FINAL

REMEDIAL INVESTIGATION (RI) REPORT

FORMER WAIKANE TRAINING AREA

KANEOHE, OAHU, HAWAII

Contract: W912DY-04-D-0007
Task Order: 0025

Prepared for:

US Army Engineering and Support Center, Huntsville

and

US Army Corps of Engineers, Honolulu District

by:

Zapata Incorporated
6302 Fairview Road, Suite 600
Charlotte, NC 28210

August 2012

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ZAPATA INCORPORATED
6302 FAIRVIEW ROAD, SUITE 600
CHARLOTTE, NORTH CAROLINA 28210
PHONE: (704) 358-8240

The views, opinions, and/or findings contained in the report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation.

Signed: ____________________
David S. Wolf, PE
Project Manager

Signed: ____________________
Michael Winningham
Vice President, Munitions Response Services

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ABBREVIATIONS AND ACRONYMS

95UCL	95th Upper Confidence Limit of the Mean
ºF	degree Fahrenheit
ADR	Automated Data Review
AOC	Area Of Concern
AP	Anti-Personnel
APHE	Armor Piercing High Explosive
ARAR	Applicable or Relevant and Appropriate Requirements
ASR	Archives Search Report
bgs	below ground surface
CD	Cultural Debris
CEPOH	U.S. Army Corps of Engineers, Honolulu District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPC	Contaminant(s) Of Potential Concern
CRREL	Cold Regions Research and Engineering Laboratory
CSM	Conceptual Site Model
CWM	Chemical Warfare Materiel
DDESB	Department of Defense Explosives Safety Board
DEP	Defense Environmental Programs
DERP	Defense Environmental Restoration Program
DGM	Digital Geophysical Mapping
DID	Data Item Description
DoD	Department of Defense
DQO	Data Quality Objective
DU	Decision Unit
EAL	Environmental Action Level
EDD	Electronic Data Deliverable
EE/CA	Engineering Evaluation and Cost Analysis
EM	Electromagnetic
EOD	Explosive Ordnance Disposal
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
ER	Engineer Regulation
ESL	Environmental Screening Levels
ESQD	Explosive Safety Quantity Distance
ESV	Ecological Screening Value
FS	Feasibility Study
FUDS	Formerly Used Defense Site
GIS	Geographic Information System
gpm	gallons per minute
GPO	Geophysical Prove-Out
GPS	Global Positioning System
HDOH	State of Hawaii, Department Of Health
HE	High Explosive
HEAT	High Explosive Anti-Tank

HFD	Hazardous Fragmentation Distance
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
HRS	Hazard Ranking System
HTW	Hazardous and Toxic Waste
IEUBK	Integrated Exposure Uptake Biokinetic
INPR	Inventory Project Report
lbs	pounds
LOAEL	Lowest Observed Adverse Effect Level
MC	Munitions Constituent
MCOPC	Munitions Constituent of Potential Concern
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MEC HA	MEC Hazard Assessment
MGFD	Munition with Greatest Fragmentation Distance
mg/kg	milligram per kilogram
MIS	Multi-Increment Sampling
mm	millimeter
MMCX	Military Munitions Center of Expertise
MMRP	Military Munitions Response Program
MPPEH	Material Potentially Presenting an Explosive Hazard
MRA	Munitions Response Area
MRS	Munitions Response Site
MRSPP	Munitions Response Site Prioritization Protocol
MSSL	Medium-Specific Screening Level
NC	No Contact
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NG	Nitroglycerine
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Observed Adverse Effect Level
NWI	National Wetlands Inventory
NWRS	National Wildlife Refuge System
PETN	Pentaerythritol Tetranitrate
PIP	Public Involvement Plan
PLS	Professional Land Surveyor
ppm	part per million
PRG	Preliminary Remediation Goal
PSAP	Programmatic Sampling and Analysis Plan
PWP	Programmatic Work Plan
PWS	Performance Work Statement
QA	Quality Assurance
QC	Quality Control
QR	Qualitative Reconnaissance
QAPP	Quality Assurance Project Plan
RAC	Risk Assessment Code
RAGS	Risk Assessment Guidance for Superfund
RDA	Recommended Daily Allowance

RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RfD	Reference Dose
RI	Remedial Investigation
RI/FS	Remedial Investigation and Feasibility Study
ROE	Right-Of-Entry
RSL	Regional Screening Level
RTK	Real-Time Kinetic
SAP	Sampling and Analysis Plan
SI	Site Investigation
SLERA	Screening Level Ecological Risk Assessment
SSL	Soil Screening Level
SS-WP	Site-Specific Work Plan
SUXOS	Senior Unexploded Ordnance (UXO) Supervisor
TAL	Target Analyte List
TDEM	Time-Domain Electromagnetic Metal
T&E	Threatened and Endangered
TNT	Trinitrotoluene
TP	Target Practice
TPP	Technical Project Planning
µg/L	microgram per Liter
U.S.	United States
UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineer Support Center, Huntsville
USC	United States Code
USGS	U.S. Geological Survey
USMC	United States Marine Corps
UTM	Universal Transverse Mercator
UXO	Unexploded Ordnance
UXOSO	UXO Safety Officer
UXOQCS	UXO Quality Control Specialist
WP	Work Plan
WTA	Waikane Training Area
WVTA	Waikane Valley Training Area

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1.0 EXECUTIVE SUMMARY

1.1 PROJECT OBJECTIVES

1.1.1 The Waikane Training Area (WTA) Munitions Response Area (MRA) is located in Waikane Valley in the District of Koolaupoko on the windward side of the island of Oahu, Hawaii. The WTA MRA is a portion of the former Waikane Valley Training Area (WVTA), which consisted of approximately 1,061 acres that were used from 1942 to 1976 by the Department of Defense as a training and artillery impact area. Live fire at the WVTA reportedly ceased in the early 1960s, but numerous types of munitions have since been recovered from the site, including 37mm and 75mm High Explosive (HE) rounds, 60mm HE mortars, M28 High Explosive Anti-Tank (HEAT) grenades, 2.36-inch and 3.5-inch HEAT rockets, M9A1 AT rifle grenades, 3.5-inch practice rockets, and M29 practice rifle grenades. The WTA MRA covers approximately 933 acres[1] of the WVTA and is the property that was evaluated during this Remedial Investigation (RI). The remainder of the WVTA is currently owned by the U.S. Marine Corps (USMC) and is therefore not an eligible property under the Defense Environmental Restoration Program-Formerly Used Defense Sites (DERP-FUDSs) program.

1.1.2 The U.S. Army Corps of Engineers (USACE) has designated the WTA MRA as Formerly Used Defense Site (FUDS) Property Number H09HI0354. The WTA MRA consists of three Munitions Response Sites (MRSs) (Figure A-1, Appendix A):

- **Southeastern Region MRS** (RMIS ID: H09HI035401R01-1), including:
    - Potential 2.36-inch Rocket Firing Point Expansion Area and
    - Stream Characterization Expansion Area;
- **Southern Impact Region MRS** (RMIS ID: H09HI035402R02-2); and
- **Western/Mountainous Region MRS** (RMIS ID: H09HI035402R03-3).

1.1.3 The WTA MRA is currently owned by several private and public land owners and includes residential areas and undeveloped open and densely forested lands. The majority of the area consists of extremely rugged terrain that limits accessibility and future development activities due to steep gulches, canyons, rocky outcrops, and mountains rising over 2,200 feet above sea level.

1.1.4 The decision to proceed with the Remedial Investigation (RI) was based on the presence of munitions and explosives of concern (MEC) and munitions debris (MD) confirmed during previous investigations. The purpose of the RI was to determine the nature and extent of MEC and MC contamination at the WTA MRA in order to adequately characterize each MRS for the purpose of developing and evaluating effective remedial alternatives.

1.1.5 This RI report documents the remedial investigation activities and findings and was prepared as a stand-alone document. The Feasibility Study (FS) and Decision Document (DD) will be addressed as separate documents following the acceptance of this RI report.

[1] Of the 1,061 acres of the WVTA, only 873.64 were considered eligible under DERP-FUDS. During the EE/CA investigation, the Munitions Response Sites were refined and acreage increased to 933 acres.

1.2 BACKGROUND

1.2.1 The following bulleted summary is a timeline of previous property use and investigations at the former WVTA. A detailed discussion of the site background and previous investigations are included in Sections 2.3 and 2.4, respectively.

- Per the Inventory Project Report (INPR) (May 1996) and Supplemental INPR (November 2004) the Army leased 1,061 acres from 1942 until July 1953 at which time the USMC was substituted as lessee. The USMC leased the property from 1953 until 1976.
- Between 1943 and 1953, the Army leased this property for maneuvers, jungle training, and small arms, artillery, and mortar firing.
- The final lease agreement for the USMC use of the WVTA was terminated as of July 1, 1976, at which time control and use of the property reverted to the respective landowners.
- Ordnance clearance sweeps were conducted by the USMC in 1976 and 1984.
- In 1989, the United States acquired title to the USMC property. Consequently, the USMC property is not eligible for cleanup under the FUDS program. Instead, it is currently being investigated by the USMC under the Munitions Response Program. More information on the USMC property is available at http://www.mcbh.usmc.mil/g4/environ/WaikaneRAB.htm.
- An Engineering Evaluation/Cost Analysis (EE/CA) was performed in 2006 over 933 acres. Seven MEC items were recovered during the EE/CA field investigation from the Southern Impact Region and Southeastern Region MRSs.
- An Abbreviated Site Investigation was conducted in 2008. Limited soil, sediment, and surface water samples were collected from areas where MEC was recovered during the 2006 EE/CA. Samples were analyzed for Target Analyte List (TAL) metals and explosives. Chemicals of Potential Concern (COPC) identified in the SI were chromium, iron, vanadium, cobalt, mercury, and RDX.
- A Non-Time Critical Removal Action (NTCRA) Action Memorandum was developed upon finalization of the EE/CA Report in June 2009. A clearance to depth of detection was the recommended alternative for approximately 14.9 acres and 26.2 acres encompassing areas where MEC and relatively high MD concentrations were found in the Southern Impact Region MRS and Southeastern Region MRS, respectively (Figures A-3 and A-4, Appendix A). It was determined during the EE/CA that a removal action was not required for the Western and Mountainous Regions (USACE- POH, 2009a).
- A NTCRA was conducted in 2011 under a separate contract, concurrent with the RI. The removal occurred in 7.3 acres of the Southern Impact Region MRS (AOC #1), 32.6 acres of the Southeastern Region MRS (AOC #2), and 0.5 acres of road surface area between the MRSs; the results will be presented in a separate Removal Action Report.

1.3 PRESENT AND FUTURE LAND USE

1.3.1 The majority of the area within Waikane Valley consists of inaccessible terrain that limits development options. However, evidence exists showing that the whole of Waikane Valley has been used, and in all probability will continue to be used, by sportsmen hunting wild boar and other game. There are also various sections within the valley that are used for recreation by moto-cross and all-terrain vehicle (ATV) enthusiasts.

1.3.2 The City and County of Honolulu produced a Master Plan to develop a fraction of the existing WTA MRA (TMK No.: 4-8-006:008) for a Waikane Valley Nature Park, which is the basis for subsequent design plans developed by the city for improvements on the site. The city is planning to establish trails, rest and picnic areas, lookouts to view surrounding landmarks of the site, a ceremonial gathering place (halau), re-vegetation areas for native plants, stream ecology study areas, ponds for aquatic wildlife studies, agricultural fields, parking areas and a visitor orientation area (Figure A-2, Appendix A).

1.3.3 Ohulehule Forest Conservancy, LLC, owner of the majority of the land (TMK Nos.: 4-8-006:001 and 4-8-014:005), has publically presented future land use plans that include restoring/preserving the native forest; protecting the only known 'elepaio (Chasiempis ibidis--listed as endangered) nesting grounds on the windward side of O'ahu; re-establishing taro farming along Waikane stream and lower portions of Waike'eke'e stream; growing high-quality organic cacao (starting with approximately five acres and expanding to a larger acreage over time); and building a single-home residence for owner personal use. The locations where these activities are planned were uncertain at the time of this RI. In the interim, it is expected that current land use patterns (i.e., unauthorized recreational use such as hiking, hunting, moto-cross, etc.) will likely continue.

1.4 RI ACTIVITIES AND SUMMARY OF RESULTS

1.4.1 Munitions and Explosives of Concern Investigation

1.4.1.1 RI fieldwork was conducted at the WTA MRA, Island of Oahu, Hawaii, between May 17, 2011 and November 7, 2011. Accessible areas (i.e., slope of 30 degrees or less) within the Southern Impact Region MRS, Southeastern Region MRS, Western/Mountainous Region MRS and expansion areas were investigated (Figure A-3, Appendix A).

1.4.1.2 Transects generally traversed the Southern Impact Region MRS and Southeastern Region MRS in a west-to-east direction and extended into the Western/Mountainous Region MRS. However, the majority of Western/Mountainous region is inaccessible due to slopes exceeding 30 degrees and the project delivery team agreed that a complete MEC exposure pathway (i.e., lack of MEC source, receptor, and receptor acting upon MEC item) was unlikely in this MRS. Approximately 6.47 acres (3-foot path width) were investigated and was comprised of over 17.8 miles of transect coverage. Based on the results of analog-and-dig transect surveys, an additional 0.82 acres (57 individual 25-foot x 25-foot grids) of geophysical grids were intrusively investigated.

1.4.1.3 Two areas within the Southern Impact Region MRS and Southeastern Region MRS (AOC #1 and AOC #2, respectively) were undergoing a concurrent subsurface removal response action and were not characterized for MEC contamination during the RI.

1.4.1.4 During the RI, a total of 5,341 anomalies were identified and intrusively investigated. The items recovered included over 3,400 items of MD but no MEC. The MD included remnants of 37mm and 75mm projectiles, 60mm and 81mm HE mortars, 3.5-inch rockets, hand grenades, rifle grenades, trip flares, expended fuzes, and small arms ammunition, and other unidentifiable munitions fragments. MD was found in all the areas investigated except for the area identified as the Unnamed Stream. Most of the MD was found in the Southern Impact Region and Southeastern Region MRSs, with the majority of the identifiable MD located in the Southeastern Region MRS. The Western/Mountainous Region MRS, the potential 2.36-inch rocket firing point, and the Waikane Stream area contained primarily MD from small arms ammunition and only minimal amounts of MD related to other munitions. All MD discovered during the investigation was collected, certified, stored securely and ultimately disposed of in accordance with the approved Work Plan.

1.4.1.5 The concurrent NTCRA recovered 42 individual MEC items from the Southeastern Region MRS (AOC #2) and no MEC items from the Southern Impact Region MRS (AOC #1). The MEC items recovered from within AOC #2 included: Hand Grenades, HE, MKII; 2.36-inch HEAT Rockets M6A1; 50mm HE Japanese Knee Mortar, Type 89; 2-inch Smoke Mortar M3; Grenade, Hand, Smoke AN-M8; 76mm HE Projectile M42A1; Simulator, Projectile, Air Burst, M27A1B1; and Simulator, Flash, Artillery, M110.

1.4.1.6 Using the RI and NTCRA data, investigated areas (MRSs and expansion areas) were evaluated to identify areas of anticipated higher and lower MEC/MD presence (Figure A-3). No MEC and only very limited MD, other than that related to small arms ammunition, has been found within the Western/Mountainous Region MRS and expansion areas. Therefore, MEC are not anticipated to be present in these areas. However, although these areas do not show evidence of concentrated munitions use, and exposure to explosive hazards in this area is unlikely, the potential for explosive hazards cannot be completely dismissed. Because the potential for MEC is considered to be minimal in these areas, a qualitative MEC Hazard Assessment (HA) was not conducted for the Western/Mountainous Region MRS or expansion areas (i.e., potential 2.36-inch rocket firing point or streams exiting the WTA MRA boundary). In the Southern Impact Region MRS and Southeastern Region MRS, where potential MEC hazards were identified, the results of these MEC HAs assigned scores of between 370 and 420 (out of 1,000) to the two assessment areas, which equates to the minimum MEC HA hazard level of 4. The results of these MEC HAs will provide the baseline for assessment of response alternatives to be conducted during the subsequent FS.

1.4.1.7 Relatively moderate to high MD density was distributed along the southern half of the Southern Impact Region MRS and Southeastern Region MRS. The highest MD density was observed southwest of AOC #2 within the Southeastern Region MRS near the WTA MRA boundary. Areas characterized with relatively high MD may contain MEC; however, a greater likelihood of exposure to an explosive hazard is associated with areas exhibiting high MEC concentrations.

1.4.1.8 During the RI, there were no MEC or MD recovered along the Unnamed Stream exiting the WTA MRA boundary; no MEC and minimal MD other than remnants of small arms ammunition were recovered within the Western/Mountainous Region MRS, along the Waikane Stream exiting the WTA MRA boundary and at the potential 2.36-rocket firing point outside of the WTA MRA boundary. These areas of minimal MD presence might still contain MEC; however, the amount of MEC anticipated to be present is not expected to pose significant explosive hazards.

1.4.1.9 MD was found throughout the Southeastern Region MRS and Southern Impact Region MRS. MD consisted of metal fragments, shell casings, rocket fins, small arms ammunition etc. Approximately 59 lbs of material documented as safe (MDAS) was shipped to a scrap processing facility in Columbus, Texas for shredding and smelting (Appendix F).

1.4.2 Munitions Constituents (MC) Investigation

1.4.2.1 Environmental samples were collected August 15 through 31, 2011 with additional sampling of some locations on October 11, 2011 and November 7, 2011. Soil and sediment samples were collected throughout the MRSs including the NTCRA areas. Multi-Incremental Soil (MIS) samples were collected (all in triplicate) from 24 Decision Units (DUs) at a depth less than 2-inches bgs. Forty discrete subsurface samples were collected from a depth of approximately 12-inches bgs. These samples were collected in areas of high MD densities as determined by the results of analog-and-dig activities conducted during the RI and collected in the vicinity of where MEC/MD items were recovered during the concurrent NTCRA within AOC #1 and AOC #2 (Figures A-7, A-8 and A-9). Twenty two sediment samples were also collected from a depth of approximately 12-inches bgs. In addition, background MC concentrations were established from MIS samples collected (all in triplicate) from 12 DUs, 16 discrete subsurface soil samples and 15 sediment samples. All of the background samples were collected from areas outside of the WTA MRA boundary (see Table 4-3, herein).

1.4.2.2 Based on the munitions known or suspected to have been used at the former WVTA, MC samples (MIS, discrete subsurface soil and sediment) were analyzed for metals (lead and copper) by United States Environmental Protection Agency (EPA) Method 6010C and explosives (EPA Method 8330B for MIS samples and Method 8330A for discrete subsurface samples).

1.4.3 Summary of Human Health and Ecological Risk Assessment

1.4.3.1 MIS samples, discrete subsurface soil, and sediment analytical results were compared against published State of Hawaii, Department of Health (HDOH) Environmental Action Levels (EALs) and the EPA Regional Screening Levels (RSLs) for Residential Soil (dated June 2011). The EPA RSL for residential soil were one set of comparison criteria used during the risk assessment and are considered more conservative (i.e., lower) than the EPA commercial/industrial regional screening levels for current/future land use scenarios. Soil detections were also compared to HDOH EALs for unrestricted land use which addresses direct exposure (incidental ingestion, dermal contact and inhalation in outdoor air) and toxicity to humans. Unrestricted land use is considered appropriate for residential housing, schools, medical facilities, day-care centers, parks and other sensitive uses. The more stringent of the two comparison values (EPA RSL or EALs) was used for the risk assessment. The EPA Integrated Exposure Uptake Biokinetic model was used to predict blood-lead levels from chronic exposure to lead (i.e., intake and uptake) in children for the risk assessment.

1.4.3.2 Results of the soil screening indicate that copper, lead, 2-amino-4,6-dinitrotoluene, 4-amino-4,6-dinitrotoluene and nitroglycerine exceeded screening criteria.

1.4.3.3 There were no MC exceedances in sediment.

1.4.3.4 Maximum and 95th upper confidence limit (95UCL) of the mean exposure concentrations of the MC of potential concern were compared to residential screening levels (the more stringent of the HDOH EAL and EPA RSL). In all cases, the 95UCL exposure concentrations were below residential screening levels and potential risks are considered negligible and are not quantified further in the risk assessment process. The HDOH Environmental Screening Levels (ESLs) Surfer database for ecotoxicity was used to obtain most of the screening levels (HDOH 2008). Elevated MC concentrations in soils are limited to the

Southeastern Region MRS in a localized area within removal area AOC #2 where intentional detonations were conducted for MEC disposal. Although lead in soils from the central portion (AOC #2) of the Southeastern Regional MRS is elevated above the ESL in four samples, the relatively low magnitude of exceedances and the low hazard quotients suggest that the potential for adverse risks to ecological receptors from exposure to lead and other munitions constituents in soil would be negligible.

1.4.3.5 The risk assessment concluded that the potential for adverse risks to human health or ecological receptors from exposure to MC in soil and sediment would be negligible at the WTA MRA.

1.5 CONCLUSIONS

1.5.1 Based on the data gathered during the RI, there are low potential explosive hazard conditions for current and reasonably anticipated future land uses at each MRS.

1.5.2 The data collected during previous investigations and for this RI are considered sufficient to characterize the potential MEC hazards and MC risk within the Western/Mountainous Region MRS. There is no documented evidence of concentrated munitions use within the MRS. Although the presence of a receptor exists and there is a possibility of receptor interaction with a MEC hazard, a complete MEC exposure pathway (i.e., lack of MEC source, receptor, and receptor acting upon MEC item) is unlikely in the Western/Mountainous Region MRS. Although this area does not appear to have been affected by concentrated munitions use, and exposure to explosive hazards in these areas is unlikely, the potential for explosive hazards cannot be completely dismissed. The Western/Mountainous Region MRS will be included in the FS to evaluate potential response alternatives.

1.5.3 Based on the RI results, no significant MEC hazards are anticipated within the Southern Impact Region MRS or the Southeastern Region MRS. Areas with relatively high MD density were found in the Southern Impact Region and Southeastern Region MRSs. No additional target areas were identified; however, due to their proximity to nearby potential impact areas (AOC #1 and AOC #2), these two MRSs will be included in the FS to evaluate potential response alternatives. Although areas characterized with relatively high MD density may contain MEC, a greater likelihood of exposure to an explosive hazard is associated with areas exhibiting high MEC concentrations.

1.5.4 The risk assessment for MC concluded that the potential for adverse risks to human health or ecological receptors from exposure to MC in soil and sediments is negligible at all three MRSs within the WTA MRA.

2.0 INTRODUCTION

2.1 PURPOSE

2.1.1 The RI is one of the steps in the remedial process for military munitions response program (MMRP) projects, under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulatory framework. The intent of the RI is to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives [40 CFR 300.430(d)(2)]. The primary purpose of this report is to present the results from the RI and provide information that may be used to assess the potential risks to human health, safety, and the environment. In addition, the RI focuses on collecting information to support the subsequent FS. The analysis and design of potential response actions include assessing the following factors:

- Physical characteristics of the property;
- Characteristics/classification of soil, air, sediment, surface water, and groundwater;
- Characteristics of the waste or military munitions (e.g., quantities, concentration, toxicity, persistence, mobility, depth, nature and extent, etc.);
- The extent to which the source can be characterized;
- Actual and potential exposure pathways through environmental media;
- Actual and potential exposure routes (e.g., inhalation and ingestion); and
- Other factors such as sensitive populations that pertain to the characterization of the site or support the analysis of potential remedial action alternatives.

2.1.2 The project team designed the RI approach in conjunction with historical records and EE/CA data so that information collected during the RI would be capable of supporting the FS and the follow-on decision documents. Data were gathered in a manner to support the analysis and design of a comprehensive list of potential response actions.

2.1.3 The RI was successful in characterizing potential MEC and MC contamination in areas covered by the investigation. The objectives of the study were met and all identified data gaps from previous investigations were addressed.

2.2 PROPERTY DESCRIPTION AND PROBLEM IDENTIFICATION

2.2.1 Property Description

The WTA MRA is located in Waikane Valley in the District of Koolaupoko on the windward side of the island of Oahu, Hawaii. The WTA MRA is a portion of the former WVTA, which consisted of approximately 1,061 acres that were used from 1942 to 1976 by the Department of Defense as a training and artillery impact area. The WTA MRA covers approximately 933 acres[1] of the WVTA and is the property that was evaluated during this RI. The remainder of the WVTA is currently owned by the USMC and is therefore not an eligible property under the DERP-FUDSs program.

[1] Of the 1,061 acres of the WVTA, only 873.64 were considered eligible under DERP-FUDS. During the EE/CA investigation, the Munitions Response Sites were refined and acreage increased to 933 acres.

2.2.1.1 Man-Made Features

There are single family homes, industrial or warehouse areas, and a park within two miles of the site. While the southern portion of the site is readily accessible; access is limited in the western portion of the WTA MRA boundary. There are no known overhead power lines or underground utilities on the site that would interfere with geophysical data collection. Several areas within the valley were littered with non-MD items, i.e., items that are non-ordnance-related including, but not limited to, household trash, construction debris/materials, old cars and car parts, old fences and fence posts, and other assorted trash, wire, banding material, rocks, and nails.

2.2.1.2 Physical Characteristics

Most of this site is covered with mature vegetation including the densely-forested coastal plain and thick grasses and shrubs in the higher elevations. There are several gulches throughout the parcels as well as numerous areas with steep slopes. According to the Western Regional Climate Center, this location receives an average of 76.03 inches of precipitation each year, with most of this rainfall occurring in October through March. The average maximum temperature for this area is 79.8°F and the average minimum temperature is 68.8°F (ZAPATA, 2011).

2.2.1.3 Geology

2.2.1.3.1 The geology of the Island of Oahu reflects a variety of processes, including volcanism, subsidence, weathering, and sedimentation (USGS, 1996). The Hawaiian Islands are sub-aerial peaks of large volcanic mountain ranges, most of which are submerged beneath the sea. The Hawaiian Ridge is believed to have been formed by the movement of the Pacific Lithospheric Plate over a convective plume in the mantle. The nearly continuous eruptive volcanism, along with movement of the Pacific Plate, produced a southeasterly succession of mountain building with progressively younger islands to the southeast (USGS, 1996). Present volcanic activity occurs at the extreme southeast end of the island chain on the island of Hawaii. The submarine portion of the Hawaiian Ridge rises about 15,000 feet above the abyssal plain before protruding above sea level. The highest point on the Island of Oahu is about 4,000 feet above sea level (ZAPATA, 2011).

2.2.1.3.2 The Island of Oahu is comprised of two coalesced shield volcanoes (Koolau Volcano to the east and the Waianae Volcano to the west), built mostly during the Pliocene and Pleistocene Epochs. The shield-building lava flows emanated mainly from prominent rift zones of the Waianae and Koolau volcanoes. The Waianae Volcanics rocks encompass shield and post shield stages of activity, and are lithologically diverse; therefore, the broader term volcanic is applied. The Koolau Basalt is wholly of basaltic composition. Koolau basalt forms the mountains and uplands of eastern Oahu, and comprises the submarine mass of the island (ZAPATA, 2011).

2.2.1.3.3 The shield volcanoes of Oahu have undergone substantial modification by secondary geologic processes, including subsidence and slope failure, chemical and physical weathering, erosion, and sedimentation (ZAPATA, 2011).

2.2.1.4 Soil

The Waikane Soil Series consists of well-drained, fine and moderately fine textured soils on uplands, fans, and terraces. These soils developed in alluvium and colluvium derived from basic igneous rock. Slopes range from nearly level to very steep. Elevations range from 200 to 1,000 feet above sea level. These soils are suitable for pasture, truck crops, and homesites. The natural vegetation consists of Christmas berry, guava, hilograss, and ricegrass. Waikane silty clay, 25 to 40 percent slopes (WpE) is the predominant soil of the northern impact area. This soil is on steep terraces and alluvial fans. In a representative profile, the surface layer is dark brown silty clay about eight inches thick. The subsoil, about 52 inches thick, is dark reddish-brown silty clay that has subangular blocky structure. The substratum is soft, weathered, gravelly alluvium and colluvium. The soil is very strongly acid in the surface layer and subsoil (ZAPATA, 2011).

2.2.1.5 Meteorology

According to the Western Regional Climate Center, this location receives an average of 76.03 inches of precipitation each year, with most of this rainfall occurring in October through March. The average maximum temperature for this area is 79.8° F and the average minimum temperature is 68.8° F (ZAPATA, 2011).

2.2.1.6 Hydrology

The Waikane-Waikeekee Stream system is the primary stream network passing through the three MRSs. The Waikane and Waikeekee Streams originate at Koolauloa Mountain Range and are fed by spillway tunnels associated with the Waiahole Ditch Tunnel Network. The Waikane and Waikeekee Streams combine and drain into Kaneohe/Koolau Bay. The tunnel network was completed in 1916 to transport water to the leeward side of the island for irrigation. The area is well drained, generally to the east, with no wetlands except along the creek banks near the streams outlets. Since excavations were hand-dug, and on a very limited scale, storm water runoff controls were not justified (ZAPATA, 2011).

2.2.1.7 Wildlife

2.2.1.7.1 The promotion of environmental awareness, including identification and avoidance of endangered species, was part of the Site-Specific Training and continued through the daily safety and operational briefs. Encounters with Threatened and/or Endangered (T&E) species were possible since there is the potential for such wildlife to be present in areas within the WTA MRA. Efforts were made to avoid, minimize or mitigate any potential impacts during performance of the fieldwork. There are numerous T&E species on Oahu; some potential T&E species that may occur within the Waikane site include:

- Hawaiian Short-Eared Owl (*Asio flammeus sandwichensis*) - state T&E species. The common name for this owl is the "pueo" and although uncommon, it may occasionally use resources within the site, especially in the more open ‘uluhe dominated higher elevations of the valley walls. Pueo primarily feed on small rodents and occasionally on small birds and invertebrates.
- Newell's Shearwater (*Puffinus auricularis newelli*) - federal and state listed. This seabird breeds in burrows dug into steep mountain slope areas that are usually sheltered by 'uluhe. Otherwise it spends most of its life at sea.
- Oahu Elepaio (*Chasiempis ibidis*) – federal and state listed endangered species. These little wren-like flycatchers occur in a variety of forest types and across a range of elevations, primarily in valleys and particularly those with tall riparian vegetation, a continuous canopy, and dense understory. Populations have seriously declined in recent decades on Oahu.

- Snail Species *(Achatinella spp.)* - federal and state listed. These small tree snails are isolated on Oahu's mountain ridges spend almost their entire lives on one tree (usually an 'ohia or kopiko tree) and feed on a type of fungus that grows on the leaves.

2.2.1.7.2 A field ecologist (from SWCA Environmental Consultants) accompanied ZAPATA on all field activities to identify T&E species and critical habitats, if observed, and to make recommendations to avoid any potential impacts from field activities.

2.2.1.8 Cultural and Archaeological Resources

A number of culturally significant sites exist within the WTA MRA. Archival data describing the existence and location of cultural properties were referenced during the planning and execution of the project. A field archaeologist (from Cultural Surveys Hawaii, Inc.) accompanied ZAPATA on all field activities to identify cultural resources and make recommendations to avoid or mitigate any potential impacts from field activities. Archaeological sites were found within the WTA MRA. These sensitive sites were protected in accordance with the approved Archaeological Monitoring Plan and are reported under separate cover.

2.2.1.9 Land Use

The majority of the Waikane Valley area consists of inaccessible terrain that cannot be accessed/developed due to steep gulches, canyons, rocky outcrops, and mountains rising over 2,090 feet above sea level. Evidence suggests that Waikane Valley has been used, and in all probability will continue to be used, by sportsmen hunting wild boar and other game. There are also various sections within the valley that are used for recreation by moto-cross and All Terrain Vehicle (ATV) enthusiasts.

2.2.2 Problem Identification

2.2.2.1 Known Explosive Safety Hazards

2.2.2.1.1 In 1944, while the former WVTA was an active military site, two people were injured and two people were killed when a 60mm mortar discovered in Waikane Valley accidentally detonated. Three children were injured in 1963 when a souvenir rifle grenade reportedly discovered in Waikane Valley exploded after it was thrown against a wall. There are no other reports of fatalities or injuries attributable to MEC discovered at Waikane Valley.

2.2.2.1.2 Previous investigations have revealed a number of MEC items at the WTA; those items are discussed in Section 2.3, Historical Information.

2.2.2.2 Terrain and Vegetation Concerns

The terrain in some of the areas of the WTA MRA prevents investigation and/or remediation due to impractical and unsafe work conditions. Vegetation is extremely thick in some areas. Naturally occurring events, such as flooding, landslides and soil erosion down steep banks are possible in areas of the WTA MRA where steep slopes exist. Brush clearing, particularly on steep slopes, would reduce soil stability leading to excessive erosion and mudslides.

2.2.2.3 Potential Human and Ecological Receptors

2.2.2.3.1 Human Receptors

Possible human receptors include residents, recreational users such as hunters, hikers, moto-cross and ATV enthusiasts; authorized visitors (e.g., wildlife management workers, research scientists); construction workers; agricultural workers; and trespassers.

2.2.2.3.2 Ecological Receptors

Soil organisms, plants, and ground-dwelling small mammals (e.g., rodents, wild hogs, mongoose) and birds (e.g., Oahu Elepaio) are potential receptors if exposed to soil contamination. In the aquatic environment of the creeks, sediment-dwelling organisms and those that prey on them are considered potential receptors if exposed to sediment contamination. The toxic mechanisms of MC include direct toxicity by contact and some bioaccumulation through the food chain.

2.3 HISTORICAL INFORMATION

2.3.1 In 1942, the Department of the Army entered into a lease agreement with Lincoln L. McCandless heirs and Waiahole Water Company, Ltd. for the right to use approximately 1,061 acres in Waikane Valley for advanced offensive warfare training and air-to-ground practice bombing due to the valley's geographical location and terrain. Between 1943 and 1953, the Army used this property for maneuvers, jungle training, and small arms, artillery, and mortar firing. Authorization for the Army to use Waikane Valley continued until July 1953, when the USMC was substituted as lessee. USMC training consisted of small arms fire, 3.5-inch rockets, and possibly medium artillery fire. Due to fire hazards, incendiaries were prohibited and all ammunition in excess of .50 caliber was to be fired into the designated impact area. The USMC leased the property from 1953 until 1976. Live fire reportedly ceased in the early 1960's. Of the 1,061 acres, approximately 933 acres were evaluated under this RI (Figure A-1).

2.3.2 In 1944, while the site was an active training area, a 60mm High Explosive (HE) mortar was discovered in Waikane Valley. Two individuals were injured and two individuals were killed, when that mortar accidentally detonated. Three children were injured in 1963 when a souvenir rifle grenade, reportedly discovered in Waikane Valley, exploded after it was thrown against a wall. There are no other reports of fatalities or injuries attributable to MEC discovered at Waikane Valley.

2.3.3 The USMC conducted ordnance clearance sweeps in 1976 and 1984. The 1976 clearance effort resulted in the removal of over 24,000 pounds of practice ordnance and fragments, including 42 items of unexploded ordnance. In December 1983, heavy rain exposed ordnance on the property and Marine Explosive Ordnance Disposal (EOD) removed a number of 3.5-inch rockets. In January 1984, the USMC conducted a sweep and removed 480 individual 3.5-inch rockets. In June 1984, an intensive ordnance clearance resulted in the removal of 16,000 pounds of demilitarized practice ordnance and 190 items of unexploded ordnance from the parcel.

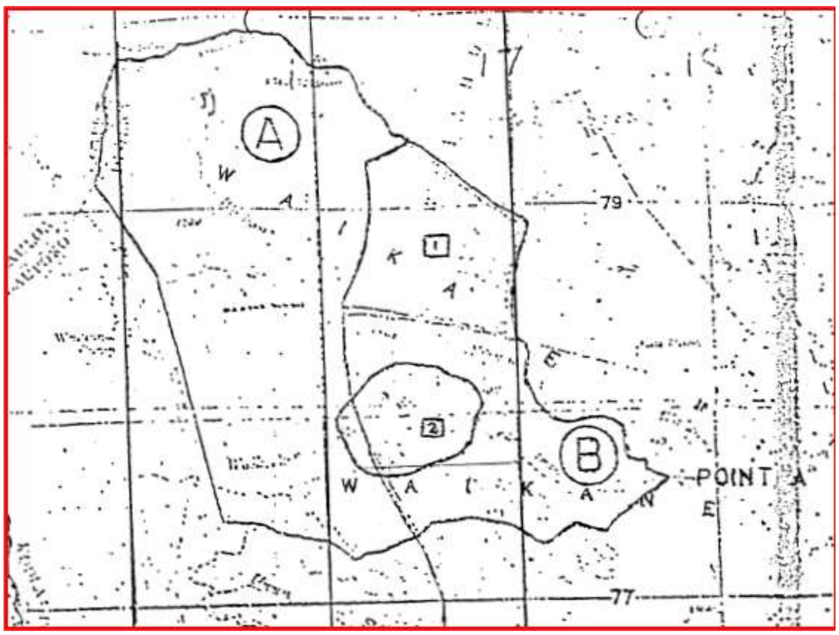
2.3.4 In 1989, the United States acquired title to the USMC property. Consequently, the USMC property is not eligible for cleanup under the FUDS program. Instead, it is currently being investigated by the USMC under the Munitions Response Program. More information on the USMC property is available at http://www.mcbh.usmc.mil/g4/environ/WaikaneRAB.htm.

2.4 PREVIOUS INVESTIGATIONS

2.4.1 1976 and 1984 Surface Clearance

Two EOD sweeps of artillery impact areas took place; one in August 1976 and the other from February to April 1984. These clearances recovered as much as 40,000 pounds of demilitarized practice ordnance as well as 37mm and 75mm high explosive rounds, 60mm mortars, 2.36 and 3.5-inch HEAT rockets, M28 HEAT grenades, and M9A1 AT rifle grenades, which were summarily destroyed. The 1976 clearance focused on Impact Areas 1 and 2, as seen in Figure 2-1, below. The 1984 clearance primarily focused in Impact Area 1.

FIGURE 2-1 1976 AND 1984 SURFACE CLEARANCE AREAS



2.4.2 1990 Archaeological Survey

An archaeological survey was conducted south and west of the USMC property, after the surface sweeps revealed the continued presence of munitions such as mortars and grenades. Three MEC items were identified in Impact Area #2 (Southern Impact Region).

2.4.3 Inventory Project Report (INPR) 1996 and Supplement 2004

The INPR was approved in 1996, followed by an INPR Supplement in 2004. These documents established the Waikane Training Area as a FUDS, established a site boundary, defined the past usage and was assigned the FUDS Project No. H09HI0354. Based on the historic use of the site, the INPR recommended further action.

2.4.4 2006 Engineering Evaluation/Cost Analysis

An EE/CA evaluating MEC risk within the 933-acre former Waikane Training Area was conducted in 2006. During the EE/CA, 150 grids (100-ft by 100-ft) and nine miles of transects (three feet wide) were investigated. Seven MEC items were recovered: two 81mm HE mortar rounds, three 60mm HE mortar rounds, and two 37mm HE projectiles. All of the MEC items were recovered in the southeastern portion of the WTA, which adjoins the southern boundary of the USMC property (Figure A-1, Appendix A). According to field observations made during the EE/CA fieldwork, most of the WTA MRA appeared to have been used for foot maneuvers as evidenced by the significant amount of small arms throughout the valley (ZAPATA, 2006). The WTA was divided up into the four regions during the EE/CA with an outcome of three recommended MRSs at completion. Combining the Western and Mountainous Regions into a single MRS was recommended to reflect the new and more accurate information obtained during the EE/CA (i.e., similar geographic setting, rights-of-entry, land use, anticipated response, hazard/risk management, etc.).

2.4.4.1 Southeastern Region MRS (RMIS ID: H09HI035401R01-1)

2.4.4.1.1 The Southeastern Region MRS (151 acres) is bordered by the Southern Impact Region to the west, the USMC parcel to the north and City and County of Honolulu property to the south and east. The terrain in the Southeastern Region is mostly rolling hills with areas of steep slopes in excess of 58 percent grade. An unimproved dirt road off of Waikane Valley Road is the main route leading into and through the area. The entrance to the access road is gated and locked. Although site access is limited by dense vegetation, terrain and a gated access road, the site remains relatively accessible to the public. Many local residents possess keys to the main gate. As for individuals that do not possess a key, the site can be accessed by unauthorized trails, paths, and streams along Kamehameha Highway. The manageable terrain and extensive dirt road network that traverses the Southeastern Region MRS make it very accessible by the public (ZAPATA, 2006).

2.4.4.1.2 During the EE/CA investigation, five UXO were discovered and documented in Southeastern Region of the site; two 81mm HE mortars and three 60mm HE mortars (Figure A-3). One 2.36-inch rocket was discovered in Southeastern Region; however, due to the condition of the 2.36-inch rocket, it could not initially be determined if it was practice or HEAT, as both the practice and HEAT rockets have the same characteristics. After the rocket was destroyed in place, it was determined that it was an inert practice round and classified as MD (ZAPATA, 2006).

2.4.4.2 Southern Impact Region MRS (RMIS ID: H09HI035402R02-2)

2.4.4.2.1 The Southern Impact Region MRS of the WTA MRA, illustrated in Figure A-1, is approximately 90 acres in size. The USMC parcel fence-line shares the northern boundary of Southern Impact Region. A dirt access road runs alongside the USMC' parcel fence-line on a mountain ridgeline. The northern side of the road drops down a very steep slope for over 80 feet in some sections; the southern segment rises upwards. Aside from the access road, the treacherous, rugged terrain and dense vegetation create inaccessible barriers within the impact area with slope grade in excess of 58 percent in several locations (ZAPATA, 2006).

2.4.4.2.2 Two MEC items (37 mm HE) were discovered and documented in the Southern Impact Region of the site (Figure A-3). One 3.5-inch rocket was discovered in the Southern Impact Region; however, due to the condition of the 3.5-inch rocket, it could not initially be determined if it was practice or HEAT. After the rocket was destroyed in place, it was determined that it was an inert practice round and classified as MD (ZAPATA, 2006).

2.4.4.3 Western and Mountainous Regions (RMIS ID: H09HI035402R03-3)

2.4.4.3.1 The Western/Mountainous Region MRS of the WTA MRA is bordered by the USMC' parcel, Southern Impact Region and Southeastern Region MRS to the east, (illustrated in Figure A-1) Pu'uohulehule Mountain (2,255 feet above sea level [asl]) on the north and the Koolau Mountain Range on the west and south. This area is approximately 692 acres with an unimproved dirt access road that runs through the area; however, it is impossible to travel off the access road due to cliffs rising up on one side and sheer drop-offs on the other side. The access road runs east to west along a ridgeline at an elevation ranging from less than 200 feet on the eastern end to over 725 feet on the west. Due to the rugged terrain and dense vegetation, the site is relatively inaccessible to the public with limited potential for future development. The area lies at the base of the Koolau Mountain with slope grade in excess of 58 percent in most locations (ZAPATA, 2006).

2.4.4.3.2 During the EE/CA investigation, no MEC was encountered and one isolated piece of MD was found in the Western Region. The piece of MD was identified as a fragment from a high explosive round. No MEC/MD items other than small arms ammunition were found within the Mountainous Region (Figure A-3).

2.4.5 2008 Abbreviated Site Investigation

An abbreviated Site Investigation (SI) focusing on the FUDS property was conducted in 2008 by CEPOH. The sampling team collected two multi-incremental soil samples in areas where MEC was found during the EE/CA, and collected two co-located surface water and sediment samples from Waikane Stream, downstream of locations where MEC was found. The samples were analyzed for Target Analyte Metals (TAL) metals and explosives. Resulting Chemicals of Potential Concern (COPC) identified in the SI were chromium, iron, vanadium, cobalt, mercury, and RDX.

2.5 CONCURRENT SITE REMEDIAL ACTIVITIES

2.5.1 CEPOH Removal Action

2.5.1.1 A Non-Time Critical Removal Action (NTCRA) Action Memorandum was developed upon finalization of the EE/CA in June 2009. As was noted, a clearance to depth of detection was the recommended alternative for approximately 14.9 acres (AOC #1) and 26.2 acres (AOC #2) encompassing areas where MEC and relatively high MD concentrations were found in the Southern Impact Region MRS and Southeastern Region MRS, respectively (Figures A-3 and A-4, Appendix A). It was determined during the EE/CA that a removal action was not required for the Western and Mountainous Regions (USACE- POH, 2009a).

2.5.1.2 CEPOH contracted Environet, Inc. to conduct a NTCRA in AOC #1 and AOC #2 within the WTA MRA as shown in Figures A-3 and A-4, Appendix A. The results of the removal action were considered preliminary at the time of this RI report but have been included to assist in the decision making process.

3.0 PROJECT REMEDIAL RESPONSE OBJECTIVES

3.0.1 This RI is being conducted in accordance with the objectives and goals established by the project delivery team (PDT) during the technical project planning (TPP) phase as summarized in the Final TPP Memorandum (ZAPATA, 2009). The primary objective for the RI at the WTA MRA is to determine the nature and extent of MEC and MC. The TPP team agreed that the RI data analysis would be based on analog-and-dig (intrusive investigation) within transects and grids of the Western/Mountainous Region MRS, Southern Impact Region MRS and Southeastern Region MRS. Environmental MC samples would be collected from locations in and around areas thought to constitute former target locations and ranges, based on confirmation from historical photographic analysis and analog-and-dig intrusive results.

3.0.2 A NTCRA Action Memorandum was developed upon finalization of the EE/CA in June 2009 (USACE POH, 2009a). As was noted, a clearance to depth of detection was the recommended alternative for approximately 26.2 acres and 14.9 acres encompassing areas where UXO and relatively high MD concentrations were found in the Southeastern Region MRS and Southern Impact Region MRS, respectively. It was determined during the EE/CA that a removal action was not required for the Western/Mountainous Region MRS since no MEC items were recovered, to date.

3.0.3 In addition, data needs specific to this RI were identified by evaluating historical information, site-specific data and through discussions of project requirements with the PDT. It was determined that additional data should be collected to support the recommended response actions. These identified data gaps limited the characterization of the nature and extent of potential MEC contamination in portions of Southern Impact Region MRS and Southeastern Region MRS. Data gaps also created uncertainty in the evaluation of the potential impacts of past MC releases on human health and the environment as only limited sampling for MC was performed previously in the MRSs.

3.1 CONCEPTUAL SITE MODEL (CSM) AND PROJECT APPROACH

3.1.1 Preliminary CSM

3.1.1.1 A preliminary CSM describing the site, sources of MEC, and receptors was developed during the SI phase and refined during the TPP and subsequent discussions with the PDT. The preliminary CSM was presented in the TPP Memorandum in Appendix I of the Work Plan. The CSM was based on historic documentation, subsequent MEC finds, and assumptions of how operations may have been conducted in cases where documentation was incomplete. The actual, potentially complete, or incomplete source-receptor interaction for current and future land use must include: a source, access, and activity.

3.1.1.2 The CSM, revised to include the RI results and source-receptor pathway analysis are presented in Section 5.0 (see Table 5-3 and Figures 5-1 and 5-2).

3.1.2 Project Approach

The approach of the RI involved compiling and critically evaluating all available pertinent data from previous reports and investigations along with the additional MEC and MC investigation findings of the RI field work. The RI project approach for the Western/Mountainous Region

MRS, Southern Impact Region MRS and Southeastern Region MRS as described during the TPP process includes:

- Collect data needed to support the explosive hazard assessment, define the extent of MEC contamination, focus the MC sampling, and evaluate remedial response actions.
- Build on the EE/CA data and findings to reduce data gaps and uncertainties.
- Analyze soil/sediment where significant quantities of UXO or Discarded Military Munitions (DMM) were found.
- Analyze soil/sediment at or near physical features indicative of MEC or MC.
- Analyze soil/sediment at locations associated with greater current or potential future exposure to MC.
- Analyze for background concentrations of select naturally occurring metals in soil and sediment.
- Protect the public and their property during project implementation.
- Minimize impacts to environmental resources.
- Adhere to all State and Federal requirements.

3.2 PRELIMINARY REMEDIATION GOALS (PRGS)

Preliminary remediation goals (PRGs) are both site- and contaminant-specific and provide the minimum characteristics necessary to be protective of human health and the environment. The project close-out statement agreed upon by the project delivery team for the site as documented in the Final Technical Project Planning Memorandum dated December 2009 was “To manage the munitions and explosives of concern (MEC) and munitions constituents (MC) risk through remediation, administrative controls, and public education; thereby rendering USACE/FUDS Property Number H09HI0354 as safe as reasonably possible to humans and the environment and conducive to the anticipated future land use”. While PRGs are initially established within the RI, they are subject to review and refinement throughout the course of the CERCLA process, as more project-related information is obtained.

3.2.1 Assessment of Land Use and Institutional Analysis Aspects

3.2.1.1 The City and County of Honolulu produced a Master Plan to develop the Waikane Valley Nature Park, which is the basis for subsequent design plans developed by the city for improvements on the site (Figure A-2, Appendix A). The majority of the area within Waikane Valley consists of inaccessible terrain that cannot be developed due to steep gulches, canyons, rocky outcrops, and mountains rising over 2,200 feet above sea level. However, evidence exists showing that the whole of Waikane Valley has been used, and in all probability will continue to be used, by sportsmen hunting wild boar and other game. There are also various sections within the valley that are used for recreation by moto-cross and ATV enthusiasts. It is anticipated that a few acres of light agricultural use will continue within the valley with a current landowner operating a nursery growing native plants.

3.2.1.2 Ohulehule Forest Conservancy, LLC, owner of the majority of the land (TMK Nos.: 4-8-006:001 and 4-8-014:005), has publically presented future land use plans that include restoring/preserving the native forest; protecting the only known 'elepaio (*Chasiempis ibidis*--listed as endangered) nesting grounds on the windward side of O'ahu; re-establishing taro farming along Waikane stream and lower portions of Waike'eke'e stream; growing high-quality organic cacao (starting with approximately five acres and expanding to a larger acreage over time); and building a single-home residence for owner personal use. The locations where these activities are planned were uncertain at the time of this RI. In the interim, it is expected that current land use patterns (i.e., unauthorized recreational, hiking, hunting, moto-cross, etc.) will likely continue.

3.2.1.3 Institutional controls include engineering controls (i.e., fencing, barriers, signage, etc.), educational programs and legal mechanisms. The overall effectiveness of institutional controls depends entirely on local agencies and private landowner support, involvement, and willingness to enforce and maintain institutional controls implemented to eliminate public interaction with MEC/MC. Local agency and community acceptance has been established based on information gathered during public meetings and interaction with local agencies and the community to date. This information will be updated at any time during the process as new information becomes available.

3.2.2 PRGs for MEC

3.2.2.1 The PRG for MEC at each MRS is to mitigate human exposure to and interaction with MEC, which can be accomplished by limiting access or through remedial activities. The following should be considered when developing PRGs for MEC:

- The estimated quantity of residual MEC;
- The expected depth of residual MEC;
- The location of MEC;
- The potential exposure pathway between humans (considering future land use) and MEC; and
- The potential for an individual to interact with any MEC once an exposure occurs.

3.2.2.2 Based on the close-out statement, the PRG for MEC is to either remove MEC to a depth at which it no longer presents a hazard to human receptors or to implement land use controls that minimize the possibility of humans encountering MEC.

3.2.3 PRGs for MC

3.2.3.1 The PRG for MC at the MRSs is to ensure that identified MC contamination, in excess of screening values (numerical values presented in Tables G-1 through G-3 and G-5 through G-8, Appendix G), is addressed to minimize or mitigate risks to human health or the environment. Screening levels are established by consensus by the project delivery team during the technical project planning process and are subject to change throughout the investigation. Furthermore, screening levels are used as a basis for establishing PRGs to be used during follow-on site activities, if warranted.

3.2.3.2 The screening values used in this investigation were defined as the most stringent of the State of Hawaii, Department of Health (HDOH) Environmental Action Levels (EALs), Table B-Groundwater is Not Current or Potential Source of Drinking Water, <150m to Surface Water Body (updated November 2009) and EPA Regional Screening Level (RSL) for Residential Soil (update June 2011) for the Human Health Risk Assessment. The HDOH ESLs Surfer database for ecotoxicity was used to obtain most of the screening levels (HDOH 2008) for the Ecological Risk Assessment. Various EPA and other federal soil and sediment screening values are used as measurement endpoints where there are no ecotoxicity ESLs. Table G-5 provides a list of available ecological screening values and their associated references. Some of the explosives compounds do not have any screening values for particular media. The PRG for MC is to ensure that identified MC contamination, if discovered, at concentrations exceeding the screening levels is addressed to minimize or mitigate risks to human health and the environment.

3.3 PRELIMINARY IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) AND "TO BE CONSIDERED" INFORMATION

3.3.1 CERCLA requires that on-site remedial actions must attain or formally waive Federal or more stringent State applicable or relevant and appropriate requirements (ARARs) of environmental laws upon completion of the remedial action. The NCP requires compliance with ARARs during remedial actions as well as at their completion. Applicable requirements mean those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. If a requirement is not applicable, it still may be relevant and appropriate. Relevant and appropriate requirements mean those cleanup standards that address problems or situations sufficiently similar to those encountered at a CERCLA site that their use is well suited to the particular site.

3.3.2 Three types of ARARs were examined in light of site-specific circumstances to determine the actual ARARs for remedial actions carried out at the WTA MRA: chemical-specific ARARs, location-specific ARARs, and action-specific ARARs.

3.3.3 Chemical-specific ARARs are promulgated health-based or risk-based numerical values that establish the acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. Where more than one requirement addressing a contaminant is determined to be an ARAR, the most stringent requirement should be used. Risk-based screening levels (e.g., EPA regional screening levels) are not considered chemical-specific ARARs because they are not promulgated. The baseline risk assessment for COPCs at WTA MRA concluded that the potential for adverse risks to human health or ecological receptors from exposure to the identified COPCs at the WTA MRA is negligible. Therefore, there are no chemical-specific ARARs for remedial actions carried out at the WTA MRA.

3.3.4 Location-specific ARARs generally are restrictions placed on the concentration of hazardous substance or the conduct of activities solely because they are in locations determined to have unique or sensitive qualities. Some examples of locations with unique or sensitive qualities include flood plains, wetlands, historic places, and sensitive ecosystems or habitats. Because the WTA MRA contains a number of significant cultural sites and because species listed as threatened or endangered under the ESA could occur within the WTA MRA, two preliminary location-specific ARARs have been identified (see Table 3-1).

3.3.5 Action-specific ARARs are usually technology- or activity-based requirements or limitations placed on actions taken with respect to remedial or removal actions. These ARARs control remedial actions involving the design or use of certain equipment, or regulate discrete actions. No action-specific ARARs have been identified for the WTA MRA.

3.3.6 ARARs alone may not adequately protect human health and the environment. In developing the site risk assessment, which is used to determine protectiveness, criteria, guidance, advisories, and proposed standards (to-be-considered criteria, or TBCs) may be used. While these policies, guidelines, or rules are not promulgated requirements (and are not potential ARARs), they may be used in combination with ARARs to achieve acceptable levels of risk.

3.3.7 Remedial actions must attain or formally waive ARARs. An alternative that cannot comply with ARARs, or for which a waiver cannot be justified, should be eliminated from consideration for further discussion as a potential alternative in the Proposed Plan or Record of Decision (ROD). If the remedial action selected in the decision document will not attain those ARARs that are identified at the time of signature, the decision document will provide the grounds for invoking a waiver under § 300.430(f)(1)(ii)(C).

3.3.8 Where a response action is carried out entirely on-site and in compliance with Section 121 of CERCLA, it is exempt from having to obtain Federal, State, or local permits. On-site actions need comply only with ARARs, not with any corresponding administrative procedures. For any remedial action selected for implementation at the WTA MRA, all ARARs will be attained unless formally waived.

TABLE 3-1 PRELIMINARY IDENTIFICATION OF APPLICABLE OF RELEVANT, AND APPROPRIATE REQUIREMENTS (ARARS)

Regulatory Authority	Law/Regulation	Requirement	Comment
Federal	*National Historic Preservation Act of 1966* 16 U.S.C. §470f.	Action must take into account effects on properties included in or eligible for the National Register of Historic Places.	The WTA MRA contains a number of significant cultural sites.
Federal	*Endangered Species Act of 1973* 16 U.S.C. §1536(a)(2).	Action must not jeopardize the continued existence of any listed endangered or threatened species or result in the destruction or adverse modification of designated critical habitat of such species.	The WTA MRA is in a region that is known to have a high probability for containing endangered and threatened species. However, none have been identified within the WTA MRA during the RI investigation.

3.4 SUMMARY OF INSTITUTIONAL ANALYSIS PLAN

3.4.1 There are many ways to protect the public from MEC related accidents. Institutional controls are an effective way to protect the public and other personnel, while still maintaining day-to-day operations. Institutional controls may include warning signs and community educational programs such as instructional pamphlets and meetings.

3.4.2 Institutional analyses are prepared to support the development of institutional control strategies and plans of action as a munitions response alternative. These strategies rely on existing powers and authorities of government agencies to protect the public at large from potential MEC hazards and MC risks.

3.4.3 The WTA MRA is owned by private and public (City and County of Honolulu) entities. The cooperation of the public and private entities is required for institutional controls to be effective.

3.4.4 The institutional analysis identifies government agencies having jurisdiction over properties that have MEC presence. The following governmental entities were identified for potential involvement in future institutional controls: USACE and HDOH.

3.4.5 The USACE represents the federal government and provides overall program management and execution, which includes funding and technical direction, for FUDS within their respective district. They are responsible for initiating the Decision Documents, inspecting the condition of signage, reporting new discoveries of MEC to environmental regulators (HDOH), attending public meetings and disseminating information and instructional pamphlets.

3.4.6 The HDOH is the state environmental regulator for the former WVTA. The agency's role is to protecting the public from environmental hazards at the State level. HDOH is responsible for permitting, reporting, variance and application review and participating in public meetings. The agency has the authority to enforce environmental laws.

3.4.7 As noted during the field activities, warning signs reading "No Trespassing" or "Danger Explosives" are currently in place at the gated entrances into the property. Additional warning signs may be added along the road traversing across the WTA MRA, if acceptable.

3.4.8 The cost for each of these institutional controls can vary greatly. The cost analysis of institutional controls will be provided, in detail, in the Feasibility Study report.

3.4.9 The Institutional Control Plan is provided as Appendix C to this RI report.

3.5 DATA NEEDS AND DATA QUALITY OBJECTIVES

3.5.1 DQOs are qualitative and quantitative criteria used to guide sample collection and analysis activities. The DQOs for this RI/FS project were developed prior to conducting the investigation to ensure that the data generated during the execution of the analytical program are of appropriate quality to support the anticipated end use of the data. DQOs are intended to ensure that the adequate type, amount, and quality of data are collected to accomplish the objectives of the project. The following subchapters summarize the major site-wide DQOs for each element of the RI, along with a statement verifying whether the DQOs were achieved. Additional geophysical measurement quality objectives (MQO) established for this investigation are discussed in Chapter 5.

3.5.2 The site characterization goals of the RI are to collect sufficient data to determine if MEC or MC poses a threat to human health, public safety, or the environment. Additionally, the RI/FS will further define the areas of MEC occurrence and generate sufficient data to complete risk assessment development and analysis of remedial alternatives, and preparation of a Proposed Plan and Decision Document for each MRS.

3.5.3 The original overall MEC DQO for the RI at Waikane Training Area was to collect approximately 13.5 acres of transect data across the MRSs along transects spaced at approximately 75-foot intervals. The data gathered during transect investigation would be supplemented with an additional 1.5 acres of grids, which would be located based on the results of the transect intrusive investigation. Slopes up to 30 degrees were to be investigated dependent upon the determination of safety in the field. These investigation acreages were based on those specified in the project PWS issued by USACE (Appendix I). The investigation areas were to be distributed in the following manner:

- Southeastern Region: 7 acres
- Southern Impact Region: 4 acres
- Western Region: 2 acres
- Mountainous Region: 2 acres

3.5.4 During the TPP process, the Western Region and Mountainous Regions were combined into a single MRS (Western/Mountainous Region MRS). Furthermore, the originally proposed transect layout and field investigation acreage was revised. Areas that were considered adequately characterized in the EE/CA process were removed. The revised transect layout removed most of the proposed transect segments that were within a 75-ft buffer of the previously investigated areas during the EE/CA; however, selected segments within the EE/CA buffer were retained. It was also agreed that the field teams would only work in areas up to 30 degrees, as long as working conditions were safe. Transects acreages were transferred to enable characterization of other areas, including a suspected 2.36-inch firing point area located outside of the WTA MRA boundary south of the Southeastern Region MRS and two streams exiting the WTA MRA boundary due to their potential to transport munitions offsite. The revised investigation areas totaled 9.0 acres and were distributed in the following manner:

- Southeastern Region MRS (including the potential 2.36-inch rocket firing point expansion area): 3.3 acres
- Southern Impact Region MRS: 0.9 acres
- Western/Mountainous Region MRS: 2.1 acres
- Stream Characterization Expansion Area: 2.7 acres (if accessible)

3.5.5 Subsequent to the last TPP meeting, the PDT agreed that a complete MEC exposure pathway (i.e., lack of MEC source, receptor, and receptor acting upon MEC item) was unlikely in the Western/Mountainous Region MRS. Transect and grid acreage from this area would be transferred, as necessary, to the Southern Impact Region MRS, Southeastern Region MRS, along the streams and used for potential expansion outside of the WTA MRA boundary area to the southeast.

3.5.6 The MEC DQOs were approved by the PDT as being adequate to characterize the site and identify areas of MEC contamination (i.e., former impact areas). The MEC DQOs for the WTA MRA are presented in Table 3-2. Subchapter 5.1.2 describes the status of the MEC DQOs following the completion of the RI. Data quality objectives were met or determined to be acceptable during the RI, the RI data combined with data from previous investigations and response actions effectively define the nature and extent of MEC at the WTA MRA.

3.5.1 Analysis of Existing Data

Data needs specific to this RI were identified by evaluating historical information, site-specific data and through discussions of project requirements with the PDT.

3.5.1.1 Sectorization

3.5.7.1.1 The Waikane Training Area was divided into three MRSs as shown in Figure A-1, Appendix A:

- **Southeastern Region MRS** (RMIS ID: H09HI035401R01-1), including:
  - Potential 2.36-inch Rocket Firing Point Expansion Area and
  - Stream Characterization Expansion Area;
- **Southern Impact Region MRS** (RMIS ID: H09HI035402R02-2); and
- **Western/Mountainous Region MRS** (RMIS ID: H09HI035402R03-3).

3.5.7.1.2 The areas of interest within the site were determined from the existing archival impact regions and training area information, supplemented with new information derived from the EE/CA conducted in 2006 (ZAPATA, 2006).

3.5.2 Additional MEC Data Obtained

3.5.8.1 Analog-and-dig investigations were conducted over a total of 7.3 acres (transects and grids) within the WTA MRA to evaluate the presence of MEC and determine where to conduct MC sampling. After reviewing the data collected during the transect coverage, and the data gathered during the previously completed EE/CA (anomaly concentrations, MEC item locations, etc.), areas of interest were identified for further investigation using grids for further defining nature of MEC contamination and to identify locations for MC sampling. Fifty-seven 25-ft by 25-ft grids were placed in areas of medium and high subsurface munitions debris density.

3.5.8.2 A combination of transects and grids were positioned across the MRSs and along the Waikane Stream and Unnamed Stream to characterize nature and extent of MEC contamination. During large rainfall events, the stream bed width can increase from 3 to 20 feet. Streams exiting the WTA MRA boundary were investigated because of their potential to transport munitions offsite.

3.5.3 Additional MC Data Obtained

3.5.9.1 During the TPP process, the PDT reviewed MC data gathered during an abbreviated SI conducted in 2008 by CEPOH. Two multi-incremental soil samples were collected in areas where MEC was found during the EE/CA. Two co-located surface water and sediment samples were collected from the Waikane Stream, downstream of locations where MEC was found. During the abbreviated SI, the samples were analyzed for TAL metals and explosives. Resulting COPC identified in the SI were chromium, iron, vanadium, cobalt, mercury, and RDX. After a review of the Munitions Items Disposition Action System (MIDAS) database, it was determined that the entire suite of TAL metals were not representative of the actual munitions expected or found at the site and chromium, iron, vanadium, cobalt and mercury were eliminated from further investigation. The COPC identified for this RI include explosives (including RDX) and select metals (copper and lead).

3.5.9.2 The stakeholders identified potential data gaps requiring additional background soil and sediment analytical data, and collection of soil, sediment and (potentially) surface water and groundwater analytical data. As a result, a Sampling and Analysis Plan (SAP) was developed addressing these gaps, resulting in collection of significant additional environmental sampling data during the RI.

3.5.4 Data Quality Objectives (DQOs) Resulting from the TPP Process

3.5.4.1 MEC DQOs

3.5.10.1.1 Analog-and-dig sampling within transects and grids was conducted to characterize the nature, extent, location, and concentration of MEC items. In general, the DQOs for the analog-and-dig investigation include;

- Use of tools, sensors and equipment that are fully functional and reliable,
- Utilization of site personnel who are fully qualified to perform the tasks in a safe and efficient manner,
- Collection of information in a manner that yields high-quality, accurate data sets,
- Interpretation of data which yield a complete, fully detailed listing of potential items encountered during the reconnaissance, and
- Repeatable and verifiable results.

3.5.10.1.2 Results obtained during the MEC intrusive investigation were considered of acceptable quality to meet the project DQOs. Detailed achieved DQOs are summarized in Table 3-2.

3.5.4.2 MC DQOs

3.5.10.2.1 In order to generate analytical data that meet the project objectives, it was necessary to define the types of decisions that will be made, identify the intended use of the data, and design a data collection program. Analytical DQOs are statements that define the type of data, the manner in which data may be combined, and the acceptable uncertainty in the data which establish requirements for data quality and quantity based on the intended use of the data. The DQO process assists in determining the appropriate quantifier, detection limits, reporting limits (quantitation limit), analytical methods, and sampling procedures.

3.5.10.2.2 Data needs specific to this RI were identified by evaluating existing data and through discussions of project requirements with HDOH, USAESCH and CEPOH. The process by which data needs were developed is documented in the TPP Memorandum and Worksheet #10 of the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP). The DQOs developed for MC, as well as the analytical data quality level requirements, were provided in Worksheet #11 of the UFP-QAPP (Appendix J).

3.5.4.3 Evaluation of Chemical-Specific DQOs

3.5.10.3.1 Chemical data collected during this program were validated to ensure the procedures defined in the UFP-QAPP were followed and that the quality of data adequately supports the intended use of the data as described in EPA's Data Quality Objectives Process (G-4) (August 2000) and Data Quality Objectives Process for Hazardous Waste Sites (G-4HW) (January 2000). The Quality Assurance/Quality Control (QA/QC) evaluation determined whether the data met the requirements of the UFP-QAPP and included validation of the laboratory data. Accutest Laboratories Southeast, Inc. at 4405 Vineland Road, Suite C-15, Orlando, Florida 32811 is accredited to DoD Environmental Laboratory Accreditation Program (ELAP) and the International Organization for Standardization and International Electrotechnical Commission (ISO/IEC) 17025:2005 through December 15, 2012. Their certification number is L2229.

3.5.10.3.2 The overall objective of the field effort was to provide an accurate, precise and representative assessment of the soil/sediment in areas identified during historical research and intrusive investigation. The collected samples and data generated from these samples were intended to provide the information necessary to assess future remediation options for Waikane, if necessary. Analytical results were compared to numeric criteria to determine if the basic DQOs were met. This includes reviewing laboratory reporting limits to confirm they did not diverge from those specified in the Work Plan and, if so, whether this was due to laboratory dilution or some other cause. Further comparisons include analytical data from soil, surface-water (if applicable), and sediment samples for explosives and selected metals (copper and lead) to the most stringent applicable screening criteria included below:

- HDOH EALs, Table B-Groundwater is Not Current or Potential Source of Drinking Water, <150m to Surface Water Body (updated November 2009);
- EPA RSL for Residential Soil (update June 2011) for the Human Health Risk Assessment; and
- The HDOH ESLs Surfer database for ecotoxicity (HDOH 2008) for the Ecological Risk Assessment.
- Various EPA and other federal soil and sediment screening values are used as measurement endpoints where there are no ecotoxicity ESL (Table G-5, Appendix G) provides a list of available ecological screening values and their associated references. Some of the explosives compounds do not have any screening values for particular media.

3.5.10.3.3 Results obtained during laboratory analyses were considered of acceptable quality to meet the project DQOs.

3.5.5 Munitions Constituent Data Collection Methods

3.5.5.1 Environmental Sampling

For MC sampling during the RI, the available methods for sample collection included MIS samples, discrete subsurface soil sampling and sediment sampling. These collection methods are considered industry standard methods and were decided by the PDT during the TPP process. The methods described below were applied to soil (incremental and discrete subsurface) and sediment samples collected for establishing background concentrations and for samples collected within the MRSs.

3.5.5.1.1 Soil

3.5.5.1.1.1 Multi-Incremental Soil Sampling (Explosives and Metals)

3.5.11.1.1.1.1 Within each Decision Unit (DU), MIS samples were collected in triplicate (one primary and two replicates), with each sample consisting of approximately 50 subsamples (grab/aliquots) collected at randomly selected, evenly-spaced points along parallel lines traversing the DU at a depth of approximately 2-inches below ground surface. Disposable hardened plastic scoops were used to collect the individual aliquots which comprised a 2 kg sample of the top 1 to 2 inches of the ground surface within each DU. Sampling was conducted in accordance with USACE, HDOH guidelines and the project-specific procedures documented in the UFP-QAPP contained in the Work Plan.

3.5.5.1.2 Discrete Subsurface Soil Samples (Explosives and Metals)

Soil samples were collected from soils recovered during soil borehole advancement using a hand auger to a depth of approximately 12-inches bgs. Sampling was conducted in accordance with USACE, HDOH guidelines and project-specific procedures documented in the UFP-QAPP as defined in the Work Plan.

3.5.5.1.3 Sediment (Explosives and Metals)

Sediment samples were collected directly from sources using a hand auger and handheld disposable sampling equipment from a depth of approximately 12-inches bgs. Sampling was conducted in accordance with USACE, HDOH guidelines and project-specific procedures documented in the UFP-QAPP as defined in the Work Plan.

TABLE 3-2 RI/FS MEC DATA QUALITY OBJECTIVES FOR THE WAIKANE TRAINING AREA MUNITIONS RESPONSE AREA

QO	Problem Statements	Required Information Inputs	Input Boundaries	Analytical Approach	Performance Criteria	Achieved DQOs during RI Fieldwork	Plan for Obtaining Data
Explanation:	*Define the problem that necessitates the study.*	*Identify data and information needed to answer study questions.*	*Specify the target population and define spatial limits.*	*Develop the logic for drawing conclusions from findings.*	*Specify probability limits for false rejections and false acceptance decision errors.*	*Adherence to performance criteria are documented in Appendix H.*	*Select the plan that meets the performance criteria.*
MRS Characterization	• Determine the nature and extent of MEC within each MRS.	• Data collected during previous activities. • Results of visual observations along transects and in grids. • Analog geophysical data. • Results of intrusive investigation of identified anomalies. • Survey of site receptors (demographic factors – population, activity).	• During field activities, transects will be spaced approximately 75 ft apart and grids will equate to 25 ft by 25 ft areas within each applicable MRS. • Conceptual transect spacing is designed to search for areas where the 37mm projectiles (the smallest item of interest) would explode on impact with the ground after missing a target, detonate and fragment. • Anomalies will be investigated to the depth of detection of the largest seed item as determined during the Test Strip or bedrock, whichever comes first, to a maximum depth of four feet. • Grid locations in areas of high, medium, and low anomaly count areas will be determined based on results of transect intrusive investigations. • Intrusively investigate potential MEC items. ***Data Collection*** – Spring - Summer Months ***Constraints***: Rights-of-Entry, weather, current land use activities, harsh terrain, dense vegetation.	• Maximum depth of each type of MEC encountered will be used to define the vertical extent for that type of MEC. • The location and spatial extent of MEC will be used to define the lateral extent for MEC encountered. It will be defined as 500 feet beyond the last MEC discovered. • If evidence of MEC is found, then discovery location may be within a zone where ordnance landed that did not function as designed. • All MD, frag, and target parts will be evaluated as possibly indicative of the location of MEC. Alternative actions will be formulated in the Feasibility Study based on the location and density of MEC, land use, and other data gathered during the investigation and comparison of those data with criteria established herein.	• Depth of detection (Analog) for a 37mm is detection at the site-specific depth of 9.5” bgs which was determined by the Test Strip. • QC/QA blind seed items were detected and recovered (in grids) at the site-specific depth determined by the test strip. • QC/QA blind seed items were marked/labeled and coordinates documented in a field log book prior to intrusive investigation. • Instrument Functionality - All items in test strip were detected by trained ear daily to items of interest. • Measured locations (i.e., grid corners and transect hubs) are reoccupied within 10m.	• Repeatability – All items in the test strip were detected on a daily basis. • Dynamic Repeatability – The UXOQC followed 100% of the transects for the first two days and >10% of the transects daily. • Coverage, Detection and Recovery – The blind coverage/blind detection seeds were recovered in each grid. • Anomaly Resolution – The UXOQC re-checked 1,648 open holes to assure at least 90% level of confidence. • Geodetic Equipment Functionality – GPS equipment were checked daily against a known temporary control point. • Geodetic Repeatability – Although GPS signals were restricted a MQO (10m radius) for geodetic repeatability was established for this project.	• Visually inspect and determine anomaly density within transects using analog-and-dig (Southern Impact Region MRS and Southeastern Region MRS, only). Data collection along approximately 8.1 acres/22.3 miles of transects and 0.8 acres/57 grids in Southern Impact Region MRS and Southeastern Region MRS. • Synthesize transect anomaly density data for PDT review and grid placement. • Select grid placement locations. Grids will be placed in high, medium, and low anomalous areas, based on analog-and-dig data and discussions with the PDT; biased placement of percentage of grids to define location of potential MEC in areas beyond impact areas.

4.0 CHARACTERIZATION OF MEC AND MC

4.1 MEC CHARACTERIZATION

4.1.1 The PDT conducted a comprehensive review of existing site-specific data, including the EE/CA and available historical documents and records, noting the type of ordnance used. It was determined that a combination of transects and grids positioned across the MRSs would be sufficient to characterize the nature and extent of MEC. Fieldwork was conducted in accordance with the Work Plan dated March 2011.

4.1.2 Based on data collected during the EE/CA, it was suspected that MEC contamination could extend beyond the currently delineated WTA MRA boundary and might lead to expansion of the Southeastern Region MRS. As discussed during the TPP process, MRS boundaries could expand based on newly found evidence of contamination. Data were collected up to the existing boundary, evaluated and discussed with the Project Delivery Team (PDT). A phased approach was proposed to delineate the extent of MEC or MD contamination near the southeastern boundary of the current WTA MRA boundary. If MEC or MD was found near the boundary, a grid would be positioned near the boundary for additional intrusive investigation. If MEC was found within the grid, a transect would be extended incrementally (500 feet) beyond the MRS and investigated until no additional MEC or MD is identified.

4.1.3 MEC Intrusive Investigation (Analog-and-Dig)

4.1.3.1 UXO Technicians who met the standards of DDESB TP-18 excavated and positively identified anomalies. The field teams maintained a detailed record of the items excavated including amounts of MD and non-munitions related debris, proper identifying nomenclature, and condition, location, depth and disposition. Digital photographs of representative items were taken for reporting purposes. No MEC items were recovered during the RI thus MEC disposal operations were not necessary.

4.1.3.2 Necessary personnel and equipment were furnished to make final disposition of all recovered Material Potentially Presenting an Explosive Hazard (MPPEH). All recovered MPPEH was inspected, consolidated, and disposed of in accordance with Chapter 14, EM 1110-1-4009 and Errata Sheet No. 2. Upon inspection, it was determined that none of the MPPEH found contained explosives hazards or other dangerous fillers or engine fluids, illuminating dials, or other visible liquid HTRW materials. The inspected materials were packaged, weighed and sealed, and a completed DD Form 1348-1A was prepared for the single 15-gallon steel container. No MEC was found; therefore the container was transferred to an approved scrap dealer with a written statement that all MDAS would be immediately processed through a smelter or shredder prior to resale (Appendix F).

4.1.4 Instrument Test Strip Construction

4.1.4.1 The probable munitions range from 37mm projectiles to 81mm mortars with the potential for hand grenades. Actual detection depths can vary based on numerous factors including site-specific conditions and type of sensor. As such, detection depths were established utilizing an instrument test strip seeded with inert items indicative of probable munitions and positioned at various orientations. The MineLab Explorer SE PRO Series metal detector was used for the RI field work. The instrument settings were determined based upon the response results from the test plot. The MineLab was selected as the most effective sensor based on information and prior experience obtained during field investigations in similar geological settings (i.e., extensive amount of mineralized soil content from the basalt rocks).

4.1.4.2 The test strip was constructed per the approved project Work Plan. The test strip contained two 37mm projectiles, two 60mm mortars, and two 81mm mortars. One of each seed item was placed in the worst orientation at 95% of its maximum detectable depth as demonstrated during construction of the test strip and one seed item was placed at the best orientation. The worst orientation is typically perpendicular to the direction of travel and horizontal to the ground surface. The best orientation is typically vertical to the ground surface. The test strip was randomly reconfigured weekly by moving seed items. Items were initially tested in an "open hole" at respective orientations at the maximum expected detection depth. The depth of the hole and instrument settings were adjusted until the maximum detectable depth was established. The seed items were then buried at 95% of the maximum detectable depth. Seed items were photographed and locations recorded with the GPS.

4.1.4.3 During analog-and-dig operation, the DQO for MEC targets and burial depths was the detection of the smallest target (i.e., 37mm, HE, MkII) at the site-specific detection depth determined by the test strip. The test strip was reconfigured on a weekly basis for process quality control.

Table 4-1 is a summary of the test strip construction and achievable depths of detection.

TABLE 4-1 TEST STRIP CONSTRUCTION SUMMARY

Inert Seed Munition	Diameter millimeter (mm)	Seed Item 1 Orientation	Actual Detection Depth (inches bgs)	Seed Item 2 Orientation	Actual Detection Depth (inches bgs)
37mm, HE, MkII	37	⊥H	9.5	V	9.5
60mm, HE, M49A2	60	⊥H	15	V	15
81mm, HE, M43	81	⊥H	16	V	13

⊥H: Perpendicular to the direction of travel and horizontal to the ground surface.
V: Vertical to the ground surface.
NA: Not Applicable; these items were not used in the test strip.

4.1.5 Brush Clearing

Limited clearing of brush understory was performed to allow access for analog-and-dig data collection. Manual clearing included the use of machetes, axes, saws and brush cutters. To minimize impacts on the environment, brush cutting was limited to vegetation less than four inches in diameter and no closer than six inches above the ground surface. A UXO Technician II was provided for UXO avoidance escort operations during brush removal activities. A field ecologist and archaeologist were present during brush clearing activities and any identified ecological or cultural areas were marked and avoided.

4.1.6 Analog-and-Dig Transects

4.1.6.1 Transects of varying lengths and spaced approximately 75 feet apart were placed traversing the Southern Impact Region MRS and the Southeastern Region MRS in an approximate east-west orientation (Figure A-3). Several individual transects extended into the Western/Mountainous Region MRS. Transects were not placed in AOC #1 or AOC #2, which were undergoing a concurrent NTCRA.

4.1.6.2 The detonation fragmentation distance of the smallest item of interest (i.e., 37 mm projectile) was used as the design basis for the transect spacing. This spacing ensured adequate coverage to identify suspect areas of interest (i.e., target areas, crater fields, heavy fragmentation areas, firing points, etc., and other forensic evidence of HE usage) as determined from historical documents and past site investigations. Coverage area (i.e., acres) was calculated by multiplying the transect length by a three foot instrument swath width derived from one pass of the analog geophysical instrument.

4.1.6.3 Transects were divided into individual 100-ft segments (as site conditions dictated) with each segment being as straight as possible. A wooden stake (hub) was securely embedded in the ground at the start of each transect, and at the beginning and end of each segment. The stakes were labeled with a transect identification number. The hub position was surveyed using a Trimble® GeoXH™ Global Positioning System (GPS) with a pole-mounted external antenna (when satellite coverage was available) or measured with a measuring tape and/or wheel from an adjacent location with a known geodetic coordinate point. Objects like large trees, boulders, water bodies, steep terrain, etc. were skirted, and the transect line picked up on the other side of the obstruction.

4.1.6.4 Transects located in safely-accessible areas (i.e., slopes less than 30 degrees) were intrusively investigated by two, three-man teams using MineLab Explorer SE PRO Series metal detectors equipped with a larger 18-inch x 15-inch butterfly coil for increased metal detection depth. The teams completed analog-and-dig of all anomalies along approximate 100-foot segments. Quantities of MD and non-munitions related debris (type and description) were recorded per 100-ft transect segment in field log books and digitally in a Trimble® GeoXH™ GPS hand-held device. Data collection results are discussed in Section 5.0 of this report.

4.1.7 Stream MEC Investigation

4.1.7.1 The Waikane Stream and an Unnamed stream to the south of the Southeastern MRS were investigated by establishing a two parallel transects along each stream with one transect positioned along the stream bed and one on lower bank of stream. Each stream was investigated from where it exits the USMC parcel or WTA MRA boundary to where the slope decreases (approximately 1,500 feet downstream from the respective boundary), then investigated at 500-ft increments when MD was found in the preceding transect segment. Points of interest were also investigated as listed below:

- Steep sidewalls;
- Sharp bends in the stream(s); and
- Stream widening and velocity reduction.

4.1.7.2 Approximately 9,200 ft (two parallel 4,600 ft segments) of transects were investigated along the Waikane Stream. Along the Unnamed Stream downstream of the WTA MRA boundary, approximately 2,400 feet (two parallel 1,200-ft segments) of transects were investigated before excessive hau growth prevented access.

4.1.8 Analog-and-Dig Grids

4.1.8.1 After reviewing the data collected during the analog-and-dig transect coverage, fifty-seven individual 25-ft by 25-ft grids were positioned principally in areas of medium and high anomaly density to better define the nature of contamination (Figure A-4). Grids were not placed in AOC #1 or AOC #2, which were undergoing a concurrent NTCRA.

4.1.8.2 All grids were established in a north-south configuration (Figures A-3 and A-4). A wooden stake (hub) was securely embedded in the ground at the southeast corner of each grid. The hubs were labeled with a grid number identifier and the position was surveyed using a Trimble® GeoXH™ GPS with a pole-mounted external antenna (when satellite coverage was available) or measured with measuring tape and/or wheel from an adjacent hub with a known geodetic coordinate point.

4.1.8.3 It was necessary to perform limited brush cutting within some of the grid areas to allow access for analog-and-dig data collection; biologists were present during brush cutting. Grids were intrusively investigated by two, three-man teams using MineLab Explorer SE PRO Series metal detectors equipped with the larger 18-inch x 15-inch butterfly coil. Quantities of MD and non-munitions related debris (type and description) were recorded for each grid in field log books and digitally in a Trimble® GeoXH™ GPS hand-held device. Data collection results are discussed in Section 5.0 of this report.

4.2 QUALITY CONTROL AUDIT PROCEDURES

4.2.1 Quality Control Matrix

Table 4-2 provides a summary of the Quality Control (QC) approach as a Quality Control Matrix. The key elements of the performance metrics include alignment with stated project objectives, quality of product, timely delivery, cost containment, customer satisfaction, and meeting the USAESCH requirements (DIDs).

4.2.2 QC Audits

4.2.2.1 Daily QC reports were reviewed by the Project Manger to ensure field procedures were being conducted in accordance with project specifications and systems were functioning as planned. The audits included a review of procedures, logs, records, etc. Management audits helps determine discrepancies in information collected or if conditions and practices create the potential for QC problems, so that corrections can be implemented before problems occur.

4.2.2.2 Listed below are QC processes and procedures associated with personnel, data collection/analysis, instruments/sensors and other equipment, data deliverables, and for measuring the effectiveness of MEC investigations. The QC processes provided for:

- Testing and calibrating equipment used to perform work.
    - Each geophysical component was noted according to make, model, and serial number in the field logbooks.
    - Functional instrument tests for the system were digitally recorded and available for review by QA personnel.
    - All instruments and equipment that required calibration were checked prior to the start of each workday.
    - Batteries were replaced as needed, and the instruments were checked against a known source.
    - Instrument-specific functional testing procedures were performed in accordance with specific DIDs (MR-005-05.01).
- QC procedures were implemented to ensure data acquisition (analog instrumentation operation), data processing (post processing of GPS data), and interpretation methods (anomaly concentration calculations and analysis) were monitored at a sufficient level to meet the overall program objectives. Random audits of procedures were performed by the PM.

- Monitoring/measuring the effectiveness of work performed.
    - The UXOQCS was responsible for ensuring that personnel accomplished all QC checks and that the appropriate log entries were made. The UXOQCS performed random, unscheduled checks to ensure that personnel accomplished all work specified in the Work Plan and submitted a report of their findings to the SUXOS.
    - Project deliverables, such as the RI/FS documents, were be prepared by the PM and reviewed by the Professional-in-Charge prior to submittal to USAESCH.
    - Daily QC Journals, completed by the Team Leader(s), were submitted to the PM and/or SUXOS and included descriptions of the areas checked and the results of the QC checks. Records of these inspections are included in Appendix H.
- Inspecting the maintenance and accuracy of site records.
- Determining compliance with site safety, environmental, and operational plans.
- Ensuring the accuracy, timeliness, and completeness of data deliverables.

4.2.2.3 Field documentation is provided in Appendix H (included electronically only on enclosed CD/DVD).

4.3 CORRECTIVE/PREVENTATIVE ACTION PROCEDURES

4.3.1 Guidelines were established to assure conditions adverse to quality such as malfunctions, deficiencies, deviations and errors were promptly investigated, documented, evaluated, and corrected. If a significant condition adverse to quality was noted, the cause of the condition would be determined and corrective action taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned would be documented and reported to the Project Manager, if necessary. All project personnel were aware of the continuing responsibility to identify problem areas promptly, solicit approved corrective actions, and report any condition adverse to quality. In general terms, corrective/preventive actions would be initiated at a minimum:

- When predetermined acceptance standards are not attained,
- When procedures or data compiled are determined to be faulty,
- When equipment or instrumentation is found faulty,
- When quality assurance requirements were violated,
- As a result of system and performance audits, and/or
- As a result of management assessment.

4.3.2 No significant corrective action procedures were noted for the RI. Field documentation is provided in Appendix H (included electronically only on enclosed CD/DVD).

TABLE 4-2 QC MATRIX

This matrix is a summary of ZAPATA'S QC Approach. Safety is key to project execution. All work processes are performed and monitored in agreement with ZAPATA'S Corporate Quality Management System. Key elements of the Performance Metrics include Alignment with Stated Project Objectives, Quality of Product, Timely Delivery, Cost Containment, Customer Satisfaction, and Meeting USACE Requirements (DIDs).

Project Phases	Performance Metrics	QC Process	Pass/Fail Criteria
Written Deliverables (Work Plans and Studies)	• Technically accurate documents with minimal grammatical or editorial errors. • Documents are submitted on time and in accordance with applicable guidance/DIDs	• Assignment of Project Delivery Team with applicable skills and experience to accomplish PWS objectives and participate in routine Team Project meetings. • Peer Review and Senior Management review of deliverables prior to submittal. • Schedule monitored by the PM.	• In-house peer-review comments addressed. • Document passes internal back-check. • No errors encountered during Senior Review.
Surveying (Establish Transects and Grids)	• Accurate placement of grid corners and transect way points. • Work product meets the requirements of Table 3-2.	• Use of licensed PLS to install any additional required general survey control points. • Daily instrument check for accuracy within tolerances of project requirements, utilizing established temporary control points.	• Transect way points (hubs) and grid corners will be positioned with screening level accuracy (10m) as specified in the PWS and Table 3-2.
Instrument Test Strip	• Selection of sensor to identify anomalies that meet scope criteria in size and depth. • Work Plan meets the requirements of DID MR-005-05.01 for analog geophysics.	• The test strip randomly reconfigured weekly by adding and/or moving seed items. • All instruments for use tested and settings recorded.	• Seed items are identified.
Analog-and-dig Investigation	• All anomalies are investigated. • No finding of ferrous MD or RRD equal to or greater than 37mm in diameter or width within grids or along transect paths on the surface or subsurface after investigation. • Work effort follows requirements of applicable DIDs. These may include Technical Management, Explosives Management, Explosives Siting, Environmental Protection, IDW, Safety Submissions, and other applicable guidance documents. • Items investigated explain instrument response.	• Intrusive data are accurate. • Per Table 3-2, field QC is performed on 100% for the first 2 days of intrusive activity on 10% thereafter for Dynamic Repeatability to assure that anomaly counts are within 20% of the digs along transect. • Blind seed items will be placed in grids to assure Coverage, Detection and Recovery. • The number of holes requiring QC checks will be based on the number of anomalies investigated during the prior 10hr work cycle (i.e., a "Lot"). Table 3-2 will be reviewed to determine the number of holes required for re-checking.	• Intrusive data reflect accurate item depth and orientation. Item is accurately identified with sufficient description using accepted formal nomenclature that would allow determination of specific characteristics such as filler and net explosive weight, if possible (MEC or intact MD). • Anomaly counts are within 20% of dug anomalies along transects, if not then redo that day's transects. • All Coverage, Detection and Recovery seeds are recovered, if not then redo that day's grids. • All of the anomalies inspected have been resolved, if redo that day's grids/transects • Successful Government inspection.

4.4 MC CHARACTERIZATION

4.4.1 Environmental samples were collected from August 15 through 31, 2011 with additional sampling of some locations on October 11 and November 7, 2011. Multi-Incremental Soil (MIS) sampling was performed in accordance with the HEER Interim Final Guidance on Incremental Soil Sampling dated June 2009. MIS sampling was conducted in 100-ft x 100-ft decision units (DUs) were placed in select areas of high MD densities based on the results of the RI analog-and-dig activities and at locations where MEC items were recovered during a concurrent NTCRA (AOC #1 and AOC #2).

4.4.2 Additionally, 22 sediment samples, and 40 discrete subsurface soil samples were collected from the MRSs. Field sampling data were reviewed and evaluated to support the MC risk assessment for human health and the environment. Section 7.0, herein, outlines the risk assessment approach and includes identification of munitions constituents of potential concern (MCOPC).

4.4.3 Background soil sample data including 12 DUs (MIS samples collected in triplicate), 15 sediment samples and 16 discrete subsurface soil samples were collected to determine background metals concentrations (Figures A-5 to A-10, Appendix A). Escort was provided by UXO qualified personnel (UXO Technician III) during sample collection.

4.4.4 Table 4-3 summarizes the quantities and locations where MC samples were collected during the RI.

TABLE 4-3 MC SAMPLE QUANTITIES AND LOCATION SUMMARY

Area	MIS Samples Decision Unit (DU)	Discrete Subsurface Soil Samples	Sediment Samples
Background	12	16	15
Western/Mountainous Region MRS	3	3	14
Southern Impact Region MRS	5	9	6
Southeastern Region MRS	16	28	2
Total	36	56	37

4.4.5 Soil Sampling

4.4.5.1 Multi-Incremental Soil Samples

4.4.5.1.1 Within each DU, MIS samples were collected in triplicate (one primary and two replicates), with each sample consisting of approximately 50 subsamples (grab/aliquots) collected at randomly selected, evenly-spaced points along parallel lines traversing the DU at a depth of approximately 2-in. below ground surface. Disposable hardened plastic scoops were used to collect the individual aliquots which comprised a 2 kg sample of the top 1 to 2 inches of the ground surface within each DU. These MIS samples were analyzed for explosives constituents, including nitroglycerine and PETN, using sample preparation and analysis methodology outlined in EPA Method 8330B. In addition, samples were analyze for selected metals (copper and lead) using EPA Method 6010C. These samples were collected from soil splits segregated from the MIS sample at the laboratory (Accutest) prior to grinding.

4.4.5.1.2 A total of 36 individual 100-ft x 100-ft DUs were collected in triplicate (during this RI (Table 4-3 and Figures A-7, A-8 and A-9). Twenty-four DUs were distributed across the three MRSs. DUs were placed in areas suspected to constitute former target locations (AOC #1 and AOC #2) and in high MD density areas identified during the RI analog-and-dig data analysis. Twelve DUs were located outside of the MRSs to establish background MC concentrations (Figures A-5 and A-6, Appendix A). Data collection results are discussed in Section 5.0 of this report.

4.4.5.2 Discrete Subsurface Soil Samples

A total of 56 discrete subsurface soil (40 primary and 16 background, not accounting for QC/QA samples) samples were collected. A stainless steel hand auger was used to collect the samples from a depth of 0.5 to 1-ft below ground surface. Discrete subsurface soil samples were collected across the three MRSs with the majority of the samples being collected within DUs chosen for MIS samples. An additional 16 samples were collected outside of the MRSs to establish background MC concentrations (Table 4-3 and Figures A-7, A-8 and A-9). Samples were analyzed for copper, lead and explosive compounds, including nitroglycerine and PETN. Data collection results are discussed in Section 5.0 of this report.

4.4.6 Sediment Sampling

A total of 37 sediment samples (22 primary and 15 background samples, not accounting for QC/QA samples) were collected from selected areas upstream and downstream of respective MRSs to adequately delineate potential MC (Table 4-3 and Figures A-7, A-8 and A-9). An additional 15 samples were collected outside of the Western/Mountainous Region MRS to establish background MC concentrations. All sediment samples were analyzed for copper, lead and explosive compounds, including nitroglycerine and PETN. Data collection results are discussed in Section 5.0 of this report.

4.4.7 Groundwater Monitoring Well Installation, Development and Sampling

4.4.7.1 Groundwater in this area is not expected to be part of a complete exposure pathway to receptors at this site. However, the PDT agreed during the TPP process that existing groundwater wells would be sampled for perchlorate if accessible and serviceable.

4.4.7.2 Although a shallow (< 12 ft bgs) groundwater well was identified using well records data, it was determined to be inaccessible based on field observations (lack of right-of-entry), and therefore was not sampled. Groundwater wells installed to shallow depths are typically used for irrigation purposes not as a source for drinking water.

4.4.7.3 Another groundwater well was located along the Waikane Road. The well had a rusted padlock at the top. According to well records, the well name is Waikane 3, was installed in 1989 to a depth of 250 ft, and is owned by Waikane Development Co. The rusted appearance of the well indicated that it likely has not been accessed for many years and was not serving as a current groundwater source. The well was not sampled.

4.4.8 Surface Water Sampling

It was determined by the project team that the necessity for surface water sampling would be controlled by the sediment sample results. The basis for this decision is supported by the fact that the project-specific COPC would be a source of contamination to surface water if identified in sediment. Since all detected constituents were below HDOH EALs in the sediment, no surface water samples were collected during the RI.

4.4.9 Quality Control and Assurance Samples

4.4.9.1 Quality Control (QC) and Quality Assurance (QA) samples were collected and analyzed for the purpose of assessing the quality of the sampling effort and of the analytical data. These samples include QA split samples, QC duplicates of field samples and QC equipment rinsate blanks. Split or duplicate samples were collected as a single sample, homogenized, divided into two or more equal parts, and placed in separate containers. The number of duplicate samples was 10% of the field samples. QA samples were analyzed by TestAmerica. MIS samples were collected in triplicate as described in Sections above. Additionally, for 10% of the DUs (two MIS field sample DUs and one MIS background sample DU), a quadruplicate MIS sample was collected and sent to the QA laboratory (Test America) for processing and analysis. Collection of these QA samples allowed comparison of test results from the primary lab with an independent peer lab.

4.4.9.2 A log identifying each Quality Control and Quality Assurance duplicate sample to its duplicate field sample was maintained during the field sampling event. This procedure ensured that the laboratory would not know which Quality Control sample matched the field samples.

4.4.9.3 An overall assessment of the quality and usability of these analytical results was conducted (Data Quality Summary report, Appendix B). No results were rejected (i.e., classified as unusable), and completeness in terms of usable data for each sampled location for the parameters of interest was 100%.

4.4.10 Equipment Decontamination

Sample collection equipment (stainless steel scoops/spoons, hand auger bucket) were decontaminated using laboratory-grade detergent (Alconox™ or Liquinox™). Equipment was rinsed with deionized, organic-free, reagent grade water; allowed to dry; and wrapped in aluminum foil, shiny side out. Disposable sample collection equipment was used for MIS samples and sediment sample collection.

5.0 REVISED CONCEPTUAL SITE MODEL AND REMEDIAL INVESTIGATION RESULTS

5.0.1 A revised Conceptual Site Model (CSM) was generated for the WTA MRA that showed the potential for an explosive safety risk dependent upon the presence of three elements: a source, a receptor, and an interaction between the source and the receptor (Table 5-3 at end of Section). A CSM is a method of organizing, displaying, and using site data that facilitates developing the hypothesis for the site history/status and draws logical conclusions about the site. There is no risk if any one element is missing. Each of the three elements provides a basis for implementing effective risk-management response actions. Revised exposure pathways for MEC and MC are presented in Figures 5-1 and 5-2, respectively.

5.0.2 Human activity at the WTA MRA is moderate and limited to residential, authorized visitors, hunting and hiking activity, motocross and ATV riding, and trespassers. The exposure route for MEC to a receptor is primarily direct contact as a result of some human activity. MEC will tend to remain in place unless disturbed by human activities, such as agriculture, or natural forces, such as erosion. Movement of MEC by naturally occurring forces may increase the probability for direct human contact but not necessarily result in a direct contact or exposure.

5.0.3 The potential source for munitions in the WTA MRA is from infantry jungle training, artillery firing, and practice bombing that took place from the onset of WWII to 1976. Previous investigations and remedial actions have confirmed the presence of UXO and MD resulting from the firing of artillery weapons (75mm), shoulder fired anti-tank weapons (2.36-inch and 3.5-inch HEAT rockets), mortars (60mm and 81mm), small arms, and aerial practice bombing exercises conducted by the military in the Southern Impact Region and Southeastern Region MRSs. During the field operations for this Remedial Investigation, MD and non-munitions related debris was recovered from the areas outside of the suspected target areas (AOC #1 and AOC #2) within these MRSs.

5.0.4 Weathered and eroded contaminants from munitions fragments can release MC into the environment. Explosives in soil and/or sediment are generally degraded over time by biotic transformations by bacteria, fungi, and other soil microbes. Degradation of explosives also occurs through abiotic transformations such as alkaline hydrolysis, photolysis, and reduction by iron. Given that several decades have passed since military operations ceased, it is expected that detections of explosives would be rare.

5.0.5 Residents and individuals visiting the WTA MRA, including unauthorized recreational enthusiasts, may conduct activities that expose and/or disturb surface and subsurface material under ordinary circumstances. Current activities include residential and recreational activities such as moto-cross and ATV riding, hunting, walking, sightseeing, and forest restoration activities. While moto-cross and ATV riding are the primary ground disturbing site activities, agricultural use in the residential property and regularly occurring natural events such as erosion and landslides may expose residents/visitors to previously covered munitions.

5.1 UPDATED MUNITIONS AND EXPLOSIVES OF CONCERN (MEC) CSM

5.1.1 Nature and Extent of MEC

The analog-and-dig intrusive investigation along transects and within grids served to characterize the nature and extent of munitions-related contamination within the Southern Impact Region MRS, Southeastern Region MRS and two streams exiting the WTA MRA boundary.

5.1.2 Results of MEC Field Investigation

5.1.2.1 During the RI, 5,341 anomalies were intrusively investigated (Table 5-1). No MEC items were recovered during the RI. Approximately 1,100 anomalies resulted in MD indicative of practice and HE items. Munitions debris consisted of metal fragments, shell casings, rocket fins, etc. Three identifiable MD items were found in the Southeastern Region MRS and included one 60mm mortar, one 81mm mortar and one AP-trip flare. The items contained no energetic material and were classified as non-hazardous by UXO personnel. Approximately 75 pounds of material documented as safe (MDAS) was shipped to a scrap processing facility in Columbus, Texas for shredding and smelting (Appendix F).

5.1.2.2 Several areas within the valley were littered with non-MD items, i.e., items that are non-ordnance-related including, but not limited to, household trash, construction debris/materials, old cars and car parts, old fences and fence posts, and other assorted trash, wire, banding material, rocks, and nails. Geological and terrain features causing geophysical anomalies are considered non-MEC items. Nearly 1,808 of the anomalies investigated (approximately 34%) during the RI resulted in Non-MD items (Table 5-1). Small arms ammunition made up approximately 43% (2,291 anomalies) of the total anomalies investigated. Small arms ammunition consists of cartridges and shells used in rifles, pistols, machine guns, and shotguns, 0.50 caliber or less. Expended small arms ammunition is MD and poses no explosive hazard, and while unexpended small arms ammunition is considered to be MEC, it is not considered to pose a significant explosive hazard (Department of the Army, 2005).

5.1.2.3 Appendix F contains documents for the disposition of MDAS. There were no activities associated with demolition of MEC during this investigation. Approximately 59 pounds of material documented as safe (MDAS) was shipped to a scrap processing facility in Columbus, Texas for shredding and smelting.

5.1.2.4 Analog geophysical Measurement Quality Objectives (MQOs) were met during the RI field activities. The following six MQOs listed in the RI work plan were applicable to analog-and-dig data acquisition:

- Repeatability – All items in the test strip were detected on a daily basis during the instrument functionality tests. The test strip was reconfigured on a weekly basis. The MQO for repeatability was met for this project.
- Dynamic Repeatability – The UXOQC followed the teams over 100% of the transects for the first two days of field work and for at least 10% of the transects on a daily basis thereafter. Dynamic repeatability QC checks were performed over approximately17% (3.42 miles) of the transects, which exceeds the MQO of 10% established for this project.
- Coverage, Detection and Recovery – The blind coverage/blind detection seeds were recovered in each grid. The MQO for repeatability was met for this project.

- Anomaly Resolution – The UXOQC re-checked 1,648 open holes of the total of 5,341 anomalies. The default MQO is to assure at least 90% level of confidence that less than 5% of the anomalies were unresolved for a RI/FS where no MEC was recovered. This requires a minimum re-check of 1,302 open holes of the total anomalies investigated based on lots sizes of each day's excavated anomalies. The anomaly resolution achieved exceeds the MQO established for this project.
- Geodetic Equipment Functionality – GPS equipment were checked daily against a known temporary control point. The GPS accuracy tests performed demonstrated that the measured positions were all less than the 5m radius MQO established for this project.
- Geodetic Repeatability –The dense tree canopy restricted GPS signals in most areas of the WTA MRA. Acquiring a GPS location coordinate is possible; however, re-locating to a previously acquired point is restricted by the technology under these conditions. Although a MQO (10m radius) for geodetic repeatability was established for this project, it cannot be confirmed it was met due to the aforementioned confines. Nevertheless, re-location for the grids and transects were considered acceptable since the exact re-location of a single transect/ grid is not critical when the information is used only for characterization by interpolating over large areas.

5.1.2.5 The QC results for each data set collected during the RI are detailed in the field forms contained in Appendix I.

5.1.2.6 Southeastern Region MRS

MD was found throughout the Southeastern Region MRS and included mortar debris, HE fragments (small, medium, and large), identifiable 60mm and 81mm practice mortars (Grid 4 and Grid 46, respectively), illumination flare (Grid 3) and small arms ammunition. Relatively high MD density was distributed along the southern half of the MRS and adjacent to AOC #2 (Grids 19, 29, 42, 43 and 45). The highest MD density was observed southwest of AOC #2 near the WTA MRA boundary (Grids 16 and 17) to the south (Figure A-4).

5.1.2.7 Southern Impact Region MRS

Similar to the Southeastern Region MRS, MD was found throughout the Southern Impact Region MRS and included mortar debris and HE fragments (small, medium, and large). Relatively high MD density was distributed along the southern half of the MRS (Grids 5, 37 and 53) and adjacent to AOC #1 (Grid 56). The highest MD density was observed east of AOC #1 and near the boundary (Grid 21) that separates the Southeastern Region from the Southern Impact Region (Figure A-4).

TABLE 5-1 RI MEC INTRUSIVE INVESTIGATION SUMMARY

Total Anomalies	MEC Quantity	MD Quantity	Non-MD Quantity	Geological
5,341	0	3,405	1,808	128

Notes: 2,291 of the 3,405 MD anomalies were small arms ammunition less than 0.50 caliber

5.1.2.8 Waikane Stream and Unnamed Stream

Although no MD was located during the MEC investigation of the Unnamed Stream, three 3.5-inch rocket shrouds (Grids 48, 49 and 50) were found along the Waikane Stream (Figure A-4).

5.1.2.9 Western/Mountainous Region MRS

No MEC and only very limited MD, other than that related to small arms ammunition, has been found within the Western/Mountainous Region MRS. A single piece of MD (HE fragmentation) was found during the evaluation that was likely a kick-out from a detonation within the impact area. Since the item was found within 500 feet of the impact area and there was no other evidence that high explosives were used in the area, the item is attributed to the Southern Impact Region. The Western/Mountainous Region MRS was apparently used for foot maneuvering evident by the significant amount of small arms throughout the area. This area is approximately 692 acres with an unimproved dirt access road that runs through the area; however, it is impractical to travel off the access road due to cliffs rising up on one side and sheer drop-offs on the other side. The access road runs east to west along a ridgeline at an elevation ranging from less than 200 feet on the eastern end to over 725 feet on the west. Due to the rugged terrain (i.e., slopes much greater than 30 degrees) and dense vegetation, the site is relatively inaccessible to the public with limited potential for future development.

5.1.3 Various Types of MEC Discovered

Although a wide variety of munitions were reportedly used at the WTA MRA, no MEC were discovered during the RI.

5.1.4 Results Compared to Previous Studies

5.1.4.1 The RI observations are consistent with previous investigations, with respect to the type of munitions debris fragments identified compared to a particular munitions type reportedly used throughout the WTA MRA. Unlike previous investigations, no MEC items were recovered during the RI.

5.1.4.2 Two suspected target areas (AOC #1 and AOC #2) totaling approximately 14.9 acres and 26.2 acres within the Southern Impact Region MRS and Southeastern Impact Region MRS respectively, were identified during the 2006 EE/CA. The RI supported this use due to the high density of MD found in grids adjacent to AOC #1 and AOC #2. A subsurface removal action was conducted concurrently with the RI within these areas, which uncovered numerous MEC items, further validating the suspected target locations.

5.2 UPDATED MUNITIONS CONSTITUENTS (MC) CSM

5.2.1 Nature and Extent of MC

The desired DQO for MC was achieved through evaluation of the potential presence of MC at the WTA MRA. During the TPP stakeholders agreed on a list of analytes, based on the composition of fillers in munitions known to have been used at the site. Metals and select explosive constituent exceedances occurred in a localized area of the Southeastern MRS (AOC #2) which was an area where MEC items were identified and disposed of by intentional detonation during the concurrent NTCRA (Figure A-10).

5.2.2 Results of MC Field Investigation

5.2.2.1 Multi-incremental Soil Samples (0.0 to 0.5-ft bgs)

5.2.2.1.1 MIS samples were collected from 24 individual 100-ft x 100-ft DUs during this RI. DUs were placed in select areas of high MD densities based on the results of the RI analog-and-dig activities and at locations where MEC items were recovered during a concurrent

NTCRA (AOC #1 and AOC #2). Twelve DUs were also located outside of the MRSs to establish background MC concentrations (Figures A-5 and A-6, Appendix A). All samples were analyzed for copper, lead and explosive compounds, including nitroglycerine and PETN. Analytical results were compared to HDOH EALs and the June 2011 EPA residential RSL. The lower of the two comparison values took precedent. If a constituent exceeded the lowest risk-based screening level, the constituent was evaluated further during the risk assessment (see Section 7.0). Analysis results are shown in Tables B-1 through B-4 in Appendix B. HDOH EAL exceedances are summarized in Table 5-2, below, and shown on Figure A-10 of Appendix A.

5.2.2.1.2 No explosives were detected in the MIS samples collected during the RI.

5.2.2.1.3 Copper concentrations above the HDOH EAL of 230 mg/kg were detected at DUs WTA-SE-ZIS-016 (362 mg/kg) and WTA-BKG-ZIS-007 (272 mg/kg). The two replicate samples collected at each DU were below the action level for copper. Repeat measurements (replicate MIS samples) within the same DU were used to estimate the expected average contaminant concentration for the location. The average (of the three replicate MIS samples) concentration for copper at WTA-BKG-ZIS-007 was 163 mg/kg and was below the HDOH EAL for copper in soil. It is also worth noting that DU WTA-BKG-ZIS-007 was collected as background and the individual elevated metal concentration falls outside of the 99th percentile (223 mg/kg) of the data set for background copper measurements. DU WTA-SE-ZIS-016 was positioned near several MEC items discovered during the removal action (AOC #2). The average (of the three replicate MIS samples) copper concentration at WTA-SE-ZIS-016 was 188 mg/kg and was below the HDOH EAL in soil. The site-specific background copper concentration in the MIS samples was 98.8 mg/kg. This concentration was estimated by calculating the average (arithmetic mean) copper concentration of the 12 DUs (i.e., 36 MIS samples) established for background.

5.2.2.1.4 Lead concentrations were detected above the HDOH EAL of 200 mg/kg in two of the three MIS samples collected at DU WTA-SE-ZIS-003. The DU was positioned in a location where MEC items were identified and disposed of by intentional detonation during the concurrent NTCRA (AOC #2). The average (of the three replicate MIS samples) lead concentration at WTA-SE-ZIS-003 was 211 mg/kg which exceeds the HDOH EAL in soil. The site-specific background lead concentration in the MIS samples was 7.23 mg/kg. This concentration was derived by calculating the average (arithmetic mean) lead concentration of the 12 DUs (i.e., 36 MIS samples) established for background.

5.2.2.2 Discrete Subsurface Soil Samples (0.5 to 1-ft bgs)

5.2.2.2.1 A total of 56 discrete subsurface soil (40 primary and 16 background, not accounting for QC/QA samples in totals) samples were collected. Samples were collected in select areas of high MD densities as determined by the results of analog-and-dig activities conducted during the RI. Samples were also collected in the vicinity of where MEC/MD items were recovered during the concurrent NTCRA within AOC #1 and AOC #2 (Figures A-7, A-8 and A-9). Discrete samples subsurface samples were also collected in the Western/Mountainous Region MRS. An additional 16 samples were located outside of the MRSs to establish background MC concentrations. Samples were analyzed for copper, lead and explosive compounds, including nitroglycerine and PETN. Analytical results were compared to HDOH

EALs (August 2009) and the June 2011 EPA residential RSL. The lower of the two comparison values took precedent. HDOH EAL exceedances are summarized in Table 5-2, below, and shown on Figure A-10 of Appendix A.

5.2.2.2.2 Lead concentrations above the HDOH EAL of 200 mg/kg were detected in samples WTA-SE-ZSB-016 (1,830 mg/kg) and WTA-SE-ZSB-028 (223 mg/kg). The samples collected at sample location WTA-SE-ZSB-028 were below the action level for lead. The highest lead concentration was measured in sample WTA-SE-ZSB-016 which was collected from a location where MEC items were identified and disposed of by intentional detonation during the concurrent NTCRA (AOC #2).

5.2.2.2.3 With the exception of one discrete soil sample (WTA-SE-ZSB-026), no explosives were detected in the discrete subsurface samples collected during the RI. Discrete subsurface soil sample WTA-SE-ZSB-026, collected from a location where MEC items were identified and disposed of by intentional detonation during the concurrent NTCRA (AOC #2), exceeded HDOH EAL of 250 ug/kg for 2-amino-4, 6-Dinitrotoluene (2-Am-DNT) in the primary samples. 4-amino-2, 6-Dinitrotoluene (4-Am-DNT) was detected in the primary samples; however, only exceeded the HDOH EAL of 250 ug/kg in the QC split sample. 4-Am-DNT and 2-Am-DNT are 2,4,6-Trinitrotoluene (TNT) breakdown products. Nitroglycerine was detected above the HDOH EAL of 1,200 ug/kg at the same sample location.

5.2.2.3 Sediment Sampling Results

5.2.2.3.1 A total of 37 sediment samples (22 primary and 15 background, not accounting for QC/QA samples) were collected in selected areas across each of the MRSs to adequately delineate potential MC. An additional 15 samples were collected outside of the Western/Mountainous Region MRS to establish background MC concentrations. All sediment samples were analyzed for copper, lead and explosive compounds, including nitroglycerine and PETN. Analytical results were compared to HDOH EALs and the June 2011 EPA residential RSL. The lower of the two comparison values took precedent. Analysis results are shown in Tables B-1 through B-4 in Appendix B. HDOH EAL exceedances are summarized in Table 5-2, below, and shown on Figure A-10 of Appendix A.

5.2.2.3.2 MC Concentrations in sediment samples collected for the RI were all below HDOH EALs.

5.2.3 Environmental Data Management and Data Validation

Definitive data validation services on all environmental analytical data collected at the WTA MRA was conducted by HSW Engineering (HSW). The contract analytical laboratories, Accutest Laboratories and TestAmerica, generated Staged Electronic Data Deliverables (SEDD) as output, and the resulting electronic data deliverables (EDDs) were independently reviewed by HSW. Analytical data were evaluated by processing individual EDDs provided by the laboratory through ADR® automated data review software and verifying the outputs of each automated review against the laboratory hard copy reports (including information provided in the laboratory case narratives, on chain-of-custody [COC] forms, and in login summary sheets). The ADR® data review software uses validation logic based on nationally-recognized validation protocols described in the EPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, 2008) and National Functional Guidelines for Superfund Inorganic Methods Data Review (USEPA, 2010). Collectively, these documents are referred to as the Functional Guidelines. The electronic data conformed to USACE Level 2a reporting and are referred to as either Staged EDD Level 2a or SEDD 2a deliverables. SEDD 2a deliverables include laboratory method QC (i.e., the results for method blanks [MBs], laboratory control samples [LCSs], matrix spike / matrix spike duplicates [MS/MSDs], laboratory duplicates [LDs], and surrogates) along with information routinely required under the National Environmental Laboratory Accreditation Program (NELAP) such as dates of sample collection, receipt, preparation, and analysis, analytical methods used, etc. The SEDD format laboratory data and the Quality Control Summary Report (QCSR) documenting all data validation processes are included on a compact disk (CD) in Appendix B.

5.2.4 Comparison of MC Sampling Results with Previous Studies

The quantity and locations of soil and sediment samples collected during a previous investigation was limited compared to those collected for this RI. Soil and sediment samples indicate the absence of explosive constituents (in most cases) and the local presence of low levels of copper and lead. During the abbreviated SI, the samples were analyzed for TAL metals and explosives. Resulting COPC identified in the SI were chromium, iron, vanadium, cobalt, mercury, and RDX. After a review of the MIDAS database, it was determined that the entire suite of TAL metals were not representative of the actual munitions expected or found at the site and chromium, iron, vanadium, cobalt and mercury were eliminated from further investigation. The COPC identified for this RI include explosives (including RDX) and select metals (copper and lead).

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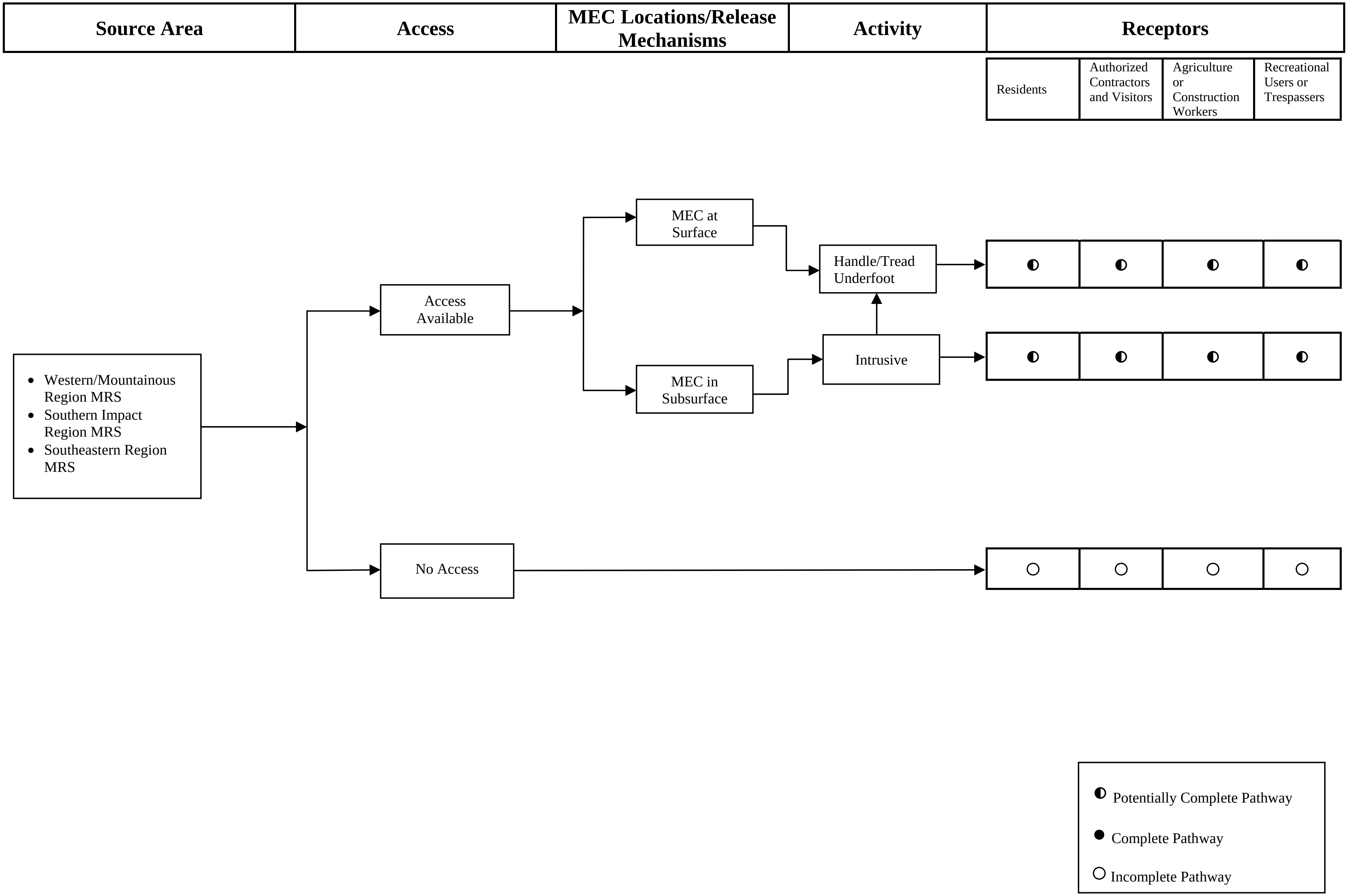
TABLE 5-2 STATE OF HAWAII, DEPARTMENT OF HEALTH ENVIRONMENTAL ACTION LEVELS EXCEEDANCES IN SOIL

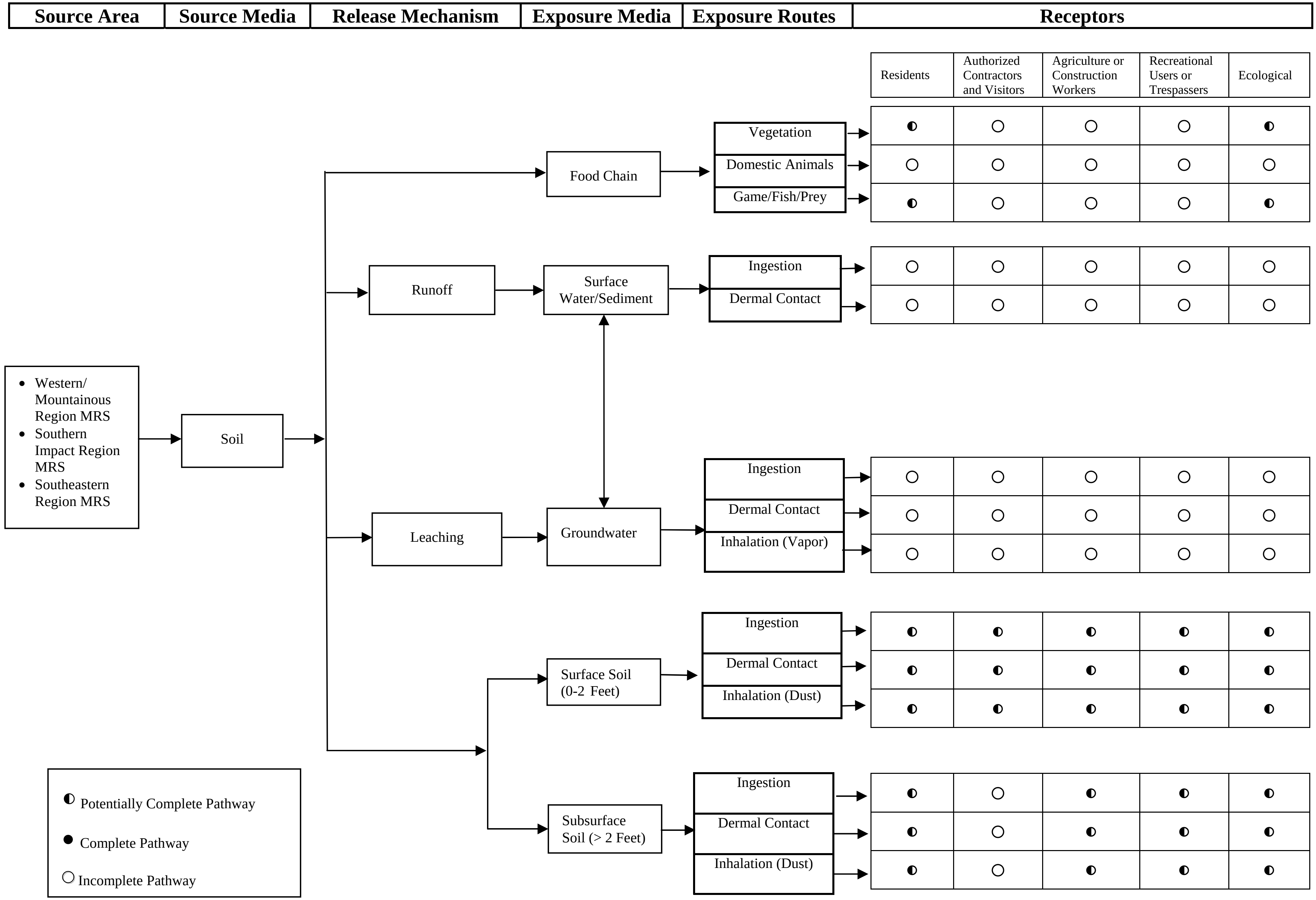
Waikane RI-FS Sample Exceedance Table

Location ID:	Project Action Limit (Human Health)[1]	WTA-BKG-ZIS-007			WTA-SE-ZSB-016	WTA-SE-ZSB-026			WTA-SE-ZSB-028			WTA-SE-ZIS-003			WTA-SE-ZIS-016		
COC Sample ID:		**WTA092**	**WTA093**	**WTA094**	**WTA221**	**WTA233**	**WTA234 (QC)**	**WTA236 (MS/MSD)**	**WTA238**	**WTA239 (QC)**	**WTA241 (MS/MSD)**	**WTA242**	**WTA243**	**WTA244**	**WTA282**	**WTA283**	**WTA284**
Date Sampled:		8/17/2011	8/17/2011	8/17/2011	8/30/2011	8/31/2011	8/31/2011	8/31/2011	8/31/2011	8/31/2011	8/31/2011	8/31/2011	8/31/2011	8/31/2011	8/31/2011	8/31/2011	8/31/2011
Matrix:		Incremental Soil	Incremental Soil	Incremental Soil	Subsurface Soil	Subsurface Soil	Subsurface Soil	Subsurface Soil	Subsurface Soil	Subsurface Soil	Subsurface Soil	Incremental Soil	Incremental Soil	Incremental Soil	Incremental Soil	Incremental Soil	Incremental Soil
Sample Type		Incremental	Incremental	Incremental	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete	Incremental	Incremental	Incremental	Incremental	Incremental	Incremental
Copper (mg/kg)	230	**103**	**114**	272	**196**	**71.5**	**90.5**	**66.5**	**74.4**	**68.5**	**78.1**	**57.7**	**57.6**	**44.3**	**362**	**111**	**91.7**
Lead (mg/kg)	200	6.2 IJ	6.4 IJ	5.4 IJ	**1,830**	**101**	**78.2**	**50.8**	**223**	**120**	**131**	**325**	**210**	**99.4**	**22.5**	**20.4**	**17**
2-amino-4,6-Dinitrotoluene (ug/kg)	250	99 U	98 U	48 U	59 U	**371**	**953**	**316**	61 U	69 U	67 U	48 U	99 U	99 U	48 U	99 U	98 U
4-amino-2,6-Dinitrotoluene (ug/kg)	250	99 UJ	98 UJ	40 UJ	59 U	**232**	**617**	**183**	61 U	69 U	67 U	40 U	99 U	99 UJ	40 U	99 UJ	98 UJ
Nitroglycerine (ug/kg)	1,200	990 UJ	980 UJ	250 UJ	370 U	450 U	490 U	430 U	380 U	1,380 IJ	**2,450**	250 U	250 U	990 U	250 U	990 U	980 U

Note:
Bold values denote levels above the method detection limit.
Shaded box denotes levels above HDOH Environmental Action Levels Soil
J = The reported value is between the laboratory detection limit an quantitation limit and / or has been classified as a qualitative due to one or more quality issues
I = The reported value is between the laboratory detection limit and quantitation limit and is an estimate.
U = The analyte was not detected at or above the indicated concentration or the result was classified as a non-detection due to the presence of the analyte in one or more blanks associated with the sample
[1] Based on HDOH Table B. Environmental Action Levels (EALs), *Groundwater IS NOT Current or Potential Source of Drinking water, ≤150m to Surface Water Body* (updated August 2009).



Zapata Incorporated	**Prepared for:** **U.S. Army Corps of Engineers**	**Former Waikane Training Area RI Conceptual Site Model (CSM) MEC Exposure Pathway Analysis**	**Figure 5-1**



Zapata Incorporated

Prepared for:

U.S. Army Corps of Engineers

Former Waikane Training Area RI
Conceptual Site Model (CSM)
MC Exposure Pathway Analysis

Figure 5-2

Table 5-3: Conceptual Site Model Waikane Training Area, Island of Oahu, Hawaii

Subsite/Range	Acreage	Suspect Past DoD Activities	Date	Previous Investigation/ Clearance Actions	Potential MEC/MD Presence	MEC/MD Found Since Closure	Post-DoD Land Use and Current Land Use	Percent of Area Accessible*	Potential Receptors	Potential Source and Receptor Interaction	Field Sampling
Southeastern Region	151	Based on EE/CA field findings the Southern Impact Area as identified in the INPR appears to extend southeasterly into the Southeastern Region. Foot maneuvering also appears to have been prevalent in the area as evident by the significant amount of small arms.	Mar-06	EE/CA (36.2ac footprint)	2.36-inch and 3.5-inch HEAT rockets, 75mm HE projectiles, 37mm HE projectiles, M9A1 AT rifle grenades, M28 HEAT rifle grenades, 60mm HE mortars, 81mm HE mortars, MKII hand grenades, smoke grenade, flares, and air-to-ground practice bombs.	5 UXO, 169 MD, 303 Small Arms (UXO: 81mm HE mortars, and 60mm HE mortars. MD: 2.36-inch Rocket, 60mm Mortar, 81mm Mortars and Fins, 75mm Projectile Fuzes, MKII Grenades, Smoke Grenade, Flares, and HE Fragmentation. Abundant small arms were also present).	Residential, Recreational use includes hunting, hiking, moto-cross and all terrain vehicles (ATVs) use, light agricultural. Locals also regularly visit a recently established memorial. City and County of Honolulu personnel passes through the area for access to the irrigation canals in the Western and Mountainous Regions. The City and County of Honolulu owns approximately 40 ac. of the MRS. The Southeastern Region contains the primary footprint of where the City and County of Honolulu plans to construct a park.	75%	Residents, Authorized Contractors and Visitors, Agriculture or Construction Workers, Recreational Users or Trespassers, Ecological	Public Access Available	None
			Nov-08	Site Investigation							Two multi-incremental soil samples, two surface water samples, and two stream bed sediment samples were collected during the SI. Resulting COPCs: chromium (SO), iron (SO), vanadium (SO), cobalt (AQ), mercury (AQ), and RDX (AQ).
			Aug-11	Subsurface Removal Action (AOC #2), 32.5 ac. footprint		50 MPPEH/MEC items, MD and abundant small arms.					None
			Aug-11	Remedial Investigation (RI)		MD HE framentation. Three MD items (81mm and 61mm mortars, AP-trip Flare). Highest concentrations southwest of AOC#2 and south boundary of MRS. Abundant small arms present. No MEC items recovered during RI.					16 multi-incremental soil samples, 28 discrete subsurface soil samples, two sediment samples were collected during the RI. Resulting COPCs: copper, lead, 2-amino-DNT, 4-amino-DNT, TNT and nitroglycerine.
Southern Impact Region	289 (Note: also includes USMC Property aka Kamaka Parcel)	Impact Areas based on INPR	Aug-76	Surface Removal Action	2.36-inch and 3.5-inch HEAT rockets, 75mm HE projectiles, 37mm HE projectiles, M9A1 AT rifle grenades, M28 HEAT rifle grenades, 60mm HE mortars, 81mm HE mortars, MKII hand grenades, smoke grenade, flares, and air-to-ground practice bombs.	42 UXO, 24,000lbs MD (75mm HE, 60mm HE mortars, a 37mm HE round, and a M28 HEAT grenade)	Recreational use includes hunting, hiking, filming of movies and television shows. City and County of Honolulu personnel passes through the area for access to the irrigation canals in the Western and Mountainous Regions. Hiking trails to archaeological sites associated with the future City and County of Honolulu park would likely constructed within the Region.	54%	Residents, Authorized Contractors and Visitors, Agriculture or Construction Workers, Recreational Users or Trespassers, Ecological	Public Access Available	None
	90	The Southern Impact Region contains the Southern Impact Area as defined in the INPR. EE/CA field findings support that it was used as an impact area as well as a foot maneuvering area evident by the significant amount of small arms.	Feb-90	Archaeological Survey		3 UXO, MD (Mortars, a Grenade, Shrapnel, Dud Rounds)					None
			Mar-06	EE/CA (10.15ac footprint)		2 UXO, 13 MD, 73 Small Arms (UXO: 37mm HE Projectiles. MD: 3.5-inch Rocket, HE Fragments, Mortar Frag, 75mm Fuze Components, and a Trip Flare. Abundant small arms were also present).					None
			Aug-11	Subsurface Removal Action (AOC #1), 7.7 ac. footprint		1 MPPEH/MEC item, MD and abundant small arms					None
			Aug-11	Remedial Investigation (RI)		MD HE framentation. Highest concentrations south of AOC#1 and south boundary of MRS. No MEC items found buring RI. Abundant small arms present. No MEC recovered during RI					Five multi-incremental soil samples, nine discrete subsurface soil samples, six sediment samples were collected during the RI. Resulting COPCs: none.
Western Region	158	The Western Region was apparently used for foot maneuvering evident by the significant amount of small arms throughout the area found during the EE/CA.	Mar-06	EE/CA (13.79ac footprint)	2.36-inch and 3.5-inch HEAT rockets, 75mm HE projectiles, 37mm HE projectiles, M9A1 AT rifle grenades, M28 HEAT rifle grenades, 60mm HE mortars, 81mm HE mortars, MKII hand grenades, smoke grenade, flares, and air-to-ground practice bombs.	1 MD, 56 Small Arms (MD: 1 HE fragment and abundant small arms were present)	Recreational use includes hunting, and hiking. City and County of Honolulu personnel passes through the area for access to the irrigation canals in the Region and Mountainous Region. Hiking trails associated with the future City and County of Honolulu park would likely constructed within the Region.	36%	Residents, Authorized Contractors and Visitors, Agriculture or Construction Workers, Recreational Users or Trespassers, Ecological	Public Access Available	None
			Aug-11	Remedial Investigation (RI)		No evidence of significant munitons use in the MRS. No MEC found during previous investiagtions. No signifcant MD other than small arms ammuntion. Western and Mountainous Region MRSs were evaluated as one MRS for the RI.					Three multi-incremental soil samples, Three discrete subsurface soil samples, 14 sediment samples were collected during the RI. Resulting COPCs: none.
Mountainous Region	534	Minimal evidence of use was found in the Mountainous Regions. It is expected that use of this area may have been limited to foot maneuvering.	Mar-06	EE/CA (8.81ac footprint)	2.36-inch and 3.5-inch HEAT rockets, 75mm HE projectiles, 37mm HE projectiles, M9A1 AT rifle grenades, M28 HEAT rifle grenades, 60mm HE mortars, 81mm HE mortars, MKII hand grenades, smoke grenade, flares, and air-to-ground practice bombs.	None	Recreational use includes hunting, and hiking. City and County of Honolulu personnel passes through the area for access to the irrigation canals in the Region.	8%	Residents, Authorized Contractors and Visitors, Agriculture or Construction Workers, Recreational Users or Trespassers, Ecological	Public access available; however, much of the terrain is rugged and impassable.	None
			Aug-11	Remedial Investigation (RI)		No evidence of significant munitons use in the MRS. No MEC found during previous investiagtions. No signifcant MD other than small arms ammuntion. Western and Mountainous Region MRSs were evaluated as one MRS for the RI.					See Western Region MRS. Western and Mountainous Region MRSs were evaluated as one MRS for the RI.
USMC Property (Kamaka Parcel) - Not FUDS property, but may be indicative of type ordnance that may be found on adjacent FUDS property	*199*	*Impact Area based on INPR*	*Apr-84*	*Surface Removal Action*	*2.36-inch and 3.5-inch HEAT rockets, 75mm HE projectiles, 37mm HE projectiles, M9A1 AT rifle grenades, M28 HEAT rifle grenades, 60mm HE mortars, 81mm HE mortars, MKII hand grenades, smoke grenade, flares, and air-to-ground practice bombs.*	*232 UXO, 16,000lbs MD (3.5-inch Rockets (practice), M29 Rifle Grenades (practice), 75mm HE, 60mm HE Mortars, 37mm HE, M28 HEAT Grenades, M9A1 AT Rifle Grenades, and 2.36-inch and 3.5-inch HEAT Rocket)*	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*
			Jan-09	*Site Inspection and Remedial Investigation*							
			Jul-11	*Remedial Investigation*		*26 MEC, 92 MPPEH, 4632 lbs MDAS*					*10 multi-incremental soild samples, 25 subsurface soil samples, 10 BIP locations, four sediment samples. COPCs include: copper, antimony and TNT.*

Notes: * Accessible is defined as areas where slope is <30 degrees.

6.0 CONTAMINANT FATE AND TRANSPORT FOR MEC/MC

6.1 MEC

6.1.1 Potential Sources for Contamination

6.1.1.1 Primary Source

Waikane Training Area was one of several sites utilized for advanced training of most units preparing for combat operations in the Pacific basin during World War II. Emphasis in training was placed almost entirely on offensive warfare. The training area was also reportedly used for air-to-ground practice bombing during that period. Per its lease, the USMC was authorized continued use of Waikane Training Area as a training area from 1953 to 1976.

6.1.2 Contaminant Persistence

MEC may remain for long periods of time, as evidenced by the discovery of numerous WWII-era UXO items during the 2006 EE/CA and 2011 Removal Action.

6.1.3 Contaminant Migration

Several factors influence the possible migration of MEC from the site. The possibility exists for human activity resulting in redistribution of MEC items. Another factor involves the movement of smaller MEC items by overland water flow, particularly in drainages and low-lying areas subject to periodic flooding. A related phenomenon involves ground movement resulting from erosion and landslides, which may unearth existing buried MEC items.

6.2 MC

6.2.1 Potential Sources for Contamination

6.2.1.1 Primary Source

Munitions constituents contamination would result from past military munitions activities at the site.

6.2.1.2 Primary Contaminant Media

The primary contaminant media is surface and subsurface soil. Soil samples collected during the Abbreviated SI (2008) and the RI fieldwork in 2011 identified low levels of select metals and explosives in surface soils and low levels of select metals in sediment.

6.2.1.3 Primary Transport Mechanism

Munitions constituents in surface and subsurface soil are potentially subject to several transport mechanisms. These processes include:

- Atmospheric dispersion through fugitive dust particle transmission;
- Precipitation/ surface runoff; and
- Erosion/ landslides.

6.2.1.4 Secondary Source Media

6.2.1.4.1 Sediment

Erosion and surface runoff are potential transport mechanisms bringing contaminated soil to surface waters. However, results of analysis from testing at MRS effluent points indicate that MC were not found in sediment above the respective HDOH EALs.

6.2.1.4.2 Surface Water

Per TPP discussions and recommendations from HDOH, it was determined that without contamination in the sediment, it is considered unlikely that MC contamination is being transported to the surface water; therefore water is not a source media or a transport mechanism.

6.2.2 Contaminant Persistence

6.2.2.1 Copper and lead are found in shell casings and various projectile components. Both of these metals are natural components of soil. These metals are not consumed in detonations, and multiple detonations of ordnance items on a training range may elevate the metals concentrations to sufficient levels to adversely affect human health and the environment (Walsh, 2004).

6.2.2.2 Copper occurs naturally in rock, soil, water, and sediment. Copper occurs in numerous minerals such as cuprite, tenorite, malachite, and azurite. It is an essential element for all known living organisms including humans and other animals at low levels of intake, with dietary ingestion providing the primary source of the necessary copper (HSDB, 2001). Copper is primarily used in the manufacture of wire, sheet metal, pipe, in agriculture to treat plant diseases, for water treatment, and as preservatives for wood, leather, and fabrics.

6.2.2.3 Copper is used extensively in military munitions in alloys of casings, solid munition components, paints, and coatings. Copper is also a constituent of the jet perforators used for the demolition of munitions.

6.2.2.4 When copper is released into soil, it can become strongly attached to the organic material and other components (e.g., clay, sand, etc.) in the top layers of soil and may not move very far when it is released. Hydrolysis and precipitation reactions dominate the chemistry of copper compounds in most natural aqueous systems. Soluble copper compounds sorb strongly to suspended particles. The presence of complexing organic ligands can stabilize dissolved copper compounds in fresh water systems and prevent copper sorption onto solids. Most insoluble and soluble copper compounds are associated with solids, have low mobility in soil, and are not expected to volatilize from water or moist soil surfaces. There is no evidence that supports the existence of biotransformation processes for copper compounds which would have a significant bearing on the fate of copper in aquatic environments.

6.2.2.5 Lead is typically found in the earth’s crust as an ore with zinc, silver, and copper. Lead has many anthropogenic uses due to its availability and cost—most of which include the use of lead in the production of batteries, plumbing, ammunition, and in medical instruments. Until its use in gasoline was banned in 1996, lead (tetraethyllead) was added to gasoline to reduce engine knocking. Lead was also used in fruit orchards to control insects before the 1950’s, and residential application of lead paint was outlawed in 1978 (ATSDR, 2007).

6.2.2.6 Lead transport in the environment is dependent on the soil chemistry and precipitation at the site. Large pieces of lead (e.g., bullet fragments) typically oxidize (corrode) over time due to their exposure to precipitation and the atmosphere. As large, pure fragments, these oxidized compounds (lead hydroxide and lead carbonate) are insoluble, but become soluble when erosion releases these compounds into the environment. Smaller particles harbor a larger surface area and may become prone to breakdown and leaching. Lead compounds become soluble where acidic conditions abound and likewise, a shift in redox potential can affect lead concentrations by shifting the speciation of lead to a more stable compound. Soil with high organic matter content and clayey soils can decrease leachability of lead since they sorb the lead, forming stable complexes. In contrast, sandy soils tend not to bind with lead nor do they hold groundwater, therefore solubized lead is more prone to leach to the groundwater (ITRC, 2003).

6.2.2.7 Lead alloy is typically used in military munitions as projectiles and casings, and lead compounds (i.e., lead azide, lead styphnate, lead carbonate, lead thiocyanate, lead nitrate, lead sulfide). Typical small arms military bullets are comprised of antimony-hardened lead in a copper jacket. These bullet masses tend to range from 32 to 86 grams per bullet, 96.4% of which is lead (ITRC, 2003).

6.2.3 Fate and Transport Characteristics of Detected Contaminants

Munitions constituents are the potential contaminants associated with the former WVTA. These include explosives and some metals such as copper and lead in the target area. Explosives in soil and sediment are generally degraded over time by biotic transformations by bacteria, fungi, and other soil microbes. Degradation of explosives also occurs through abiotic transformations such as alkaline hydrolysis, photolysis, and reduction by iron. The behavior of organic and inorganic chemicals in the environment is complex. Transport and eventual fate of chemicals through water, air, and soil involve a combination of biological, physical and chemical processes. These processes include:

- Dispersion – the general term applied to the observed spreading of a solute plume and generally attributed to hydrodynamic dispersion and molecular diffusion.
- Adsorption/desorption – the process by which dissolved, chemical species accumulate (adsorption) at an interface or are released from the interface (desorption) into solution.
- Diffusion – the migration of solute molecules from regions of higher concentration to regions of lower concentration.
- Oxidation/reduction – reactions in which electron(s) are transferred between reactants.
- Covalent binding – the formation of chemical bonds with specific functional groups in soil organic solids
- Plant root uptake – the transport of chemicals into plants through the roots.
- Sedimentation – the removal from the water column of suspended particles by gravitational settling.

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7.0 BASELINE RISK ASSESSMENT FOR MC AND HAZARD ASSESSMENT FOR MEC

7.1 BASELINE RISK ASSESSMENT FOR MC

7.1.1 Human Health Risk Assessment

7.1.1.1 Introduction

7.1.1.1.1 The purpose of the human health risk assessment (HHRA) is to evaluate the potential current and future health effects caused by the releases of MC, i.e., hazardous substances, from the site. The HHRA is intended to support a RI/FS for the project area.

7.1.1.1.2 Soil and sediment samples were collected as part of the RI that focused on the possible risk to human health from munitions response sites at the Waikane Training Area. This HHRA evaluates the 2011 data to determine if there is a Munitions Constituent of Potential Concern (MCOPC) that may require further assessment of exposure and risks.

7.1.1.1.3 The principal guidance documents used in conducting this human health risk assessment include:

- Munitions and Explosives of Concern Hazard Assessment Methodology, Interim, October 2008 (EPA, 2008).
- Risk Assessment Guidance for Superfund (RAGS) (Parts A through E) (EPA, 1989, 1991a, 1991b, 2001, and 2004) and USACE guidance, EM 200-1-4, Volume I, Human Health Evaluation (USACE, 1999).

7.1.1.2 Identification of Munitions Constituents of Potential Concern

7.1.1.2.1 The first step in the risk assessment process is to identify those hazardous substances that may pose a threat to human health. The selection of MCOPC includes an evaluation of the analytical data, previous investigations, site characteristics, review of historical MCOPC contamination sources and affected areas (e.g., impact areas, firing points, munitions types, small arms ammunition usage), and a review of site characteristics.

7.1.1.2.2 For this risk assessment, 72 MIS samples (i.e., 24 DUs with MIS samples collected in triplicate), 40 discrete subsurface soil, and 22 sediment samples were screened for the presence of copper, lead, and explosives plus nitroglycerin and PETN. These samples were targeted in the highest likely areas of contamination. Samples were collected outside of the WTA MRA boundary to establish background concentrations and within the following regions:

- Southeastern Region MRS (RMIS ID: H09HI035401R01-1);
  - Stream Expansion Area
  - Potential 2.36-inch Rocket Firing Point
- Southern Impact Region MRS (RMIS ID: H09HI035402R02-2); and
- Western/Mountainous Region MRS (RMIS ID: H09HI035402R03-3)

7.1.1.2.3 The full data set is presented in Appendix B of this RI report. Per risk assessment guidance, RAGS Part D Tables H-1 through G-3 (Appendix G) lists all chemicals that have been analyzed for in at least one sampling location from surface soil, subsurface soil, and sediment. To facilitate data analysis, data were combined into a single dataset and segregated by media type for each MRS. Grouping of data is necessary for conducting statistical analysis during risk assessments. Sampling locations for these environmental media are presented in Figures A-5 through A-9, Appendix A. The RAGS tables also contain statistical information about the chemicals detected in each medium, the detection limits of chemicals analyzed, risk-based screening values for MC selection, and rationale for the selection or deletion of the chemical as COPC. The following screening criteria were used to select or eliminate each chemical:

- Surface soil, subsurface soil, and sediment analytical results were compared against published HDOH EALs and the EPA RSLs for Residential Soil (dated June 2011), whichever was more stringent. The HDOH EALs and EPA RSLs are based on incidental ingestion, inhalation of vapors or dust, and dermal absorption.
- Analytical results were also compared to site-specific background levels.

7.1.1.2.4 The maximum concentration for each constituent was compared to the applicable screening criterion. In cases when a duplicate sample was collected and the constituent was detected in both samples, then the average of the parent and duplicate sample was used for screening. When the constituent was detected in either the parent or duplicate sample and was non-detect in the other, then the detected value was used for screening. If the concentration used for screening for a constituent exceeds the conservative risk-based screening level, then the constituent was retained as an MCOPC and evaluated further in the risk assessment.

7.1.1.2.5 Note that the screening-level approach that was followed is consistent with applicable guidance documents. In particular, comparisons of the maximum detected concentrations found anywhere were made to EALs or RSLs. Had the contamination been more widespread instead of one or two scattered points, examination of individual DUs would have been warranted.

7.1.1.2.6 Results of the surface soil screening (Table G-1, Appendix G) indicate that copper, lead, and nitroglycerine are MCOPC. Results of the subsurface soil screening (Table G-2, Appendix G) indicate that lead, 2-amino-4,6-dinitrotoluene, 4-amino-4,6-dinitrotoluene and nitroglycerine are MCOPC. For sediment, there are no MCOPC (Table G-3, Appendix G).

7.1.1.3 Exposure Assessment

The objective of the exposure assessment is to estimate the magnitude of potential human exposure to MC at the Waikane Training Area. The results of the exposure assessment are then combined with chemical-specific toxicity information to estimate the potential human health risks associated with chemical exposure.

7.1.1.3.1 Exposure Pathways and Analysis

An exposure pathway is the mechanism through which a receptor comes in contact with contaminated media. Potential exposure pathways typically include incidental ingestion, inhalation of particulates, and dermal contact with soil. Munitions constituents expected at the WTA MRA include copper, lead and explosives. Based on the screening cited above, copper, lead, 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, and nitroglycerin are MCOPC. These MCOPC are limited to the Southeastern Region MRS. No MCOPC were detected in either of the other two MRSs.

7.1.1.3.1.1 MIS Samples (Surface Soil)

7.1.1.3.1.1.1 MCOPC identified in the Southeastern Region surface soil are copper, lead, and nitroglycerin. Separate discussions of potential hazards are provided below.

- **Copper** was detected in surface soil samples collected from the Southeastern Region at concentrations ranging from 31 to 362 milligrams per kilogram (mg/kg). When the maximum concentration is compared to the residential screening level, a hazard quotient (HQ) of 2 is obtained.

7.1.1.3.1.1.2 The HQ is the ratio of the site concentration to the screening level. Exposures at or below the reference level (HQ=1) are not likely to be associated with adverse health effects. As exposures increase above the reference level (i.e., HQs increase above 1), the potential for adverse effects also increases. The HQ, however, should not be interpreted as a probability of adverse effects.

7.1.1.3.1.1.3 An individual receptor is assumed to be equally exposed to media within all portions of the exposure unit (i.e., single MRS) over the time frame of the risk assessment. EPA recommends using the average concentration to represent a reasonable estimate of the concentration likely to be contacted over time during the risk assessment. Further, because of the uncertainty associated with estimating the true average concentration at a site, the 95UCL of the arithmetic mean should be used for this variable (USEPA 2002). Confidence limits gives an indication of how much uncertainty there is in the estimate of the true mean. The 95UCL exposure concentration of copper is 88.6 mg/kg (Table G-4 of Appendix G). Calculations of the 95UCL may be found in Attachment A of Appendix G. This exposure concentration (88.6 mg/kg) is lower than the most stringent residential screening level. Therefore, copper is not a MC of concern in surface soil in the Southeastern Region.

- **Lead** was detected in MIS samples collected from the Southeastern Region at concentrations ranging from 6 to 325 mg/kg. It was chosen as a MCOPC based on the fact that its maximum concentration exceeded the HDOH EAL of 200 mg/kg.

7.1.1.3.1.1.4 There are no traditional toxicity constants available for lead. Instead, blood-lead concentrations have been accepted as the best measure of exposure to lead. Because young children (especially those under the age of 7 years) are the most vulnerable to lead toxicity, EPA developed an Integrated Exposure Uptake Biokinetic (IEUBK) model in children to predict blood-lead levels from chronic exposures (i.e., indoor air, diet, water consumption, soil and dust) of children to lead. The arithmetic average concentration of lead in surface soil, 31.6 mg/kg, was input into the latest version of the IEUBK model (EPA, 2010). The arithmetic average soil lead concentration is typically used in the IEUBK model (Lead Model version 1.1). Default lead concentrations were used for the remaining parameters. When this model is used with site concentration data, the predicted blood-lead levels in young children (the most vulnerable group in the population) are shown to be acceptable. It is not necessary to address adult exposure due to the acceptable results in young children. Therefore, lead is not a MC of concern.

7.1.1.3.1.1.5 The arithmetic average concentration of lead in surface soil, 31.6 mg/kg, was input into the latest version of the IEUBK model (EPA, 2010). Default lead concentrations were used for the remaining parameters. The printout from the model is provided in Attachment G.

- **Nitroglycerin** was detected in only one out of 48 MIS samples collected in the Southeastern Region. It was not detected in the other two MRS regions. Its concentration of 0.466 mg/kg exceeds the HDOH EAL of 0.079 mg/kg, hence its selection as a MCOPC. However, the EAL is based on protection of groundwater rather than protection of human health. The residential human health RSL is 6.1 mg/kg, which is much higher than the isolated nitroglycerine detection of 0.466 mg/kg. Therefore, nitroglycerine is not considered a MC of concern for human health exposure. With respect to groundwater, it is not likely that the single, isolated detection would constitute a threat to groundwater quality.

7.1.1.3.1.2 Discrete Subsurface Soil Samples

7.1.1.3.1.2.1 Soil samples were collected in the highest likely areas of contamination based on the results of the RI. Although 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene and nitroglycerine exceeded the screening criteria in several individual samples, these compounds were infrequently detected in subsurface soil within the 151 ± acres that constitute the Southeastern Region MRS: Two out of 28 samples for nitroglycerin, 3 out of 28 samples for 2-amino-4,6-dinitrotoluene and 3 of 28 samples for 4-amino-2,6-dinitrotoluene. The maximum detected concentration of 2-amino-4,6-dinitrotoluene was not significantly higher, defined as an order of magnitude higher, than its screening level (953 vs. 250 µg/kg). Similarly, for 4-amino-2,6-dinitrotoluene, its maximum detected concentration was not significantly higher than its screening level (617 vs. 250 µg/kg). For nitroglycerin, its maximum detected concentration (2,450 µg/kg) was significantly greater than the screening level (79 µg/kg), hence its selection as a MCOPC. However, this screening level is based on protection of groundwater (discussed above). The more appropriate comparison is to the residential human health RSL (6,100 µg/kg). The maximum detected concentration of nitroglycerin in soil is not a direct-contact hazard at 2,450 µg/kg.

7.1.1.3.1.2.2 Lead detections occasionally exceeded action levels in subsurface soil. The arithmetic average concentration of lead in subsurface soil, 99.0 mg/kg, was input into the latest version of the IEUBK model (EPA, 2010). The arithmetic average soil lead concentration is typically used in the IEUBK model (Lead Model version 1.1). Default lead concentrations were used for the remaining parameters. The predicted blood-lead levels in young children (the most vulnerable group in the population) are shown to be acceptable. Therefore, lead is not a MC of concern. The maximum lead concentration of 1,830 mg/kg was from a single subsurface sample WTA-SE-ZSB-016 (WTA221). This concentration fell outside of the 99th percentile value (1,300 mg/kg) of the data set for subsurface soil concentrations in the Southeastern Region MRS. Confirmation samples will be collected at this location and results discussed in the FS.

7.1.1.3.1.2.3 For these reasons, the MCOPC s in the Southeastern Region MRS subsurface soil, lead, 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, and nitroglycerin, are not MC of concern in the Southeastern Region MRS.

7.1.1.4 Conclusion

7.1.1.4.1 Maximum and 95UCL exposure concentrations of the MC of potential concern were compared to conservative residential screening levels (the lower of the EAL and RSL). In all cases, the 95UCL exposure concentrations were below residential screening levels, and since the dominant exposure scenario would be recreational, potential risks are considered negligible and are not quantified further in the risk assessment process.

7.1.1.4.2 The potential for a receptor to encounter a contaminated media source in the subsurface and interacting with a source is considered unlikely. As noted, the maximum lead concentration of 1,830 mg/kg was from a single subsurface sample WTA-SE-ZSB-016 (WTA221). Although this lead concentration fell outside of the 99th percentile value (1,300 mg/kg) of the data set for subsurface soil lead concentrations in the Southeastern Region MRS, it was accounted for in calculations used as input values for IEUBK model simulations. Confirmation samples will be collected at this location and results discussed in the FS.

7.1.1.4.3 When the IEUBK model is used with site lead concentration data, and the predicted blood-lead levels in young children (the most vulnerable group in the population) are shown to be acceptable, it is not necessary to also address adult exposure.

7.1.1.4.4 In conclusion, there are no threats from concentrations of MC to human health at the WTA MRA.

7.1.2 Ecological Risk Assessment

7.1.2.1 Introduction

7.1.2.1.1 The purpose of the screening-level ecological risk assessment (SLERA) is to evaluate the potential effects to ecological receptors caused by the releases of MC, i.e., hazardous substances from the site. This SLERA is developed within the framework of a RI/FS for the WTA MRA and is consistent with Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (EPA, 1997) and EM 200-1-4, Volume II Environmental Evaluation (USACE, 1996).

7.1.2.1.2 The SLERA constitutes steps 1 and 2 of the 8-step ecological risk assessment process (EPA, 1997) and is comprised of a screening-level problem formulation and a screening-level exposure estimate and risk calculation. The outcome of the SLERA will determine if:

- ecological risks are negligible;
- the ecological risk assessment process should continue to determine whether a risk exists (i.e., continue to Step 3);
- there is a potential for adverse ecological effects and a more detailed assessment incorporating more site-specific information is needed.

7.1.2.1.3 This SLERA evaluates the data collected as part of the RI to determine if there any MC of concern that may require further assessment of ecological risks.

7.1.2.2 Screening-Level Problem Formulation and Ecological Effects Characterization

This section covers Step 1 of the EPA risk assessment process and provides a general discussion of the following issues (see section 5.0 for supplemental detail):

- environmental setting;
- contaminant fate and transport mechanisms that may exist on the site;
- categories of likely receptors and mechanisms of ecotoxicity;
- identification of complete exposure pathways; and
- screening-level assessment and measurement endpoints.

7.1.2.2.1 Environmental Setting

7.1.2.2.1.1 The physical characteristics of the site area are described in detail in a previous Section of the RI report. The site includes portions of the coastal plain adjacent to Kaneohe Bay and on the slopes of the Koolau Mountain Range. Most of the site is covered with dense vegetation including the densely forested coastal plain and thick grasses and shrubs in the higher elevations. There are several steep gulches, canyons, rocky outcrops, and mountains rising over 2,200 feet above sea level.

7.1.2.2.1.2. Native plant communities such as Ohia Scrub and Koa/Uluhe Woodland occur on some of the ridges within the site. The Ohia scrub is characterized by low and shrubby ohia trees (*Metrosideros polymorpha*) with dense clumps of the native fern palaa (*Sphenomeris chinensis*) between the shrubs. Koa/Uluhe woodland is dominated by the uluhe (*Dicranopteris linearis*) ferns. The majority of the site, however, has been historically disturbed and is comprised by secondary forest found in most of the flat to sloping areas of the site and abandoned agricultural clearings that cover large patches on the alluvial plain of the Waikane Stream, and areas around rural residential sites. Most of the lowlands are now dominated by the non-native tree albizia (*Falcataria moluccana*) which is a large, fast-growing tree with an open, spreading canopy. Riparian habitat exists along Waikane Stream.

7.1.2.2.1.3 There are numerous threatened and endangered (T&E) species that are on the island of Oahu as listed in Table 7-1. Of the listed animal T&E species, the following is a partial list of those that appear most likely to occur within the WTA MRA:

- Oahu Elepaio (*Chasiempis sandwichensis ibidis*) – federal and state listed endangered species. These little wren-like flycatchers occur in a variety of forest types and across a range of elevations, primarily in valleys and particularly those with tall riparian vegetation, a continuous canopy, and dense understory. Populations have seriously declined in recent decades on Oahu.
- Newell's Shearwater (*Puffinus auricularis newelli*) - federal and state listed. This seabird breeds in burrows dug into steep mountain slope areas that are usually sheltered by uluhe. Otherwise it spends most of its life at sea.
- Hawaiian Short-Eared Owl (*Asio flammeus sandwichensis*) - state T&E species. The common name for this owl is the "pueo" and although uncommon, it may occasionally use resources within the site, especially in the more open uluhe dominated higher elevations of the valley walls. Pueo primarily feed on small rodents and occasionally on small birds and invertebrates.

- Snail Species (*Achatinella spp.*) - federal and state listed. These small tree snails are isolated on Oahu's mountain ridges spend almost their entire lives on one tree (usually an ohia or kopiko tree) and feed on a type of fungus that grows on the leaves.

7.1.2.2.1.4 There are over 100 endangered plant species on Oahu, which includes a variety of ferns, vines, shrubs, grasses, herbs, and trees.

TABLE 7-1 FEDERAL THREATENED AND ENDANGERED SPECIES ON OAHU

Listed Mammals

Scientific Name	*Common Name*	*Status*
Lasiurus cinereus semotus	Bat, Hawaiian hoary; Opeapea	E

Listed Birds

Anas wyvilliana	Duck, Hawaiian; Koloa maoli	E
Asio flammeus sandwichensis	Owl, Short-eared	T
Chasiempis sandwichensis ibidis	Elepaio, Oahu	E, CH
Fulica alai	Coot, Hawaiian; Alae keokeo	E
Gallinula chloropus sandvicensis	Moorhen, Common; Hawiian gallinule	E
Himantopus mexicanus knudseni	Stilt, Black-necked; Hawaiian stilt; Aeo	E
Paroreomyza maculata	Creeper, Oahu; Oahu Alauahio	E
Pterodroma phaeopygia sandwichensis	Petrel, Dark-rumped; Hawaiian Petrel; Uau	E
Puffinus auricularis	Shearwater, Newell's	T
Vestiaria coccinea	Iiwi	P

Listed Snails

Achatinella spp.	Snail, Oahu tree; Pupu kani oe (41 species)	E

Listed Arthropods

Drosophila spp.	Picture-wing fly, Oahu (6 species)	E, CH
Hylaeus spp.	Yellow-faced bee, Hawaiian (5 species)	E
Megalagrion leptodemas	Crimson Hawaiian damselfly	PE
Megalagrion nigrohamatum nigrolineatum	Blackline Hawaiian damselfly	PE
Megalagrion oceanicum	Oceanic Hawaiian damselfly	PE
Megalagrion pacificum	Pacific Hawaiian damselfly	PE

Listed Plants

Abutilon eremitopetalum	No common name	E
Abutilon menziesii	Kooloaula	E
Achyranthes splendens var. *rotundata*	Hinahina ewa	E * CH
Adenophorus periens	No common name	E *
Bidens amplectens	Ko oko olau	PE
Bidens micrantha ssp. *Kalealaha*	Ko oko olau	E, CH
Bonamia menziesii	No common name	E
Brighamia rockii	Pua ala	E *
Caesalpinia kavaiensis	Uhiuhi	E *
Cenchrus agrimoniodes var. *agrimonioides*	Kamanomano	E *
Centaurium sebaeoides	Awiwi	E

Chamaesyce kuwaleana	Akoko	E, CH
Chamaesyce rockii	Akoko	E, CH
Chamaesyce skottsbergii var. *skottsbergii*	Akoko	E, CH
Colubrina oppositifolia	Kauila	E, CH
Ctenitis squamigera	Pauoa	E, CH
Cyanea acuminata	Haha	E, CH
Cyanea calycia	Haha	PE
Cyanea crispa	Haha	E, CH
Cyanea grimesiana ssp. *Grimesiana*	Haha	E * CH
Cyanea grimesiana ssp. *Obatae*	Haha	E, CH
Cyanea humboldtiana	Haha	E, CH
Cyanea koolauensis	Haha	E, CH
Cyanea lanceolata	Haha	PE
Cyanea longiflora	Haha	E, CH
Cyanea pinnatifida	Haha	E, CH
Cyanea purpurellifolia	Haha	PE
Cyanea st.-johnii	Haha	E, CH
Cyanea superba ssp. *Regina*	Haha	E * CH
Cyanea superba ssp. *Superba*	Haha	E, CH
Cyanea truncata	Haha	E, CH
Cyperus pennatiformis ssp. *Pennatiformis*	No common name	E * CH
Cyperus trachysanthos	Pulukala	E, CH
Cyrtandra crenata	Haliwale	E *
Cyrtandra dentata	Haliwale	E, CH
Cyrtandra gracilis	Haliwale	PE
Cyrtandra kaulantha	Haliwale	PE
Cyrtandra polyantha	Haliwale	E, CH
Cyrtandra sessilis	Haliwale	PE
Cyrtandra subumbellata	Haliwale	E, CH
Cyrtandra viridiflora	Haliwale	E, CH
Cyrtandra waiolani	Haliwale	PE
Delissea subcordata	No common name	E * CH
Delissea takeuchii	No common name	E * CH
Delissea waianaeensis	No common name	E, CH
Diellia erecta	No common name	E, CH
Diellia falcata	No common name	E, CH
Diellia unisora	No common name	E, CH
Diplazium molokaiense	No common name	E * CH
Doryopteris takeuchii	No common name	PE
Dubautia herbstobatae	Nalenale	E, CH
Eragrostis fosbergii	No common name	E * CH
Eugenia koolauensis	Nioi	E, CH
Euphorbia haeleeleana	No common name	E, CH
Flueggea neowawraea	Mehamehame	E, CH
Gardenia mannii	Nanu	E, CH
Gouania meyenii	No common name	E, CH
Gouania vitifolia	No common name	E, CH
Hedyotis coriacea	Kiolele	E * CH
Hedyotis degeneri var. *coprosmifolia*	No common name	E * CH
Hedyotis degeneri var. *degeneri*	No common name	E, CH
Hedyotis parvula	No common name	E, CH
Hesperomannia arborescens	No common name	E, CH
Hesperomannia arbuscula	No common name	E, CH

Hibiscus brackenridgei ssp. *Mokuleianus*	Malo hau hele	E * CH
Hibiscus brackenridgei ssp. *Molokaiana*	Malo hau hele	E, CH
Huperzia nutans	Wawaeliole	E
Ischaemum byrone	Hilo ischaemum	E
Isodendrion laurifolium	Aupaka	E, CH
Isodendrion longifolium	Aupaka	E, CH
Isodendrion pyrifolium	Wahine noho kula	E * CH
Korthalsella degeneri	Hulumoa	PE
Labordia cyrtandrae	Kamakahala	E, CH
Lepidium arbuscula	Anaunau	E, CH
Lipochaeta lobata var. *leptophylla*	Nehe	E, CH
Lobelia gaudichaudii ssp. *Koolauensis*	No common name	E, CH
Lobelia monostachya	No common name	E, CH
Lobelia niihauensis	No common name	E, CH
Lobelia oahuensis	No common name	E, CH
Lysimachia filifolia	No common name	E, CH
Marsilea villosa	Ihi ihi	E, CH
Melanthera tenuifolia	Nehe	E, CH
Melanthera waimeaensis	Nehe	E, CH
Melicope christophersenii	Alani	PE
Melicope hiiakae	Alani	PE
Melicope lydgatei	Alani	E, CH
Melicope makahae	Alani	PE
Melicope pallida	Alani	E * CH
Melicope saint-johnii	Alani	E, CH
Myrsine juddii	Kolea	E, CH
Neraudia angulata var. *angulata*	No common name	E, CH
Neraudia angulata var. *dentata*	No common name	E, CH
Nototrichium humile	Kululi	E, CH
Panicum fauriei var. *carteri*	Carter's panic grass	E, CH
Peucedanum sandwicense	Makou	T, CH
Phyllostegia haliakalae	No common name	E * CH
Phyllostegia hirsuta	No common name	E, CH
Phyllostegia kaalaensis	No common name	E, CH
Phyllostegia mollis	No common name	E, CH
Phylostegia parviflora var. *lydgatei*	No common name	E, CH
Phyllostegia parviflora var. *parviflora*	No common name	E, CH
Plantago princeps var. longibracteata	Laukahi kuahiwi	E, CH
Plantago princeps var. princeps	Laukahi kuahiwi	E, CH
Platanthera holochila	No common name	E * CH
Platydesma cornuta var. cornuta	No common name	PE
Platydesma cornuta var. decurrens	No common name	PE
Pleomele forbesii	Hala pepe	PE
Pritchardia kaalae	Loulu	E
Psychotria hexandra ssp. oahuensis	Kopiko	PE
Pteralyxia macrocarpa	Kaulu	PE
Pteris lidgatei	No common name	E, CH
Sanicula mariversa	No common name	E, CH
Sanicula purpurea	No common name	E, CH
Scaevola coriacea	Dwarf naupaka	E *
Schiedea adamantis	No common name	E
Schiedea hookeri	No common name	E, CH
Schiedea kaalae	No common name	E, CH

Schiedea kealiae	No common name	E, CH
Schiedea nuttallii	No common name	E, CH
Schiedea obovata	No common name	E, CH
Schiedea trinervis	No common name	E, CH
Sesbania tomentosa	Ohai	E, CH
Silene lanceolata	No common name	E, CH
Silene perlmanii	No common name	E * CH
Solanum sandwicense	Popolo aiakeakua	E * CH
Spermolepis hawaiiensis	No common name	E, CH
Stenogyne kanehoana	No common name	E, CH
Tetramolopium filiforme var. *filiforme*	No common name	E, CH
Tetramolopium filiforme var. *polyphyllum*	No common name	E, CH
Tetramolopium lepidotum ssp. *Lepidotum*	No common name	E, CH
Tetraplasandra lydgatei	Ohe	PE
Tetraplasandra gymnocarpa	Ohe ohe	E, CH
Trematolobelia singularis	No common name	E, CH
Urera kaalae	Opuhe	E, CH
Vigna o-wahuensis	No common name	E * CH
Viola chamissoniana ssp. *Chamissoniana*	olopu; pamakani	E, CH
Viola oahuensis	No common name	E, CH
Zanthoxylum oahuense	Ae	PE

Notes:
Source: U.S. Fish and Wildlife Service http://www.fws.gov/pacificislands
Species status: E = endangered; T = threatened; CH = critical habitat designated; P = proposed
* = possibly extirpated in the wild

7.1.2.3 Screening Level Assessment and Measurement Endpoints

Screening-level assessment endpoints include plant and animal populations and communities, habitats, and sensitive environments. The HDOH ESLs Surfer database for ecotoxicity was used to obtain most of the screening levels (HDOH 2008). Various EPA and other federal soil and sediment screening values are used as measurement endpoints where there are no ecotoxicity ESL. Table G-5 provides a list of available ecological screening values and their associated references. Some of the explosives compounds do not have any screening values for particular media.

7.1.2.4 Screening-Level Exposure Estimate and Risk Calculation

This section provides a summary of the screening-level assessment (considered Step 2 of the 1997 EPA guidance), which includes an initial estimate of exposure to receptors and calculates preliminary risks by comparing the maximum documented exposure concentrations in soil, sediment, and surface water with EPA ecotoxicity screening-level values.

7.1.2.5 Screening-Level Measurement Estimates

For this ecological risk assessment, 72 MIS samples (i.e., 24 DUs with MIS samples collected in triplicate), 40 discrete subsurface soil, and 22 sediment samples were screened for the presence of copper, lead, and explosives plus nitroglycerin and PETN to identify MCOPC. The full data set is presented in Appendix B of the RI report. The maximum detected concentration of each chemical in each medium was used as the exposure estimate.

7.1.2.6 Screening Level Risk Calculation

Screening-level risks to ecological receptors were evaluated by calculating a hazard quotient (HQ) for each chemical in each medium. The HQ in this case is the ratio of the site maximum detected concentration (exposure concentration) to the ecological screening value. A HQ less than one indicates that the chemical alone is unlikely to cause adverse effects to ecological receptors. A HQ greater than one indicates a potential for ecological impact from exposure to that chemical and becomes designated as a MCOPC. The screening-level risk calculation is a very conservative estimate to ensure that potential risk to ecological receptors is not underestimated. The results of this screening calculation serve only to determine whether a chemical presents negligible risk or whether additional site-specific information is warranted. Tables G-6 through G-8 (Appendix G) present the results of the screening assessment by identifying MCOPC in surface soil, subsurface soil, and sediment, respectively.

7.1.2.7 Soil

7.1.2.7.1 Nitroglycerine was detected in one out of 72 MIS samples and in two out of 56 discrete subsurface samples. The concentrations were well below the ecological screening level (Tables G-6 and G-7). Explosive constituents, 2,4,6-trinitrotoluene, 2-Amino-4,6-dinitrotoluene, and 4-Amino-2,6-dinitrotoluene were also detected in subsurface soils at concentrations below the screening level (Table G-7). Therefore, explosives are not of concern to ecological receptors.

7.1.2.7.2 Copper exceeded the screening level in one out of 72 MIS samples. There were no exceedances in discrete subsurface samples (Tables G-6 and G-7). The highest concentration (362 mg/kg) was from the Southeastern Region MRS with a hazard quotient of 1.6. However, the other two samples associated with the triplicate collected at the DU had copper concentrations of 91.7 and 111mg/kg. This results in an average concentration at the DU of 188 mg/kg, which is below the ESL. For risk assessment, often the 95UCL is used to assess potential exposure to ecological receptors. Based on the 95UCL copper soil exposure concentrations in the MRS, the HQ is much less than 1.0. Therefore, no ecological receptors are considered to be at risk from exposure to copper.

7.1.2.7.3 Lead in MIS samples had a maximum concentration of 325 mg/kg and exceeded the ESL of 200 mg/kg in two out of 72 samples (Table G-6). The maximum discrete subsurface soil lead concentration was 1,830 mg/kg and exceeded the ESL in 2 of 48 samples. Therefore, a further evaluation of ecological risks from exposure to lead is discussed below.

7.1.2.8 Potential Risks from Exposure to Lead

7.1.2.8.1 The elevated lead concentrations in soils are limited to the Southeastern Regional MRS in areas of high density munitions debris. The maximum lead of 1,830 mg/kg was from subsurface sample WTA-SE-ZSB-016 (WTA221). Confirmation samples will be collected at this location and results addressed in the FS. The corresponding DU (WTA-SE-ZIS-007) had concentrations of lead below 31 mg/kg in the triplicate MIS samples. This suggests that the lead is associated with buried fragment debris. The median, mean, and 95UCL lead concentration in all soil samples from the Southeastern Region MRS are 18, 59, and 165 mg/kg, respectively which are all less than the ESL. The maximum value skewed the distribution towards a more conservative (i.e., higher) calculated 95UCL for screening level comparisons.

7.1.2.8.2 The ecological risk assessment conducted as part of the Waikane Site Inspection Report (NAVFAC, 2009) used a conservative food web model for the pueo (short-eared owl). In that report, lead soil concentrations of 125 mg/kg produced a hazard quotient of 0.7 for the pueo using no-observed-adverse-effect toxicological reference values. This indicates that a concentration of approximately 180 mg/kg would result in an HQ of 1.0. This no-adverse-effect level of 180 mg/kg is higher than the 95UCL concentration of 165 mg/kg in the Southeastern MRS and suggests that adverse risks to sensitive birds within the MRS would not be expected.

7.1.2.9 Sediment

7.1.2.9.1 Twenty two sediment samples were collected and screened to identify MCOPC. Table G-8 indicates that no explosive constituents were detected in sediment. The maximum lead concentration was below the ecological screening value but copper exceeded the screening level.

7.1.2.9.2 Twice the background sediment copper concentration (152 mg/kg) was used as the screening level. For naturally occurring inorganics (e.g., copper) the maximum detected concentration is often compared to twice the average site-specific background concentration and was more stringent than the EPA RSLs and HDOH EALs. Only one of the 22 sediment samples exceeded the background screening level with a concentration of 189 mg/kg. The site-specific hazard quotient associated with the sample (WTA182) is 1.2. This sample is located in the upper drainage in Western/Mountainous Region MRS near six background stations (WTA-BKG-ZSD-001 through -006) with virtually no known munitions debris, suggesting a closer relationship with background. Given that the HQ is slightly greater than 1.0 and is slightly greater than background, copper is not expected to pose an adverse threat to aquatic organisms that may be dependent on the sediment.

7.1.2.10 Conclusion

Elevated lead concentrations in soils are limited to the Southeastern Regional MRS in a localized area within removal area AOC #2 where intentional detonations were conducted for MEC disposal. Although lead in soils from the central portion (AOC #2) of the Southeastern Regional MRS is elevated above the ESL in four samples, the relatively low magnitude of exceedances and the low hazard quotients suggest that the potential for adverse risks to ecological receptors from exposure to lead and other munitions constituents in soil would be negligible.

7.2 MEC HAZARD ASSESSMENT (MEC HA)

This section describes the methodology for conducting, and presents the results of, the hazard assessment (HA) for MEC items located within each MRS. The MEC HA addresses the explosives safety concerns posed by MEC to human receptors at each the MRS. It does not address environmental or ecological concerns including potential risks associated with exposure to MC as environmental contaminants, which are evaluated in Section 7.0 (Baseline Risk Assessment, herein).

7.2.1 Components of Explosive Hazard

The MEC HA framework is comprised of three basic components including severity, accessibility and sensitivity. *Severity* evaluates the potential consequences of the effect (death or injury) on a human receptor if an MEC item detonates. *Accessibility* describes the likelihood that a human receptor will be able to come in contact with an MEC item. *Sensitivity* assesses the likelihood that an MEC item will detonate if a human receptor interacts with it.

7.2.1.1 MEC HA Input Factors

7.2.1.1.1 Severity

The severity component is comprised of two input factors including the energetic material type in the MEC items in the MRS (e.g., high explosive, incendiary), and the location of additional human receptors (i.e., if the MEC item detonates, could it affect one or more secondary receptors, in addition to the individual initiating the detonation).

7.2.1.1.2 Accessibility

The accessibility of a site affects the likelihood of an individual being exposed to MEC. The accessibility component is described by the following input factors:

- Accessibility (e.g., the presence of structural barriers like fences or natural barriers such as rough terrain, which limit site accessibility.
- Potential Contact Hours (i.e., the number of hours that people use the site each year).
- Minimum depth of MEC relative to the maximum intrusive depth of receptor activity (i.e., the relationship of receptor activity to the location and depth of MEC).; and
- Potential for migration of MEC items (e.g., erosion).

7.2.1.1.3 Sensitivity

Sensitivity affects the likelihood of an MEC item functioning as designed when encountered by an individual. The MEC classification (e.g., UXO, fuzed or unfuzed discarded military munitions [DMM], bulk explosives) and MEC size are input factors used to describe the sensitivity component of the explosive hazard.

7.2.1.2 MEC HA Structure

7.2.1.2.1 MEC HA is designed to use numeric values associated with the input factors to assign weighted values that allow scoring which describes the hazards associated with the MEC. The scores are then summed, allowing determination of the hazard level. In order to ensure that the framework may be sensitive enough to distinguish between different removal and remedial alternatives, input factors are weighted. This assures a distinction between the input factors that do, and do not change in response to a cleanup, as well as the input factors that change to reflect different land use activities.

7.2.1.2.2 The input factor categories each have a corresponding numeric score. The input factor categories reflect site-specific conditions, which result in differing scores reflecting a greater or lesser contribution to the explosive hazards at the site.

7.2.2 Outputs from the MEC HA Scoring

Once each scenario is assessed using MEC HA, a score is produced which is associated with one of four hazard levels reflecting the interaction between the current and future human activities in an MRS and the types, amounts, and conditions of MEC items within the MRS.

7.2.3 Scoring Considerations

7.2.3.1 MEC HA scoring may be conducted several times for an individual MRS, in order to account for different site condition scenarios. These factors may be changed to reflect conditions after cleanup, different land use activities, or land use controls. Data on the current, determined or reasonably anticipated future land use activities are used to select categories for four input factors as follows:

- Location of Additional Human Receptors;
- Site Accessibility;
- Potential Contact Hours; and
- Minimum MEC Depth Relative to the Maximum Intrusive Depth.

7.2.3.2 Outdoor activities create the greatest exposure to MEC. Each land use type (e.g., residential, industrial or commercial, recreational, and open space) may have associated outdoor activities. Residential users may garden or build an addition onto their home. Construction, agriculture, and mining are by their nature intrusive; examples include upgrading or replacement of buried infrastructure and seasonal plantings or landscape upgrades (USEPA, 2006).

7.2.3.3 Sources of information on future land use scenarios include, but are not limited to, zoning maps, local government master plans, historical land use trends, parcel ownership maps from local government, and public park authorities. The MEC HA supports the evaluation of removal or remedial actions that are protective of human health and the environment. The project team using the CERCLA removal or remedial process will often identify two types of removal or remedial alternatives:

- Cleanup of MEC items from the surface and subsurface. The major variation will be the depth and area covered by the cleanup; and
- Identification of LUCs that effectively control potential exposure to any remaining MEC.

7.2.3.4 Response actions can range from removal of MEC items combined with use of LUCs, or to use of LUCs alone. The NCP remedy preference is that institutional controls not be the sole remedy unless treatment is impracticable. Removal or remedial alternatives are input factors. Each alternative can affect various input factor categories (USEPA, 2006).

7.3 SUMMARY OF MEC HA SCORES

7.3.1 Previous investigations have revealed that the Southeastern Region and Southern Impact Region MRSs (approximately 241 acres) contained MEC items resulting in a subsurface removal action in portions of these two MRSs (AOC #1 and AOC #2, Figure A-3). A MEC HA was prepared for the Southeastern Region MRS and Southern Impact Region MRS with baseline conditions representing current conditions (i.e., post NTCRA subsurface removal action).

7.3.2 Table 7-1 presents a summary of the MEC Hazard Assessment (MEC HA) scoring for each MRS. The complete results of automated Worksheets for estimating the MEC HA for the Southeastern Region and Southern Impact Region MRSs are provided in Appendix D.

TABLE 7-2 MEC HA HAZARD LEVEL DETERMINATION SUMMARY

	Baseline Condition (Subsurface Clearance)	Subsurface Cleanup with LUCs
Southern Impact Region MRS		
MEC HA Scoring Summary	380	370
Corresponding Hazard Level Category	**4**	**4**
Southeastern Region MRS		
MEC HA Scoring Summary	420	380
Corresponding Hazard Level Category	**4**	**4**

7.3.3 In summary, Southeastern Region MRS received a hazard level of “4” (indicating low potential explosive hazard conditions) for current and future land uses (open space, agricultural, and nature preserve areas) since surface/subsurface clearance alternatives were conducted. Land use controls may further help to reduce the hazard risk of the Southeastern Region MRS compared to current conditions because there are no fences securing the area. A locked gate across the main road currently secures access into Waikane Training Area; however, there are paths and trails along the southeastern boundary that allows hikers, moto-cross and ATV riders, etc. into the area. Fences enclose the northern impact area within the USMC parcel on the northern side of the WTA MRA.

7.3.4 The Southern Impact Region MRS received a hazard level of “4” (indicating low potential explosive hazard conditions) for current and future land uses (open space, agricultural, and nature preserve areas) since surface/subsurface clearance alternatives were conducted. Land use controls may further help to reduce the hazard risk of the MRS compared to current conditions because there are no fences securing the area. A locked gate across the main road currently secures access into Waikane Training Area; however, there are paths and trails along the southeastern boundary that allows hikers, moto-cross and ATV riders, etc. into the area. Fences enclose the northern impact area within the USMC parcel on the northern side of the WTA MRA.

7.3.5 No MEC and only very limited MD, other than that related to small arms ammunition, has been found within the Western/Mountainous Region MRS. Therefore, MEC are not anticipated to be present in the MRS. However, although this area does not appear to have been affected by concentrated munitions use, and exposure to explosive hazards in this area is unlikely, the potential for explosive hazards cannot be completely dismissed. Because the potential for MEC is considered to be minimal in this MRS, a qualitative MEC HA was not conducted for the Western/Mountainous Region MRS.

8.0 SUMMARY OF RESULTS

8.0.1 RI fieldwork was conducted at the WTA MRA, Island of Oahu, Hawaii, with between May 15, 2011 and November 7, 2011. Accessible areas (i.e., slope of 30 degrees or less) within the Southern Impact Region MRS, Southeastern Region MRS, Western Mountainous Region MRS, a potential 2.36-inch rocket firing point (outside of the WTA MRA boundary) and along the Waikane Stream and Unnamed Stream (downstream of the WTA MRA boundary) were investigated. The purpose of the RI was to determine the nature and extent of MEC and MC contamination at the WTA MRA in order to adequately characterize each MRS for the purpose of developing and evaluating effective remedial alternatives. The characterization tasks performed during this RI included hand-held analog metal detector geophysical survey, intrusive anomaly investigation, and sampling and analysis of environmental media. The results of these MEC and MC characterization activities are described in the following paragraphs.

8.0.2 To complete the characterization of MEC at Waikane Training Area, approximately 6.47 acres (3-foot path width) were investigated and was comprised of over 17.8 miles of transect coverage. The analog-and-dig investigation was conducted along multiple transects throughout the WTA MRA with limited brush cutting, as required, to clear the transect paths. Based on the results of analog-and-dig transect surveys, an additional 0.82 acres (57 individual 25-foot x 25-foot grids) of geophysical grids were intrusively investigated.

8.0.3 Two areas within the Southern Impact Region MRS and Southeastern Region MRS (AOC #1 and AOC #2, respectively) were undergoing a concurrent NTCRA and were not investigated for MEC during the RI. A total of 5,341 anomalies were identified and intrusively investigated in the analog-and-dig investigation. The DQOs for the MEC investigation were achieved for each of the MRS and the areas investigated outside of the WTA MRA boundary.

8.0.4 No MEC items were recovered in the areas investigated during the RI. MD was found in each of areas with the exception of the Unnamed Stream. Only minimal amounts of MD related to munitions other than small arms ammunition were recorded in the Western/Mountainous Region MRS, the potential 2.36-inch rocket firing point and the Waikane Stream.

8.0.5 Greater quantities of MD were found in the Southern Impact Region and the Southeastern Region MRS. The MD found included remnants of various munitions including projectiles (i.e., 37mm and 75mm) mortars (60mm and 81mm HE); 3.5-inch rockets; hand grenades; rifle grenades; trip flares; expended fuzes; hundreds of pieces of unidentifiable munitions fragmentation, and small arms ammunition. The majority of the identifiable MD was located in the Southeastern Region MRS. The MEC items recovered from within AOC #2 included: Hand Grenades, HE, MKII; 2.36-inch HEAT Rockets M6A1; 50mm HE Japanese Knee Mortar, Type 89; 2-inch Smoke Mortar M3; Grenade, Hand, Smoke AN-M8; 76mm HE Projectile M42A1; Simulator, Projectile, Air Burst, M27A1B1; and Simulator, Flash, Artillery, M110. Over 3,400 items of MD were recovered during the analog-and-dig investigation conducted throughout the RI. MD discovered was collected, certified, stored securely, and ultimately disposed of in accordance with the approved work plan.

8.0.6 Using the above data and information gathered from previously completed investigations and removal actions, the MRSs and the locations outside of the WTA MRA were evaluated with regard to MEC contamination. This evaluation involved analyzing the data gathered using GIS software to generate estimates of relative MD density across the site. Using these data, areas of relatively minimal, moderate and high MD presence were identified.

8.0.7 The RI concluded that there were no MEC or MD recovered along the Unnamed Stream exiting the WTA MRA boundary; no MEC and minimal MD presence other than remnants of small arms ammunition were recovered within the Western/Mountainous Region MRS, along the Waikane Stream exiting the WTA MRA boundary and at the potential 2.36-rocket firing point outside of the WTA MRA boundary. These areas of minimal MD presence might still contain MEC; however, the amount of MEC anticipated to be present is not expected to pose significant explosive hazards.

8.0.8 A concurrent NTCRA recovered 42 individual MEC items from the Southeastern Region MRS (AOC #2) and no MEC items from the Southern Impact Region MRS (AOC #1). The RI was conducted in areas outside of the removal action areas and concluded no MEC and relatively moderate to high MD density was distributed along the southern half of the Southern Impact Region MRS and Southeastern Region MRS. The highest MD density was observed southwest of AOC #2 within the Southeastern Region MRS near the WTA MRA boundary. Areas characterized with relatively high MD may contain MEC; however, a greater likelihood of exposure to an explosive hazard is associated with areas exhibiting high MEC concentrations.

8.0.9 No MEC and only very limited MD, other than that related to small arms ammunition, have been found within the Western/Mountainous Region MRS and expansion areas. Therefore, MEC are not anticipated to be present in these areas. However, although these areas do not appear to have been affected by concentrated munitions use, and exposure to explosive hazards in these areas is unlikely, the potential for explosive hazards cannot be completely dismissed. Because the potential for MEC is considered to be minimal in these areas, a qualitative MEC HA was not conducted for the Western/Mountainous Region MRS or expansion areas (i.e., potential 2.36-inch rocket firing point or streams exiting the WTA MRA boundary). In the Southern Impact Region and Southeastern Region MRSs, where potential MEC hazards were determined to exist and MEC exposure pathways are potentially complete, a qualitative MEC HA was conducted using information from historical documentation, previous studies and removal actions combined with field observations made during the RI. The results of these MEC HAs assigned scores of between 370 and 420 (out of 1,000) to the two MRSs, which equates to the minimum MEC HA hazard level of 4. The results of these MEC HAs will provide the baseline for assessment of response alternatives to be conducted during any subsequent FS.

8.0.10 To complete the characterization of MC at the WTA MRA, soil and sediment samples were collected at or near locations where MEC and/or MD were located. Soil samples were collected using incremental and discrete methods. The primary purpose of collecting these samples was to determine the presence of MC contamination, as no extensive MC sampling had been previously conducted at the WTA MRA.

8.0.11 During the RI field work, MIS samples were collected (all in triplicate) from 24 DUs at a depth less than 2-inches bgs. Forty discrete subsurface samples were collected (not accounting for QC/QA in the total) from a depth of approximately 12-inches bgs. These samples were collected in areas of high MD densities as determined by the results of analog-and-dig activities conducted during the RI. Samples were also collected in the vicinity of where MEC/MD items were recovered during the concurrent NTCRA within AOC #1 and AOC #2 (Figures A-7, A-8 and A-9). Twenty two sediment samples were also collected (not accounting for QC/QA in the total) from a depth of approximately 12-inches bgs. In addition, background MC concentrations were established from MIS samples collected (all in triplicate) from 12 DUs, 16 discrete subsurface soil samples and 15 sediment samples. All of these samples were collected from areas outside of the WTA MRA boundary.

8.0.12 Based on the munitions known or suspected to have been used at the Waikane Training Area, MC samples (MIS, discrete subsurface soil and sediment) were analyzed for metals (lead and copper) by EPA Method 6010C and explosives (EPA Method 8330B for MIS samples and Method 8330A for discrete subsurface samples).

8.0.13 MIS samples, discrete subsurface soil, and sediment analytical results were compared against published HDOH EALs and the EPA RSLs for Residential Soil (dated June 2011), the lower of the two criteria took precedent. The HDOH EALs and EPA RSLs are based on incidental ingestion, inhalation of vapors or dust, and dermal absorption. Analytical results were also compared to site-specific background levels.

8.0.14 Results of the soil screening indicate that copper, lead, nitroglycerine, 2-amino-4,6 dinitrotoluene, 4-amino-4,6-dinitrotoluene and nitroglycerine exceeded screening levels. No MC exceeded screening levels in sediment samples collected.

8.0.15 Maximum and 95UCL exposure concentrations of the MC were compared to conservative residential screening levels. In all cases, the 95UCL exposure concentrations were below residential screening levels. Potential risks are considered negligible and were not quantified further in the risk assessment process. Furthermore, the arithmetic average concentration of lead in MIS samples (31.6 mg/kg and 99.0 mg/kg) was input into the latest version of the Integrated Exposure Uptake Biokinetic model (EPA, 2010). The predicted blood-lead levels in young children (the most vulnerable group in the population) were suggested to be acceptable.

8.0.16 Elevated lead concentrations in soils are limited to the Southeastern Regional MRS in a localized area within removal area AOC #2 where intentional detonations were conducted for MEC disposal. Although lead in soils from the central portion (AOC #2) of the Southeastern Regional MRS is elevated above the ESL in four samples, the relatively low magnitude of exceedances and the low hazard quotients suggest that the potential for adverse risks to ecological receptors from exposure to lead and other munitions constituents in soil would be negligible.

8.0.17 The risk assessment concluded that the potential for adverse risks to human health or ecological receptors from exposure to MC in these media would be negligible at the WTA MRA.

8.0.18 Based on the potential MEC hazards identified during this RI, an FS will be conducted to assess potential response alternatives within the Western/Mountainous Region MRS, Southern Impact Region MRS and the Southeastern Region MRS.

8.0.19 The data collected during previous investigations and for this RI are considered sufficient to characterize the potential MEC hazards and MC risk within the Western/Mountainous Region MRS. There is no evidence of concentrated munitions use within the MRS. Although the presence of a receptor exists and there is a possibility of receptor interaction with a MEC hazard, a complete MEC exposure pathway (i.e., lack of MEC source, receptor, and receptor acting upon MEC item) is unlikely in the Western/Mountainous Region MRS.

8.0.20 Based on the RI results, no significant MEC hazards are anticipated within the Southern Impact Region MRS or the Southeastern Region MRS; however, due to their proximity to nearby potential impact areas (AOC #1 and AOC #2), these two MRSs will be included in the FS to evaluate the potential response alternatives. Areas characterized with relatively high MD density may contain MEC; however, a greater likelihood of exposure to an explosive hazard is associated with areas exhibiting high MEC concentrations.

8.0.21 Based on the results of the MC evaluation, no additional sampling is required to evaluate the potential risk associated with exposure to MC at this site. However, confirmation samples will be collected at location WTA-SE-ZSB-016 (WTA221) where the highest lead concentration was measured and results discussed in the FS.

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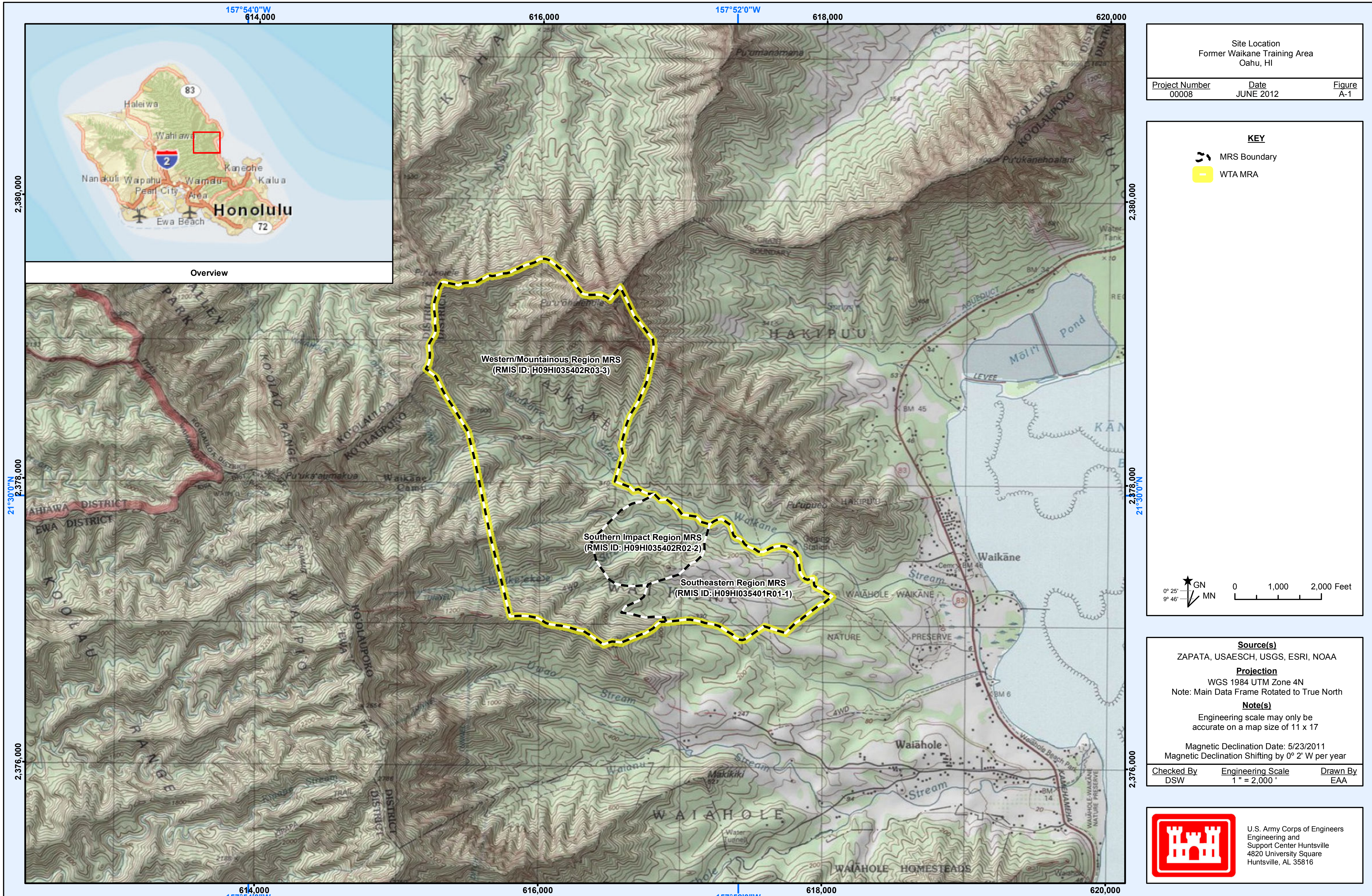
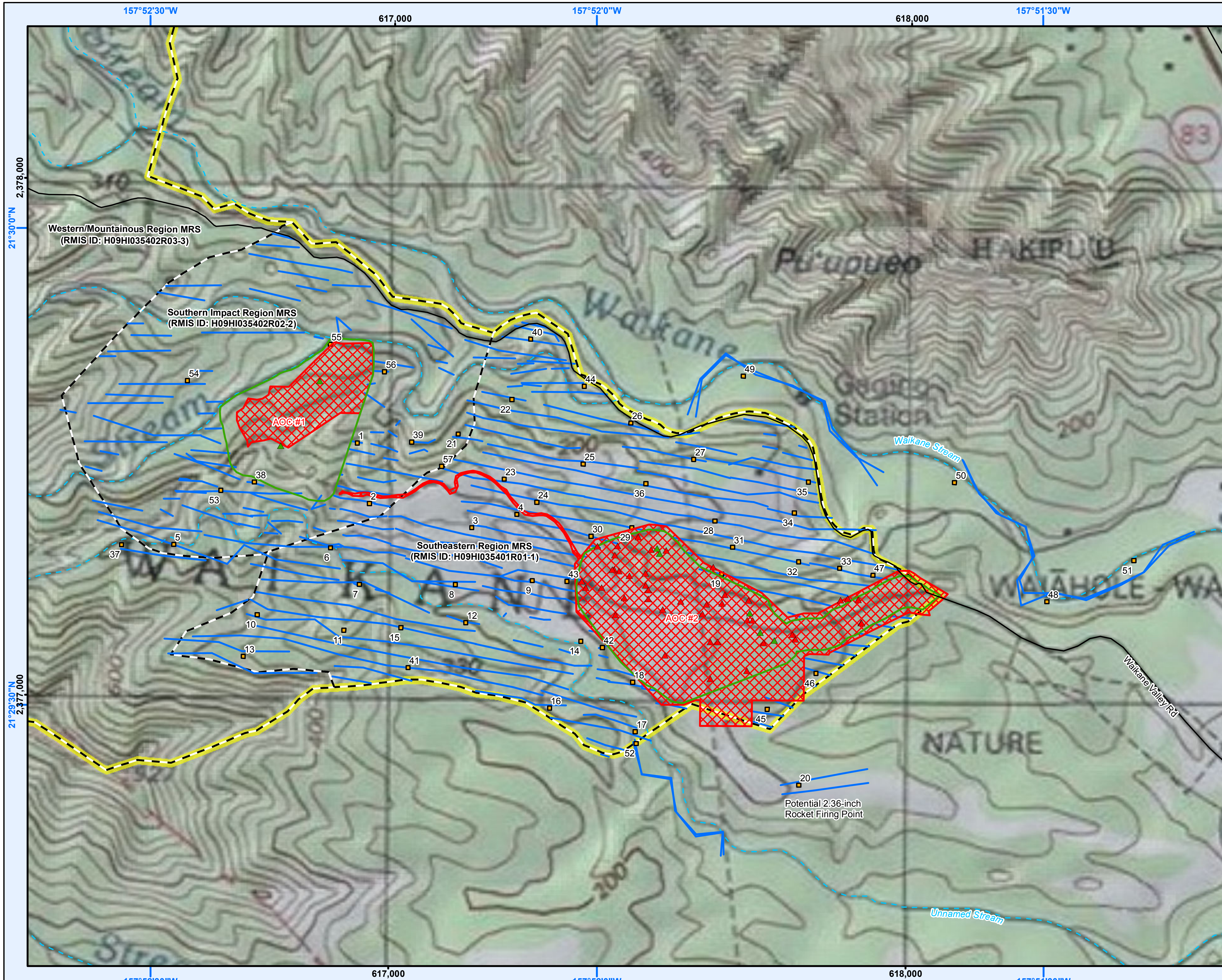
APPENDIX A
FIGURES



Site Location
Former Waikane Training Area
Oahu, HI
Project Number 00008
Date JUNE 2012
Figure A-1
KEY
MRS Boundary
WTA MRA
Western/Mountainous Region MRS
(RMIS ID: H09HI035402R03-3)
Southern Impact Region MRS
(RMIS ID: H09HI035402R02-2)
Southeastern Region MRS
(RMIS ID: H09HI035401R01-1)
Overview
Haleiwa
Wahiawa
Kaneohe
Kailua
Nanakuli
Waipahu
Waimalu
Pearl City
Area
Honolulu
Ewa Beach
83
2
72
157°54'0"W
157°52'0"W
21°30'0"N
614,000
616,000
618,000
620,000
2,380,000
2,378,000
2,376,000
HAKIPU'U
Mōli'i Pond
LEVEE
Waikāne
Waiāhole
WAIAHOLE
WAIĀHOLE HOMESTEADS
NATURE PRESERVE
WAIAHOLE - WAIKANE
KO'OLAU RANGE
KO'OLAULOA
KO'OLAUPOKO
Pu'ukanehoalani
Pu'umanamana
Pu'u'uka'aumakua
Waikane Camp
WAHIAWA DISTRICT
EWA DISTRICT
Stream
GN
MN
0° 25'
9° 46'
0 1,000 2,000 Feet
Source(s)
ZAPATA, USAESCH, USGS, ESRI, NOAA
Projection
WGS 1984 UTM Zone 4N
Note: Main Data Frame Rotated to True North
Note(s)
Engineering scale may only be accurate on a map size of 11 x 17
Magnetic Declination Date: 5/23/2011
Magnetic Declination Shifting by 0° 2' W per year
Checked By DSW
Engineering Scale 1 " = 2,000 '
Drawn By EAA
U.S. Army Corps of Engineers
Engineering and
Support Center Huntsville
4820 University Square
Huntsville, AL 35816

157°51'45"W
157°51'30"W
157°51'15"W
618,000
618,500
2,377,500
2,377,000
21°29'45"N
21°29'30"N
Southeastern Region MRS
(RMIS ID: H09HI035401R01-1)
Waikane Stream
Waikane Valley Rd
Unnamed Stream
Waikane Valley Master Plan
Former Waikane Training Area
Oahu, HI
Project Number
00008
Date
JUNE 2012
Figure
A-2
KEY
Proposed Educational Research Area
Proposed Rest Area
Tax Parcels
MRS Boundary
WTA MRA
GN
MN
0° 25'
9° 46'
0
150
300 Feet
Source(s)
ZAPATA, USAESCH, USGS, NOAA
Projection
WGS 1984 UTM Zone 4N
Note: Main Data Frame Rotated to True North
Note(s)
Engineering scale may only be
accurate on a map size of 11 x 17
Magnetic Declination Date: 5/23/2011
Magnetic Declination Shifting by 0° 2' W per year
Checked By
DSW
Engineering Scale
1 " = 300 '
Drawn By
EAA
U.S. Army Corps of Engineers
Engineering and
Support Center Huntsville
4820 University Square
Huntsville, AL 35816



Southeastern Region MRS, Southern Impact Region MRS, and Expansion Area MEC Investigation
Former Waikane Training Area
Oahu, HI

Project Number	Date	Figure
00008	JUNE 2012	A-3

KEY

- UXO From Removal Action²
- UXO From EE/CA
- Roads
- Action Memo Removal Action Area¹
- Removal Action Area²
- Investigation Grid (25 FT x 25 FT)
- Investigation Transect
- MRS Boundary
- Stream
- WTA MRA

0° 25' GN
9° 46' MN

0 300 600 Feet

Source(s)
ZAPATA, USAESCH, USGS, NOAA

Projection
WGS 1984 UTM Zone 4N
Note: Main Data Frame Rotated to True North

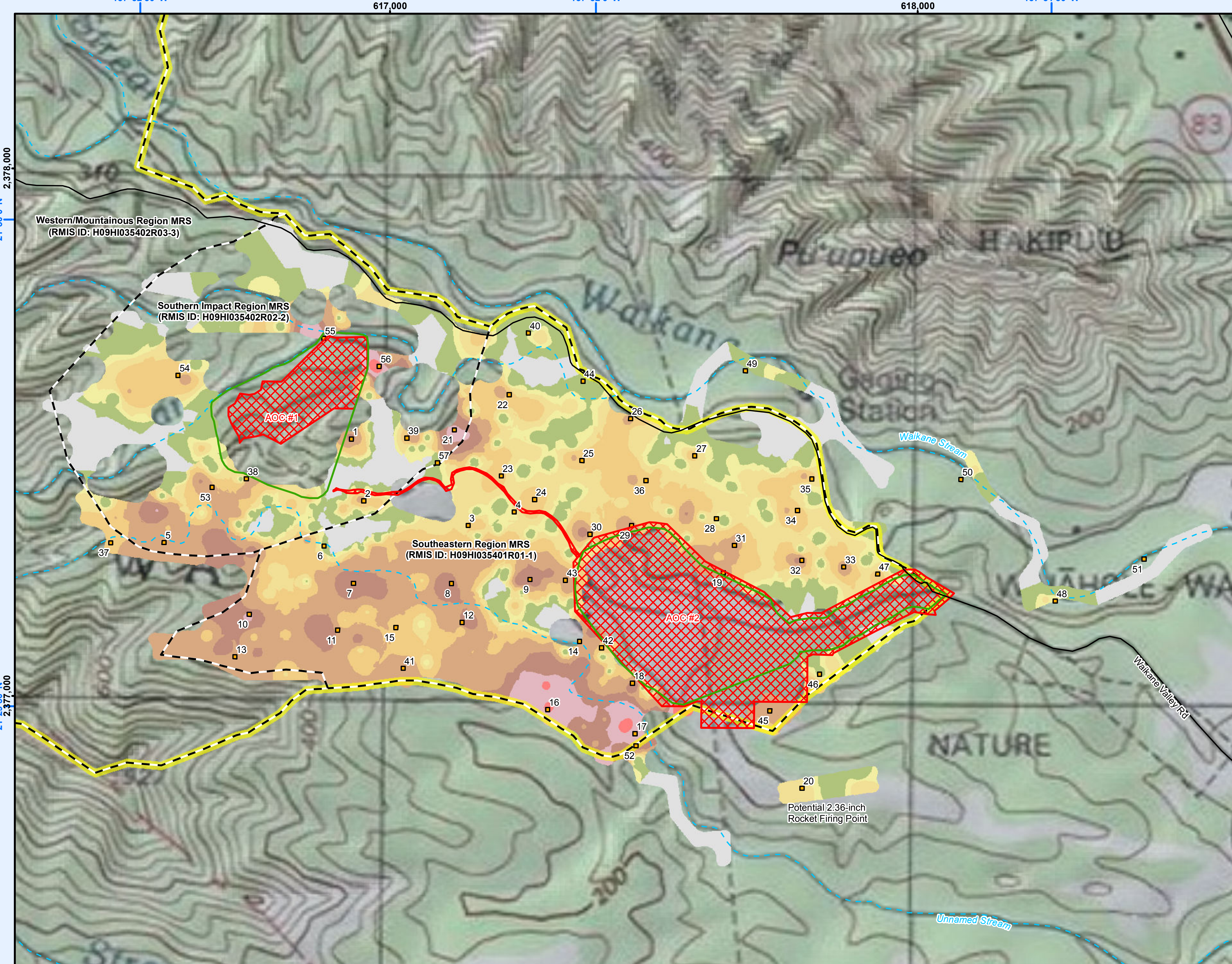
Note(s)
Engineering scale may only be accurate on a map size of 11 x 17

Magnetic Declination Date: 5/23/2011
Magnetic Declination Shifting by 0° 2' W per year

¹ NTCRA Action Memorandum (UASCE-POH, 2009)
² Removal Action was conducted buer a separate contract (Environet 2011)

Checked By	Engineering Scale	Drawn By
DSW	1 " = 600 '	EAA

U.S. Army Corps of Engineers
Engineering and
Support Center Huntsville
4820 University Square
Huntsville, AL 35816



Southeastern Region MRS, Southern Impact Region MRS, and Expansion Area MD Extrapolation
Former Waikane Training Area
Oahu, HI

Project Number	Date	Figure
00008	JUNE 2012	A-4

KEY

- Roads
- Action Memo Removal Action Area¹
- Removal Action Area²
- Investigation Grid
- MRS Boundary
- Stream
- WTA MRA

MD/Acre (Without SA)

- 0
- 0 - 25
- 25.1 - 50
- 50.1 - 100
- 100.1 - 200
- 200.1 - 400
- 400.1 - 800
- 800.1 - 1,600
- 1,600.1 - 2,384

GN MN 0° 25' 9° 46'

0 300 600 Feet

Source(s)
ZAPATA, USAESCH, USGS, NOAA

Projection
WGS 1984 UTM Zone 4N
Note: Main Data Frame Rotated to True North

Note(s)
Engineering scale may only be accurate on a map size of 11 x 17

Magnetic Declination Date: 5/23/2011
Magnetic Declination Shifting by 0° 2' W per year

¹ NTCRA Action Memorandum (UASCE-POH, 2009)
² Removal Action was conducted buer a separate contract (Environet 2011)

Checked By	Engineering Scale	Drawn By
DSW	1 " = 600 '	EAA

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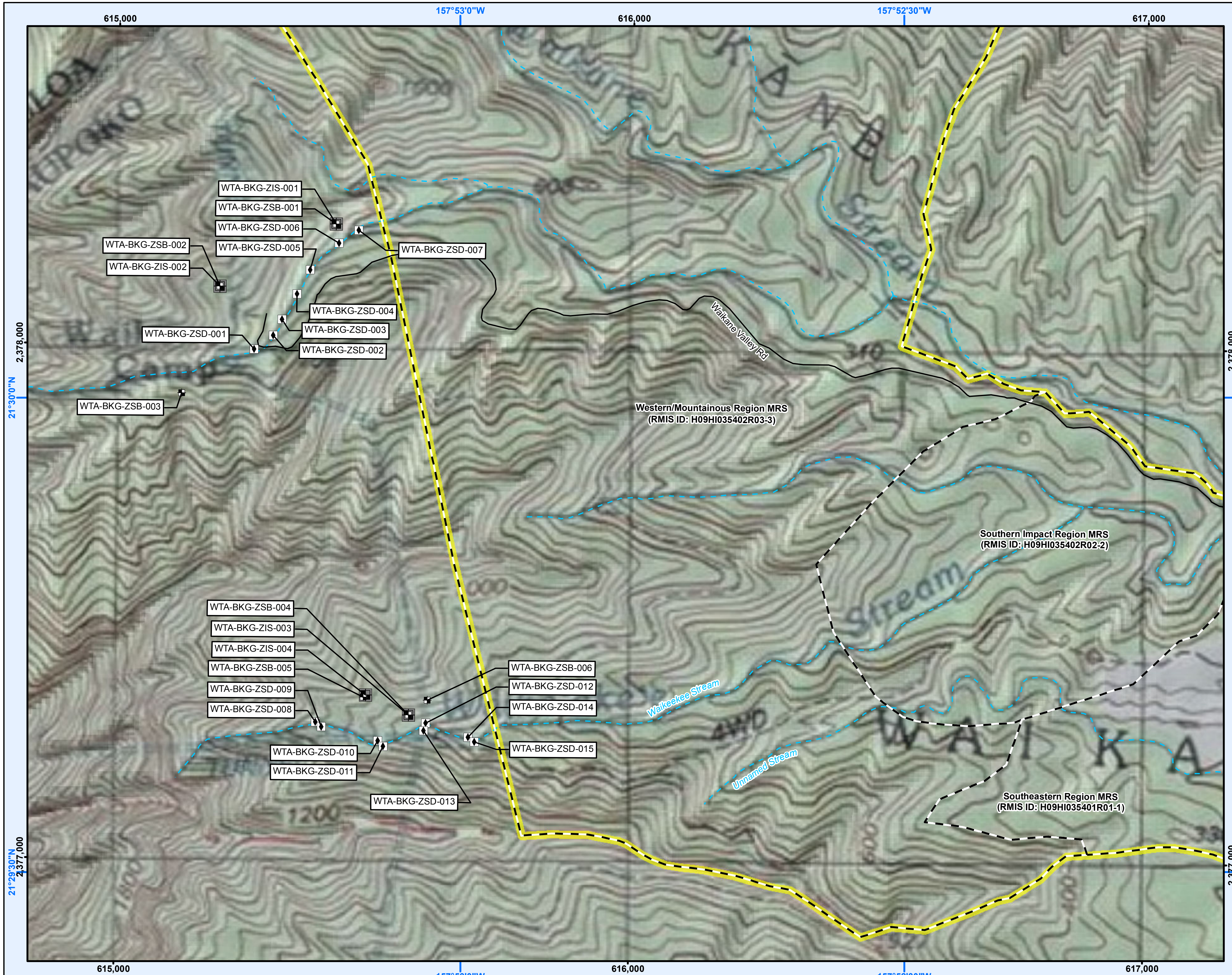

MC Background Sample Locations - West
Former Waikane Training Area
Oahu, HI

Project Number	Date	Figure
00008	JUNE 2012	A-5

KEY

- Background Sediment Sample Location
- Background Discrete Soil Sample Location
- Background Incremental Sample Location
- Roads
- Stream
- MRS Boundary
- WTA MRA

GN
MN
0° 25'
9° 46'
0 300 600 Feet

Source(s)
ZAPATA, USAESCH, USGS, NOAA

Projection
WGS 1984 UTM Zone 4N
Note: Main Data Frame Rotated to True North

Note(s)
Engineering scale may only be accurate on a map size of 11 x 17

Magnetic Declination Date: 5/23/2011
Magnetic Declination Shifting by 0° 2' W per year

Checked By	Engineering Scale	Drawn By
DSW	1 " = 600 '	CRP

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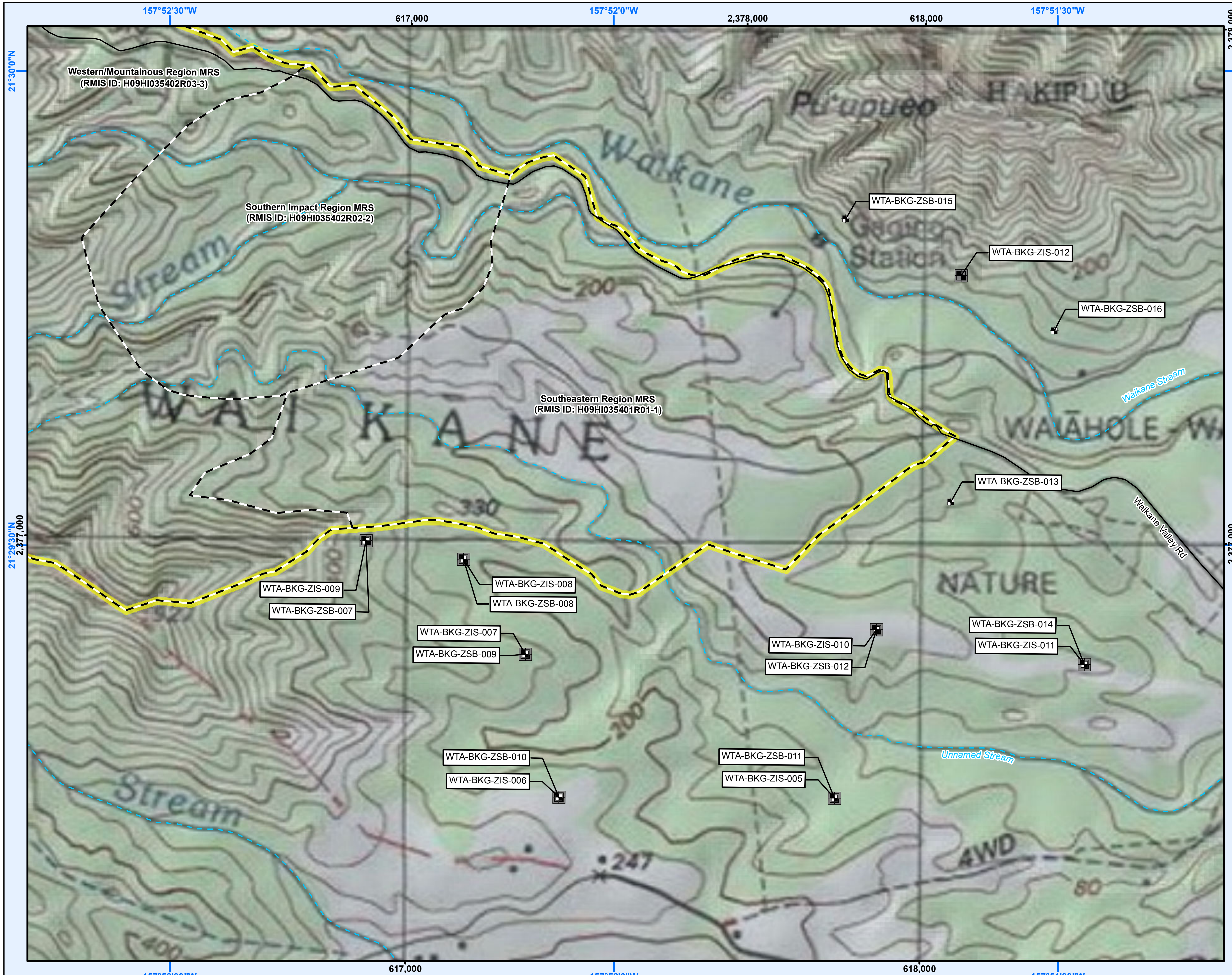

MC Background Sample Locations - South
Former Waikane Training Area
Oahu, HI

Project Number	Date	Figure
00008	JUNE 2012	A-6

KEY

- Background Sediment Sample Location
- Background Discrete Soil Sample Location
- Background Incremental Sample Location
- Roads
- Stream
- MRS Boundary
- WTA MRA

GN 0° 25'
MN 9° 46'

0 300 600 Feet

Source(s)
ZAPATA, USAESCH, USGS, NOAA

Projection
WGS 1984 UTM Zone 4N
Note: Main Data Frame Rotated to True North

Note(s)
Engineering scale may only be accurate on a map size of 11 x 17

Magnetic Declination Date: 5/23/2011
Magnetic Declination Shifting by 0° 2' W per year

Checked By	Engineering Scale	Drawn By
DSW	1 " = 600 '	CRP

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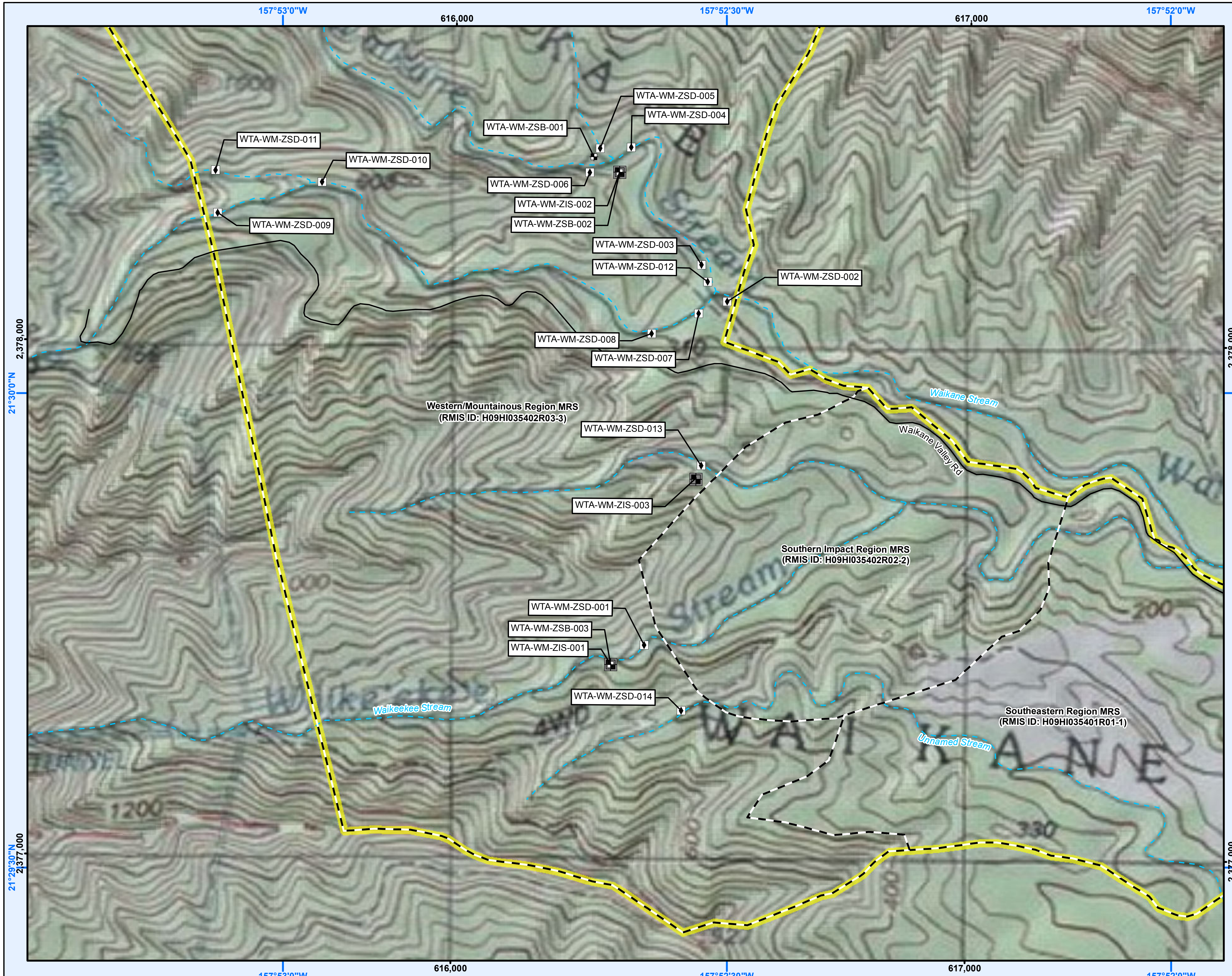

MC Sample Locations
Western Mountainous Region MRS
Former Waikane Training Area
Oahu, HI

Project Number	Date	Figure
00008	JUNE 2012	A-7

KEY

- Sediment Sample Location
- Discrete Soil Sample Location
- Incremental Sample Location
- Roads
- Stream
- MRS Boundary
- WTA MRA

GN
MN
0° 25'
9° 46'

0 300 600 Feet

Source(s)
ZAPATA, USAESCH, USGS, NOAA

Projection
WGS 1984 UTM Zone 4N
Note: Main Data Frame Rotated to True North

Note(s)
Engineering scale may only be accurate on a map size of 11 x 17

Magnetic Declination Date: 5/23/2011
Magnetic Declination Shifting by 0° 2' W per year

Checked By	Engineering Scale	Drawn By
DSW	1 " = 600 '	CRP

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MC Sample Locations
Southern Impact Region MRS
Former Waikane Training Area
Oahu, HI

Project Number	Date	Figure
00008	JUNE 2012	A-8

KEY

- Sediment Sample Location
- Discrete Soil Sample Location
- Incremental Sample Location
- Roads
- Action Memo Removal Action Area¹
- Removal Action Area²
- MRS Boundary
- Stream
- WTA MRA

GN
MN
0° 25'
9° 46'

0 200 400 Feet

Source(s)
ZAPATA, USAESCH, USGS, NOAA

Projection
WGS 1984 UTM Zone 4N
Note: Main Data Frame Rotated to True North

Note(s)
Engineering scale may only be accurate on a map size of 11 x 17

Magnetic Declination Date: 5/23/2011
Magnetic Declination Shifting by 0º 2' W per year

¹ NTCRA Action Memorandum (UASCE-POH, 2009)
² Removal Action was conducted buer a separate contract (Environet 2011)

Checked By	Engineering Scale	Drawn By
DSW	1 " = 400 '	CRP

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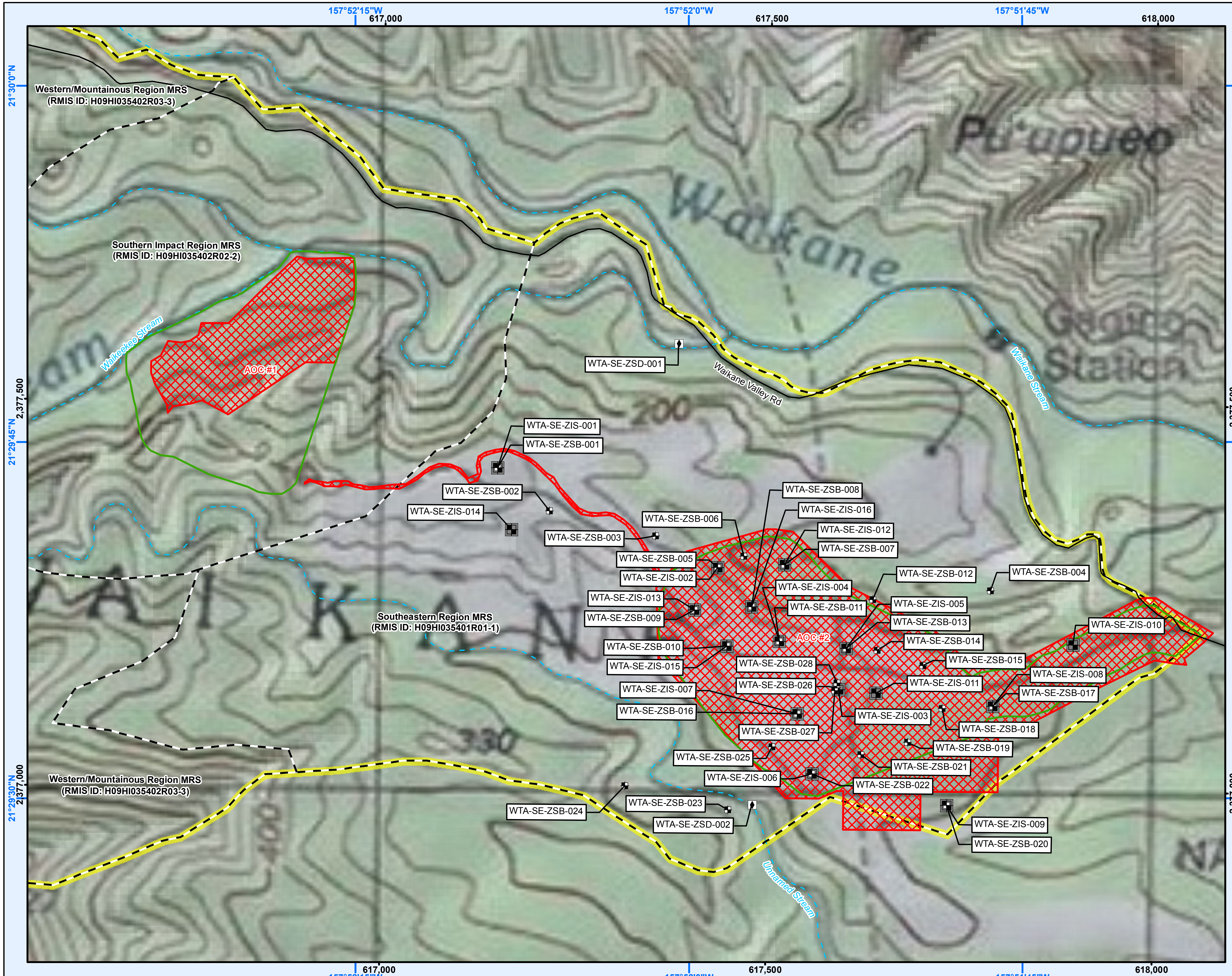

MC Sample Locations
Southeastern Region MRS
Former Waikane Training Area
Oahu, HI

Project Number	Date	Figure
00008	JUNE 2012	A-9

KEY

- Sediment Sample Location
- Discrete Soil Sample Location
- Incremental Sample Location
- Roads
- Action Memo Removal Action Area[1]
- Removal Action Area[2]
- MRS Boundary
- Stream
- WTA MRA

GN
MN
0° 25'
9° 46'

0 200 400 Feet

Source(s)
ZAPATA, USAESCH, USGS, NOAA

Projection
WGS 1984 UTM Zone 4N
Note: Main Data Frame Rotated to True North

Note(s)
Engineering scale may only be accurate on a map size of 11 x 17

Magnetic Declination Date: 5/23/2011
Magnetic Declination Shifting by 0° 2' W per year

[1] NTCRA Action Memorandum (UASCE-POH, 2009)
[2] Removal Action was conducted buer a separate contract (Environet 2011)

Checked By	Engineering Scale	Drawn By
DSW	1 " = 400 '	CRP

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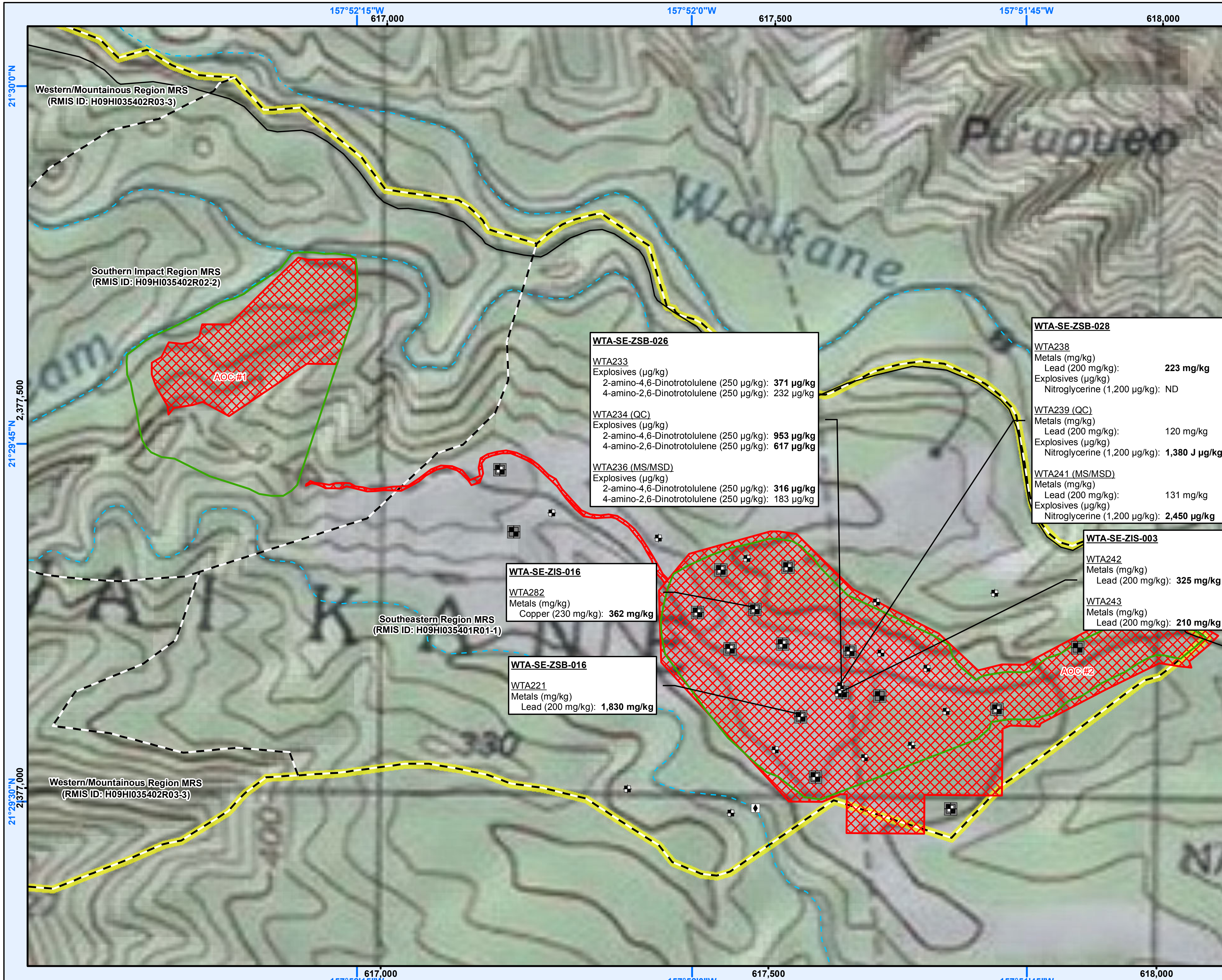

MC HDOH EAL Exceedances
Southeastern Region MRS
Former Waikane Training Area
Oahu, HI

Project Number	Date	Figure
00008	JUNE 2012	A-10

KEY

- Sediment Sample Location
- Discrete Soil Sample Location
- Incremental Sample Location
- Roads
- Action Memo Removal Action Area¹
- Removal Action Area²
- MRS Boundary
- Stream
- WTA MRA

0° 25' GN
9° 46' MN

0 200 400 Feet

Source(s)
ZAPATA, USAESCH, USGS, NOAA

Projection
WGS 1984 UTM Zone 4N
Note: Main Data Frame Rotated to True North

Note(s)
Engineering scale may only be accurate on a map size of 11 x 17

Magnetic Declination Date: 5/23/2011
Magnetic Declination Shifting by 0° 2' W per year

ND = Non-detection
J = Indicates an estimated value
-Bold values denotes concentrations above HDOH EAL Soil/Sediment
-HDOH EAL is in parenthesis

¹ NTCRA Action Memorandum (UASCE-POH, 2009)
² Removal Action was conducted buer a separate contract (Environet 2011)

Checked By	Engineering Scale	Drawn By
DSW	1 " = 400 '	CRP

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APPENDIX B

ANALYTICAL RESULTS TABLES

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Table B-1: Waikane Valley RI
Constituant Detections in Background Samples

Location ID	COC ID	Collection Date	6010C					8330A / 8330B											
			Copper		Lead			2-Amino-4,6-dinitrotoluene			4-Amino-2,6-dinitrotoluene			Nitroglycerine			2,4,6-Trinitrotoluene		
			CAS No. 7440508		CAS No. 7439921			CAS No. 35572782			CAS No. 19406510			CAS No. 55630			CAS No. 118967		
			mg/Kg	RSD	mg/Kg		RSD	ug/Kg		RSD	ug/Kg		RSD	ug/Kg		RSD	ug/Kg		RSD
WTA-BKG-ZIS-001	WTA015	8/15/2011	**67.8**	5.9%	**4.9**	I J	61.9%	99	U	NC	99	UJ	NA	990	U	NA	99	UJ	NA
WTA-BKG-ZIS-001	WTA016	8/15/2011	**75.8**		**5.7**	I J		98	U	NC	98	UJ	NA	980	U	NA	98	UJ	NA
WTA-BKG-ZIS-001	WTA017	8/15/2011	**74.4**		**14.1**			100	U	NC	100	UJ	NA	1000	U	NA	100	UJ	NA
WTA-BKG-ZIS-002	WTA020	8/15/2011	**111**	10.0%	**39.4**		76.1%	100	U	NC	100	UJ	NA	1000	U	NA	100	UJ	NA
WTA-BKG-ZIS-002	WTA021	8/15/2011	**114**		**15.5**			98	U	NC	98	UJ	NA	980	U	NA	98	UJ	NA
WTA-BKG-ZIS-002	WTA022	8/15/2011	**133**		**8.7**			100	U	NC	100	UJ	NA	1000	U	NA	100	UJ	NA
WTA-BKG-ZIS-003	WTA053	8/16/2011	**101**	9.7%	**3.8**	I J	10.6%	99	U	NC	99	UJ	NA	990	UJ	NA	99	U	NA
WTA-BKG-ZIS-003	WTA054	8/16/2011	**83.2**		**3.3**	I J		99	U	NC	99	UJ	NA	990	UJ	NA	99	U	NA
WTA-BKG-ZIS-003	WTA055	8/16/2011	**95.0**		**3.1**	I J		100	U	NC	100	UJ	NA	1000	UJ	NA	100	U	NA
WTA-BKG-ZIS-004	WTA056	8/16/2011	**94.8**	2.2%	**3.9**	I J	8.4%	100	U	NC	100	UJ	NA	1000	UJ	NA	100	U	NA
WTA-BKG-ZIS-004	WTA057	8/16/2011	**95.6**		**3.3**	I J		100	U	NC	100	UJ	NA	1000	UJ	NA	100	U	NA
WTA-BKG-ZIS-004	WTA058	8/16/2011	**98.8**		**3.7**	I J		99	U	NC	99	UJ	NA	990	UJ	NA	99	U	NA
WTA-BKG-ZIS-005	WTA086	8/17/2011	**111**	3.8%	**6.9**	I J	13.1%	98	U	NC	98	UJ	NA	980	UJ	NA	98	U	NA
WTA-BKG-ZIS-005	WTA087	8/17/2011	**108**		**6.2**	I J		98	U	NC	98	UJ	NA	980	UJ	NA	98	U	NA
WTA-BKG-ZIS-005	WTA088	8/17/2011	**103**		**5.3**	I J		100	U	NC	100	UJ	NA	1000	UJ	NA	100	U	NA
WTA-BKG-ZIS-006	WTA089	8/17/2011	**111**	4.1%	**6.6**	I J	7.5%	99	U	NC	99	UJ	NA	990	UJ	NA	99	U	NA
WTA-BKG-ZIS-006	WTA090	8/17/2011	**108**		**6.0**	I J		99	U	NC	99	UJ	NA	990	UJ	NA	99	U	NA
WTA-BKG-ZIS-006	WTA091	8/17/2011	**117**		**5.7**	I J		99	U	NC	99	UJ	NA	990	UJ	NA	99	U	NA
WTA-BKG-ZIS-007	WTA092	8/17/2011	**103**	58.0%	**6.2**	I J	8.8%	99	U	NC	99	UJ	NA	990	UJ	NA	99	U	NA
WTA-BKG-ZIS-007	WTA093	8/17/2011	**114**		**6.4**	I J		98	U	NC	98	UJ	NA	980	UJ	NA	98	U	NA
WTA-BKG-ZIS-007	WTA094	8/17/2011	**272**		**5.4**	I J		99	U	NC	99	UJ	NA	990	UJ	NA	99	U	NA
WTA-BKG-ZIS-008	WTA095	8/17/2011	**116**	11.6%	**5.8**	I J	4.4%	99	U	NC	99	UJ	NA	990	UJ	NA	99	U	NA
WTA-BKG-ZIS-008	WTA096	8/17/2011	**105**		**5.5**	I J		100	U	NC	100	UJ	NA	1000	UJ	NA	100	U	NA
WTA-BKG-ZIS-008	WTA097	8/17/2011	**91.9**		**6.0**	I J		100	U	NC	100	UJ	NA	1000	UJ	NA	100	U	NA
WTA-BKG-ZIS-009	WTA098	8/17/2011	**109**	11.9%	**5.8**	I J	2.6%	100	U	NC	100	UJ	NA	1000	UJ	NA	100	U	NA
WTA-BKG-ZIS-009	WTA099	8/17/2011	**87.0**		**6.0**	I J		100	U	NC	100	UJ	NA	1000	UJ	NA	100	U	NA
WTA-BKG-ZIS-009	WTA100	8/17/2011	**92.3**		**5.7**	I J		99	U	NC	99	UJ	NA	990	UJ	NA	99	U	NA
WTA-BKG-ZIS-010	WTA105	8/17/2011	**57.2**	4.0%	**8.3**		8.7%	97	U	NC	97	UJ	NA	970	UJ	NA	97	U	NA
WTA-BKG-ZIS-010	WTA106	8/17/2011	**56.1**		**7.4**			100	U	NC	100	UJ	NA	1000	UJ	NA	100	U	NA
WTA-BKG-ZIS-010	WTA107	8/17/2011	**52.9**		**8.8**			99	U	NC	99	UJ	NA	990	UJ	NA	99	U	NA
WTA-BKG-ZIS-011	WTA108	8/17/2011	**79.5**	9.7%	**6.3**	I J	38.3%	100	U	NC	100	UJ	NA	1000	UJ	NA	100	U	NA
WTA-BKG-ZIS-011	WTA109	8/17/2011	**87.3**		**4.4**	I J		100	U	NC	100	UJ	NA	1000	UJ	NA	100	U	NA
WTA-BKG-ZIS-011	WTA110	8/17/2011	**71.9**		**9.5**			99	U	NC	99	UJ	NA	990	UJ	NA	99	U	NA
WTA-BKG-ZIS-012	WTA123	8/18/2011	**70.7**	15.9%	**7.9**		37.0%	99	U	NC	99	UJ	NA	990	UJ	NA	99	U	NA
WTA-BKG-ZIS-012	WTA124	8/18/2011	**90.7**		**4.0**	I J		100	U	NC	100	UJ	NA	1000	UJ	NA	100	U	NA
WTA-BKG-ZIS-012	WTA125	8/18/2011	**97.0**		**4.8**	I J		99	U	NC	99	UJ	NA	990	UJ	NA	99	U	NA
WTA-BKG-ZSB-001	WTA018 / 019	8/15/2011	**87.0**	NC	**4.7**	I J	NC	160	U	NC	160	U	NC	1600	U	NC	160	U	NC
WTA-BKG-ZSB-002	WTA023 / 024	8/15/2011	**102**	NC	**59.0**		NC	160	U	NC	160	U	NC	1600	U	NC	160	U	NC
WTA-BKG-ZSB-003	WTA025 / 026	8/15/2011	**89.8**	NC	**1.8**	I J	NC	180	U	NC	180	U	NC	1800	U	NC	180	U	NC
WTA-BKG-ZSB-004	WTA060 / 061	8/16/2011	**89.6**	NC	**1.7**	I J	NC	200	U	NC	200	U	NC	2000	U	NC	200	U	NC
WTA-BKG-ZSB-005	WTA062 / 063	8/16/2011	**86.2**	NC	**3.2**	I J	NC	190	U	NC	190	U	NC	1900	U	NC	190	U	NC
WTA-BKG-ZSB-006	WTA064 / 065	8/16/2011	**60.5**	NC	**2.5**		NC	200	U	NC	200	U	NC	2000	U	NC	200	U	NC
WTA-BKG-ZSB-007	WTA070 / 071	8/17/2011	**93.2**	NC	**5.6**		NC	180	U	NC	180	U	NC	1800	U	NC	180	U	NC
WTA-BKG-ZSB-008	WTA072 / 073	8/17/2011	**72.3**	NC	**4.3**		NC	200	U	NC	200	U	NC	2000	U	NC	200	U	NC
WTA-BKG-ZSB-009	WTA074 / 075	8/17/2011	**103**	NC	**9.8**		NC	160	U	NC	160	U	NC	1600	U	NC	160	U	NC
WTA-BKG-ZSB-010	WTA076 / 077	8/17/2011	**80.6**	NC	**5.0**		NC	170	U	NC	170	U	NC	1700	U	NC	170	U	NC
WTA-BKG-ZSB-010	WTA078 / 079	8/17/2011	**137**	NC	**5.7**	I J	NC	170	U	NC	170	U	NC	1700	U	NC	170	U	NC
WTA-BKG-ZSB-010	WTA082 / 083	8/17/2011	**110**	NC	**3.7**	J	NC	160	U	NC	160	U	NC	1600	U	NC	160	U	NC
WTA-BKG-ZSB-011	WTA084 / 085	8/17/2011	**50.00**	NC	**4.7**		NC	180	U	NC	180	U	NC	1800	U	NC	180	U	NC

Table B-1: Waikane Valley RI
Constituant Detections in Background Samples

Location ID	COC ID	Collection Date	6010C						8330A / 8330B											
			Copper			Lead			2-Amino-4,6-dinitrotoluene			4-Amino-2,6-dinitrotoluene			Nitroglycerine			2,4,6-Trinitrotoluene		
			CAS No. 7440508			CAS No. 7439921			CAS No. 35572782			CAS No. 19406510			CAS No. 55630			CAS No. 118967		
			mg/Kg		RSD	mg/Kg		RSD	ug/Kg		RSD	ug/Kg		RSD	ug/Kg		RSD	ug/Kg		RSD
WTA-BKG-ZSB-012	WTA101 / 102	8/17/2011	**69.8**		NC	**5.9**		NC	170	U	NC	170	U	NC	1700	U	NC	170	U	NC
WTA-BKG-ZSB-013	WTA115	8/18/2011	**75.8**		NC	**13.8**		NC	190	U	NC	190	U	NC	**940**	I J	NC	190	U	NC
WTA-BKG-ZSB-014	WTA103 / 104	8/17/2011	**68.0**		NC	**3.7**		NC	160	U	NC	160	U	NC	1600	U	NC	160	U	NC
WTA-BKG-ZSB-015	WTA119	8/18/2011	**76.6**		NC	**3.5**	I J	NC	180	U	NC	180	U	NC	1800	U	NC	180	U	NC
WTA-BKG-ZSB-015	WTA120	8/18/2011	**87.0**		NC	**4.7**	I J	NC	180	U	NC	180	U	NC	1800	U	NC	180	U	NC
WTA-BKG-ZSB-016	WTA122	8/18/2011	**57.4**		NC	**7.6**		NC	180	U	NC	180	U	NC	1800	U	NC	180	U	NC
WTA-BKG-ZSD-001	WTA001 / 002	8/15/2011	**50.7**		NC	**0.80**	I J	NC	200	U	NC	200	U	NC	2000	U	NC	200	U	NC
WTA-BKG-ZSD-002	WTA003 / 004	8/15/2011	**68.2**		NC	**1.4**	I J	NC	190	U	NC	190	U	NC	1900	U	NC	190	U	NC
WTA-BKG-ZSD-003	WTA005 / 006	8/15/2011	**62.0**		NC	**2.6**		NC	190	U	NC	190	U	NC	1900	U	NC	190	U	NC
WTA-BKG-ZSD-004	WTA007 / 008	8/15/2011	**74.3**		NC	**95.8**		NC	180	U	NC	180	U	NC	1800	U	NC	180	U	NC
WTA-BKG-ZSD-005	WTA009 / 010	8/15/2011	**55.8**		NC	**2.0**		NC	170	U	NC	170	U	NC	1700	U	NC	170	U	NC
WTA-BKG-ZSD-006	WTA011 / 012	8/15/2011	**66.9**		NC	**1.6**	I J	NC	190	U	NC	190	U	NC	1900	U	NC	190	U	NC
WTA-BKG-ZSD-007	WTA013 / 014	8/15/2011	**59.6**		NC	**5.2**		NC	180	U	NC	180	U	NC	1800	U	NC	180	U	NC
WTA-BKG-ZSD-008	WTA031 / 032	8/16/2011	**84.4**		NC	**2.0**	I J	NC	140	U	NC	140	U	NC	1400	U	NC	140	U	NC
WTA-BKG-ZSD-008	WTA033 / 034	8/16/2011	**86.5**		NC	**1.5**	I J	NC	180	U	NC	180	U	NC	1800	U	NC	180	U	NC
WTA-BKG-ZSD-008	WTA037 / 038	8/16/2011	**89.1**		NC	**1.5**	I J	NC	160	U	NC	160	U	NC	1600	U	NC	160	U	NC
WTA-BKG-ZSD-009	WTA039 / 040	8/16/2011	**84.6**		NC	**2.5**	I J	NC	180	U	NC	180	U	NC	1800	U	NC	180	U	NC
WTA-BKG-ZSD-010	WTA041 / 042	8/16/2011	**83.2**		NC	**4.0**	I J	NC	160	U	NC	160	U	NC	1600	U	NC	160	U	NC
WTA-BKG-ZSD-011	WTA043 / 044	8/16/2011	**86.2**		NC	**2.1**	I J	NC	190	U	NC	190	U	NC	1900	U	NC	190	U	NC
WTA-BKG-ZSD-012	WTA045 / 046	8/16/2011	**72.9**		NC	**3.1**	I J	NC	180	U	NC	180	U	NC	1800	U	NC	180	U	NC
WTA-BKG-ZSD-013	WTA047 / 048	8/16/2011	**89.7**		NC	**1.7**	I J	NC	190	U	NC	190	U	NC	1900	U	NC	190	U	NC
WTA-BKG-ZSD-014	WTA049 / 050	8/16/2011	**74.2**		NC	**2.2**		NC	170	U	NC	170	U	NC	1700	U	NC	170	U	NC
WTA-BKG-ZSD-015	WTA051 / 052	8/16/2011	**107**		NC	**2.1**	I J	NC	180	U	NC	180	U	NC	1800	U	NC	180	U	NC

I	The reported value is between the laboratory detection limit and quantitation limit and is an estimate.
J	The reported value is between the laboratory detection limit and quantitation limit and / or has been classified as qualitative due to one or more quality issues.
J+	The reported value is between the laboratory detection limit and quantitation limit and / or has been classified as qualitative due to one or more quality issues. The direction of potential analytical bias is positive.
U	The analyte was not detected at or above the indicated concentration or the result was classified as a non-detection due to the presence of the analyte in one or more blanks associated with the sample.
mg/Kg	milligrams per kilogram
ug/Kg	micrograms per kilogram
RSD	Relative Standard Deviation (Values < 50% are considered to have low variablity)
NA	Not applicable. Results were non-detections.

Table B-2: Waikane Valley RI
Constituant Detections in Multi-Incremental Soil (MIS) Samples

Location ID	COC ID	Collection Date	6010C						8330A / 8330B											
			Copper			Lead			2-Amino-4,6-dinitrotoluene			4-Amino-2,6-dinitrotoluene			Nitroglycerine			2,4,6-Trinitrotoluene		
			CAS No. 7440508			CAS No. 7439921			CAS No. 35572782			CAS No. 19406510			CAS No. 55630			CAS No. 118967		
			mg/Kg		RSD	mg/Kg		RSD	ug/Kg		RSD	ug/Kg		RSD	ug/Kg		RSD	ug/Kg		RSD
WTA-SE-ZIS-001	WTA197	8/30/2011	**55.8**		14.4%	**12.3**		15.2%	100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-001	WTA198	8/30/2011	**70.2**			**9.5**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-001	WTA199	8/30/2011	**54.7**			**9.6**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-002	WTA202	8/30/2011	**56.6**		10.1%	**11.9**		4.3%	100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-002	WTA203	8/30/2011	**50.1**			**11.8**			100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-002	WTA204	8/30/2011	**46.4**			**11.0**			100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-003	WTA242	8/31/2011	**57.7**		14.5%	**325**		53.3%	99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-003	WTA243	8/31/2011	**57.6**			**210**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-003	WTA244	8/31/2011	**44.3**			**99.4**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-004	WTA245	8/31/2011	**143**		57.2%	**17.8**		10.8%	100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-004	WTA246	8/31/2011	**66.2**			**15.3**			100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-004	WTA247	8/31/2011	**50.4**			**14.5**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-005	WTA248	8/31/2011	**44.3**		2.9%	**15.2**		7.1%	99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-005	WTA249	8/31/2011	**45.6**			**14.8**			100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-005	WTA250	8/31/2011	**43.0**			**16.9**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-006	WTA251	8/31/2011	**31.0**		9.3%	**15.6**		6.4%	100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-006	WTA252	8/31/2011	**36.8**			**14.2**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-006	WTA253	8/31/2011	**32.0**			**16.1**			100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-007	WTA254	8/31/2011	**46.2**		21.5%	**13.9**		21.5%	99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-007	WTA255	8/31/2011	**58.6**			**15.8**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-007	WTA256	8/31/2011	**71.4**			**20.9**			99	U	NA	99	UJ	NA	**466**	J	NA	99	U	NA
WTA-SE-ZIS-008	WTA257	8/31/2011	**108**		36.2%	**30.2**		5.0%	98	U	NA	98	UJ	NA	980	U	NA	98	U	NA
WTA-SE-ZIS-008	WTA258	8/31/2011	**188**			**27.8**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-008	WTA259	8/31/2011	**102**			**30.5**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-009	WTA260	8/31/2011	**76.4**		10.0%	**12.4**		8.4%	100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-009	WTA261	8/31/2011	**83.2**			**13.6**			100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-009	WTA262	8/31/2011	**68.0**			**11.5**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-010	WTA263	8/31/2011	**55.9**		10.7%	**26.6**		59.3%	99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-010	WTA264	8/31/2011	**69.1**			**31.7**			100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-010	WTA265	8/31/2011	**65.1**			**74.3**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-011	WTA266	8/31/2011	**48.9**		12.1%	**11.2**		9.5%	100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-011	WTA267	8/31/2011	**44.0**			**11.7**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-011	WTA268	8/31/2011	**38.3**			**13.4**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-012	WTA269	8/31/2011	**103**		17.2%	**38.6**		34.2%	100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-012	WTA270	8/31/2011	**75.4**			**24.8**			100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-012	WTA271	8/31/2011	**79.9**			**20.3**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-013	WTA273	8/31/2011	**124**		33.4%	**10**		25.1%	99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-013	WTA274	8/31/2011	**115**			**12.3**			100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-013	WTA275	8/31/2011	**62.0**			**16.4**			100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-014	WTA276	8/31/2011	**68.9**		22.0%	**14.5**		46.3%	100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-014	WTA277	8/31/2011	**71.9**			**6.0**	J		98	U	NA	98	UJ	NA	980	U	NA	98	U	NA
WTA-SE-ZIS-014	WTA278	8/31/2011	**101**			**17.1**			100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SE-ZIS-015	WTA279	8/31/2011	**61.4**		14.8%	**52.1**		35.2%	99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-015	WTA280	8/31/2011	**64.5**			**30.9**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-015	WTA281	8/31/2011	**48.3**			**28.3**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-016	WTA282	8/31/2011	**362**		80.1%	**22.5**		13.9%	99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-016	WTA283	8/31/2011	**111**			**20.4**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SE-ZIS-016	WTA284	8/31/2011	**91.7**			**17.0**			98	U	NA	98	UJ	NA	980	U	NA	98	U	NA
WTA-SI-ZIS-001	WTA160	8/23/2011	--			--			100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SI-ZIS-001	WTA160B	10/14/2011	**96.4**		6.0%	**3.1**		11.4%	--			--			--			--		
WTA-SI-ZIS-001	WTA161	8/23/2011	--			--			100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SI-ZIS-001	WTA161B	10/14/2011	**106**			**3.5**			--			--			--			--		
WTA-SI-ZIS-001	WTA162	8/23/2011	--			--			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SI-ZIS-001	WTA162B	10/14/2011	**95.0**			**3.9**			--			--			--			--		

Table B-2: Waikane Valley RI

Constituant Detections in Multi-Incremental Soil (MIS) Samples

Location ID	COC ID	Collection Date	6010C						8330A / 8330B											
			Copper			Lead			2-Amino-4,6-dinitrotoluene			4-Amino-2,6-dinitrotoluene			Nitroglycerine			2,4,6-Trinitrotoluene		
			CAS No. 7440508			CAS No. 7439921			CAS No. 35572782			CAS No. 19406510			CAS No. 55630			CAS No. 118967		
			mg/Kg		RSD	mg/Kg		RSD	ug/Kg		RSD	ug/Kg		RSD	ug/Kg		RSD	ug/Kg		RSD
WTA-SI-ZIS-002	WTA137	8/22/2011	**86.0**		1.2%	**7.7**		46.8%	100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SI-ZIS-002	WTA138	8/22/2011	**87.5**			**3.7**	I J		100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SI-ZIS-002	WTA139	8/22/2011	**85.5**			**3.6**	I J		98	U	NA	98	UJ	NA	980	U	NA	98	U	NA
WTA-SI-ZIS-003	WTA140	8/22/2011	**91.8**		5.3%	**2.9**	I J	18.8%	100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SI-ZIS-003	WTA141	8/22/2011	**102**			**2.4**	I J		99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SI-ZIS-003	WTA142	8/22/2011	**96.1**			**3.5**	I J		99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SI-ZIS-004	WTA143	8/22/2011	**80.8**		3.8%	**5.3**	I J	25.3%	100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SI-ZIS-004	WTA144	8/22/2011	**77.7**			**5.4**	I J		100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SI-ZIS-004	WTA145	8/22/2011	**74.9**			**8.1**			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-SI-ZIS-005	WTA146	8/22/2011	**86.2**		9.8%	**2.4**	I J	40.5%	100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SI-ZIS-005	WTA147	8/22/2011	**105**			**3.3**	I J		100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-SI-ZIS-005	WTA148	8/22/2011	**97.5**			**5.3**	I J		100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-WM-ZIS-001	WTA154	8/23/2011	--			--			100	U		100	UJ		1000	U		100	U	
WTA-WM-ZIS-001	WTA154B	10/14/2011	**105**		12.7%	**4.0**		1.5%	--			--			--			--		
WTA-WM-ZIS-001	WTA155	8/23/2011	--			--			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-WM-ZIS-001	WTA155B	10/14/2011	**126**			**3.9**			--			--			--			--		
WTA-WM-ZIS-001	WTA156	8/23/2011	--			--			99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-WM-ZIS-001	WTA156B	10/14/2011	**99.4**			**4.0**			--			--			--			--		
WTA-WM-ZIS-002	WTA175	8/29/2011	**85.5**			**3.0**	I J		98	U	NA	98	UJ	NA	980	U	NA	98	U	NA
WTA-WM-ZIS-002	WTA176	8/29/2011	**78.9**		11.3%	**3.4**	I J	6.6%	100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-WM-ZIS-002	WTA177	8/29/2011	**81.6**			**3.0**	I J		100	U	NA	100	UJ	NA	1000	U	NA	100	U	NA
WTA-WM-ZIS-003	WTA134	8/22/2011	**96.8**		3.4%	**3.1**	I J	26.2%	99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-WM-ZIS-003	WTA135	8/22/2011	**97.3**			**4.8**	I J		99	U	NA	99	UJ	NA	990	U	NA	99	U	NA
WTA-WM-ZIS-003	WTA136	8/22/2011	**91.4**			**5.3**	I J		99	U	NA	99	UJ	NA	990	U	NA	99	U	NA

I The reported value is between the laboratory detection limit and quantitation limit and is an estimate.

J The reported value is between the laboratory detection limit and quantitation limit and / or has been classified as qualitative due to one or more quality issues.

J+ The reported value is between the laboratory detection limit and quantitation limit and / or has been classified as qualitative due to one or more quality issues. The direction of potential analytical bias is positive.

U The analyte was not detected at or above the indicated concentration or the result was classified as a non-detection due to the presence of the analyte in one or more blanks associated with the sample.

mg/Kg milligrams per kilogram

ug/Kg micrograms per kilogram

RSD Relative Standard Deviation (Values < 50% are considered to have low variablity)

NA Not applicable. Results were non-detections.

Table B-3: Waikane Valley RI
Constituant Detections in Discrete Subsurface Soil Samples

Location ID	COC ID	Collection Date	6010C				8330A / 8330B							
			Copper		Lead		2-Amino-4,6-		4-Amino-2,6-		Nitroglycerine		2,4,6-Trinitrotoluene	
			CAS No. 7440508		CAS No. 7439921		CAS No. 35572782		CAS No. 19406510		CAS No. 55630		CAS No. 118967	
			mg/Kg		mg/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg	
WTA-SE-ZSB-001	WTA196	8/30/2011	**56.3**	J	**34.5**		180	U	180	U	1800	U	180	U
WTA-SE-ZSB-002	WTA200	8/30/2011	**62.6**		**28.0**	J	180	U	180	U	1800	U	180	U
WTA-SE-ZSB-003	WTA201	8/30/2011	**81.5**		**7.3**	I J	190	U	190	U	1900	U	190	U
WTA-SE-ZSB-004	WTA206	8/30/2011	**77.8**		**11.6**	J	180	U	180	U	1800	U	180	U
WTA-SE-ZSB-005	WTA207	8/30/2011	**61.5**		**27.3**	J	180	U	180	U	1800	U	180	U
WTA-SE-ZSB-006	WTA208	8/30/2011	**102**		**46.4**		160	U	160	U	1600	U	160	U
WTA-SE-ZSB-007	WTA209	8/30/2011	**52.0**	J	**16.6**	J	170	U	170	U	1700	U	170	U
WTA-SE-ZSB-008	WTA210	8/30/2011	**58.5**	J	**26.8**	J	170	U	170	U	1700	U	170	U
WTA-SE-ZSB-009	WTA211	8/30/2011	**38.1**	J	**19.6**	J	160	U	160	U	1600	U	160	U
WTA-SE-ZSB-009	WTA212	8/30/2011	**57.6**	J	**29.6**	J	180	U	180	U	1800	U	180	U
WTA-SE-ZSB-009	WTA214	8/30/2011	**46.8**	J	**17.4**	J	170	U	170	U	1700	U	170	U
WTA-SE-ZSB-010	WTA215	8/30/2011	**104**		**5.6**	I J	190	U	190	U	1900	U	190	U
WTA-SE-ZSB-011	WTA216	8/30/2011	**75.4**		**11.5**	J	190	U	190	U	1900	U	190	U
WTA-SE-ZSB-012	WTA217	8/30/2011	**58.4**	J	**17.3**	J	180	U	180	U	1800	U	180	U
WTA-SE-ZSB-013	WTA218	8/30/2011	**50.2**	J	**16.7**	J	150	U	150	U	1500	U	150	U
WTA-SE-ZSB-014	WTA219	8/30/2011	**44.6**		**44.1**	J+	160	U	160	U	1600	U	160	U
WTA-SE-ZSB-015	WTA220	8/30/2011	**46.0**		**110**		170	U	170	U	1700	U	170	U
WTA-SE-ZSB-016	WTA221	8/30/2011	**196**		**1830**		150	U	150	U	1500	U	150	U
WTA-SE-ZSB-017	WTA222	8/30/2011	**50.5**		**48.0**		150	U	150	U	1500	U	150	U
WTA-SE-ZSB-018	WTA223	8/30/2011	**94.1**		**35.8**		170	U	170	U	1700	U	170	U
WTA-SE-ZSB-019	WTA224	8/30/2011	**40.2**		**38.0**		160	U	160	U	1600	U	160	U
WTA-SE-ZSB-020	WTA225	8/30/2011	**39.0**		**25.0**		150	U	150	U	1500	U	150	U
WTA-SE-ZSB-021	WTA226	8/30/2011	**64.6**		**26.2**		170	U	170	U	1700	U	170	U
WTA-SE-ZSB-022	WTA227	8/30/2011	**44.6**		**21.2**		170	U	170	U	1700	U	170	U
WTA-SE-ZSB-023	WTA228	8/30/2011	**65.8**		**69.1**		170	U	170	U	1700	U	170	U
WTA-SE-ZSB-024	WTA229	8/30/2011	**37.4**		**8.9**	I J	180	U	180	U	1800	U	180	U
WTA-SE-ZSB-025	WTA230	8/30/2011	**43.3**		**18.0**		180	U	180	U	1800	U	180	U
WTA-SE-ZSB-026	WTA233	8/31/2011	**71.5**		**101**		**371**		**232**		1800	U	180	U
WTA-SE-ZSB-026	WTA234	8/31/2011	**90.5**		**78.2**		**953**		**617**		2000	U	**213**	
WTA-SE-ZSB-026	WTA236	8/31/2011	**66.5**		**50.8**		**316**		**183**		1700	U	170	U
WTA-SE-ZSB-027	WTA237	8/31/2011	**170**		**84.7**		190	U	190	U	1900	U	190	U
WTA-SE-ZSB-028	WTA238	8/31/2011	**74.4**		**223**		150	U	150	U	1500	U	150	U
WTA-SE-ZSB-028	WTA239	8/31/2011	**68.5**		**120**		170	U	170	U	**1380**	I J	170	U
WTA-SE-ZSB-028	WTA241	8/31/2011	**78.1**		**131**		170	U	170	U	**2450**		170	U
WTA-SI-ZSB-001	WTA149	8/22/2011	**74.1**		**2.5**	I J	150	U	150	U	1500	U	150	U

Table B-3: Waikane Valley RI
Constituant Detections in Discrete Subsurface Soil Samples

Location ID	COC ID	Collection Date	6010C				8330A / 8330B							
			Copper		Lead		2-Amino-4,6-		4-Amino-2,6-		Nitroglycerine		2,4,6-Trinitrotoluene	
			CAS No. 7440508		CAS No. 7439921		CAS No. 35572782		CAS No. 19406510		CAS No. 55630		CAS No. 118967	
			mg/Kg		mg/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg	
WTA-SI-ZSB-002	WTA285	10/11/2011	**63.7**		**11.5**		180	U	180	UJ	1800	U	1800	U
WTA-SI-ZSB-003	WTA157	8/23/2011	**119**		**3.8**	I J	180	U	180	U	1800	U	180	U
WTA-SI-ZSB-004	WTA183	8/30/2011	**81.2**		**0.73**	I J	180	U	180	U	1800	U	180	U
WTA-SI-ZSB-004	WTA184	8/30/2011	**67.9**		**1.2**	I J	150	U	150	U	1500	U	150	U
WTA-SI-ZSB-004	WTA186	8/30/2011	**76.3**		**1.4**	I J	190	U	190	U	1900	U	190	U
WTA-SI-ZSB-005	WTA187	8/30/2011	**89.9**		**3.4**	I J	180	U	180	U	1800	U	180	U
WTA-SI-ZSB-006	WTA188	8/30/2011	**111**		**2.7**	I J	190	U	190	U	1900	U	190	U
WTA-SI-ZSB-007	WTA189	8/30/2011	**79.7**		**3.6**	I J	180	U	180	U	1800	U	180	U
WTA-SI-ZSB-008	WTA190	8/30/2011	**101**		**4.1**	I J	170	U	170	U	1700	U	170	U
WTA-SI-ZSB-009	WTA191	8/30/2011	**123**		**5.4**	I J	190	U	190	U	1900	U	190	U
WTA-WM-ZSB-001	WTA173	8/29/2011	**85.8**		**3.8**	I J	180	U	180	U	1800	U	180	U
WTA-WM-ZSB-002	WTA174	8/29/2011	**113**		**2.5**	I J	190	U	190	U	1900	U	190	U
WTA-WM-ZSB-003	WTA150	8/22/2011	**66.3**		**9.8**		200	U	200	U	2000	U	200	U

I	The reported value is between the laboratory detection limit and quantitation limit and is an estimate.
J	The reported value is between the laboratory detection limit and quantitation limit and / or has been classified as qualitative due to one or more quality issues.
J+	The reported value is between the laboratory detection limit and quantitation limit and / or has been classified as qualitative due to one or more quality issues. The direction of potential analytical bias is positive.
U	The analyte was not detected at or above the indicated concentration or the result was classified as a non-detection due to the presence of the analyte in one or more blanks associated with the sample.
mg/Kg	milligrams per kilogram
ug/Kg	micrograms per kilogram

Table B-4: Waikane Valley RI
Constituant Detections in Sediment Samples

Location ID	COC ID	Collection Date	6010C				8330A / 8330B							
			Copper		Lead		2-Amino-4,6-		4-Amino-2,6-		Nitroglycerine		2,4,6-Trinitrotoluene	
			CAS No. 7440508		CAS No. 7439921		CAS No. 35572782		CAS No. 19406510		CAS No. 55630		CAS No. 118967	
			mg/Kg		mg/Kg		ug/Kg		ug/Kg		ug/Kg		ug/Kg	
WTA-SE-ZSD-001	WTA286	11/7/2011	**71.6**		**5.1**		68	U	68	U	420	U	68	U
WTA-SE-ZSD-002	WTA287	11/7/2011	**100**		**108**		64	U	64	U	400	U	64	U
WTA-SE-ZSD-002	WTA288	11/7/2011	**102**		**11.4**		63	U	63	U	390	U	63	U
WTA-SI-ZSD-001	WTA130	8/22/2011	**76.9**		**2.1**	I J	160	U	160	U	1600	U	160	U
WTA-SI-ZSD-002	WTA131	8/22/2011	**71.2**		**3.3**		140	U	140	U	1400	U	140	U
WTA-SI-ZSD-003	WTA132	8/22/2011	**123**		**2.9**	I J	200	U	200	U	2000	U	200	U
WTA-SI-ZSD-004	WTA159	8/23/2011	**88.0**		**2.9**		180	U	180	U	1800	U	180	U
WTA-SI-ZSD-005	WTA151	8/22/2011	**88.6**		**4.0**	I J	190	U	190	U	1900	U	190	U
WTA-SI-ZSD-006	WTA152	8/22/2011	**89.0**		**5.0**	I J	150	U	150	U	1500	U	150	U
WTA-WM-ZSD-001	WTA153	8/23/2011	**63.4**		**2.3**		180	U	180	U	1800	U	180	U
WTA-WM-ZSD-002	WTA165	8/29/2011	**95.5**		**2.7**	I J	160	U	160	U	1600	U	160	U
WTA-WM-ZSD-002	WTA166	8/29/2011	**121**		**9.1**		190	U	190	U	1900	U	190	U
WTA-WM-ZSD-002	WTA168	8/29/2011	**102**		**2.1**	I J	190	U	190	U	1900	U	190	U
WTA-WM-ZSD-003	WTA169	8/29/2011	**95.9**		**1.1**	I J	170	U	170	U	1700	U	170	U
WTA-WM-ZSD-004	WTA170	8/29/2011	**105**		**1.7**	I J	190	U	190	U	1900	U	190	U
WTA-WM-ZSD-005	WTA171	8/29/2011	**82.1**		**0.87**	I J	140	U	140	U	1400	U	140	U
WTA-WM-ZSD-006	WTA172	8/29/2011	**105**		**1.5**	I J	180	U	180	U	1800	U	180	U
WTA-WM-ZSD-007	WTA178	8/29/2011	**87.8**		**2.2**	I J	170	U	170	U	1700	U	170	U
WTA-WM-ZSD-008	WTA179	8/29/2011	**98.0**		**1.9**	I J	170	U	170	U	1700	U	170	U
WTA-WM-ZSD-009	WTA180	8/29/2011	**110**		**10.1**		170	U	170	U	1700	U	170	U
WTA-WM-ZSD-010	WTA181	8/29/2011	**66.9**		**1.9**	I J	180	U	180	U	1800	U	180	U
WTA-WM-ZSD-011	WTA182	8/29/2011	**189**		**5.8**	I J	170	U	170	U	1700	U	170	U
WTA-WM-ZSD-012	WTA192	8/30/2011	**75.6**		**1.1**	I J	190	U	190	U	1900	U	190	U
WTA-WM-ZSD-012	WTA193	8/30/2011	**69.8**		**1.6**	I J	160	U	160	U	1600	U	160	U
WTA-WM-ZSD-012	WTA195	8/30/2011	**80.6**		**1.6**	I J	170	U	170	U	1700	U	170	U
WTA-WM-ZSD-013	WTA133	8/22/2011	**86.2**		**2.4**	I J	170	U	170	U	1700	U	170	U
WTA-WM-ZSD-014	WTA158	8/23/2011	**126**		**4.4**		180	U	180	U	1800	U	180	U

I	The reported value is between the laboratory detection limit and quantitation limit and is an estimate.
J	The reported value is between the laboratory detection limit and quantitation limit and / or has been classified as qualitative due to one or more quality issues.
J+	The reported value is between the laboratory detection limit and quantitation limit and / or has been classified as qualitative due to one or more quality issues. The direction of potential analytical bias is positive.
U	The analyte was not detected at or above the indicated concentration or the result was classified as a non-detection due to the presence of the analyte in one or more blanks associated with the sample.
mg/Kg	milligrams per kilogram
ug/Kg	micrograms per kilogram

QCSR

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QUALITY CONTROL SUMMARY REPORT

Waikane Training Area
Remedial Investigation / Feasibility Study
Island of Oahu, Hawaii

Sampling Conducted
August 15 -31, October 11, and November 7, 2011

Prepared for:

Zapata Incorporated
6302 Fairview Road, Suite 600
Charlotte, North Carolina 28210
(704) 358-8240

Prepared by:

HSW Engineering, Inc.
3820 Northdale Blvd, Suite 210-B
Tampa, Florida 33624
(813) 968-7722

December 2, 2011

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1.0 OBJECTIVE AND SUMMARY OF FINDINGS

A Remedial Investigation / Feasibility Study (RI/FS) was conducted by Zapata Incorporated (Zapata) during 2011 at Waikane Training Area (WTA), located on the Island of Oahu, Hawaii. The RI/FS was conducted on behalf of the United States Army Corps of Engineers (USACE). Environmental samples were collected August 15 through 31, with re-sampling of some locations conducted on October 11 and November 7, 2011. Samples were collected from 108 multi-increment soil (MIS) sampling locations, 72 sediment sampling locations, and 110 subsurface soil sampling locations. Field duplicates were collected at ten locations. Three field blanks and six equipment rinsates also were collected. All samples were analyzed for copper and lead (EPA Method 6010C or 6020A) and explosives residue (EPA Method 8330B for MIS samples and EPA Method 8330A for sediment and subsurface soil samples). The objective of this Quality Control Summary Report (QCSR) is to provide the data user with an overall assessment of the quality and usability of these analytical results and provide recommendations for future field events.

The contract laboratory for these analyses was Accutest Southeast (Accutest) in Orlando, Florida. All analyses for explosives residues and most analyses for metals were performed by Accutest in their Orlando facility. Some analyses for metals were performed by Accutest's Dayton, New Jersey, facility. The laboratory data underwent a systematic technical review to determine whether the analytical results are scientifically valid and are of known and acceptable accuracy, precision, and sensitivity. Both automated and manual data review techniques were used, with electronic data deliverables (EDDs) provided by the laboratory processed through ADR® automated data review software (Version 8.3) and the automated data review outputs evaluated in light of information in the laboratory hard copy (PDF) data packages. A copy of the criteria established for this project in ADR® (project library) is included as Attachment A of this QCSR. The exported SEDD 2a deliverables have been provided in electronic format as a separate deliverable from this QCSR.

Of 4062 discrete data, 338 results were classified as qualitative due to one or more laboratory issues. Most of these qualifications were to findings of non-detect for four explosives analyzed by Method 8330A due to slightly low recoveries of laboratory spike samples suggesting possible low bias of the results. No results were rejected (classified as unusable), and completeness in terms of usable data for each sampled location for the parameters of interest is 100%.

2.0 DATA VERIFICATION AND REVIEW

Analytical data were evaluated by processing individual EDDs provided by the laboratory through ADR® automated data review software and verifying the outputs of each automated review against the laboratory hard copy reports (including information provided in the laboratory case narratives, on chain-of-custody [COC] forms, and in log-in summary sheets). The ADR® data review software uses validation logic based on nationally-recognized validation protocols described in the USEPA Contract Laboratory Program *National Functional Guidelines for Superfund Organic Methods Data Review (USEPA, 2008)* and *National Functional Guidelines for Superfund Inorganic Methods Data Review (USEPA, 2010)*. Collectively, these documents are referred to as the Functional Guidelines. The electronic data conformed to USACE Level 2a reporting and are referred to as either Staged EDD Level 2a or SEDD 2a deliverables. SEDD 2a deliverables include laboratory method QC (i.e., the results for method blanks [MBs], laboratory control samples [LCSs], matrix spike / matrix spike duplicates [MS/MSDs], laboratory duplicates [LDs], and surrogates) along with information routinely required under the National Environmental Laboratory Accreditation Program (NELAP) such as dates of sample collection, receipt, preparation, and analysis, analytical methods used, etc.

The hard copy laboratory data packages, which were provided to the validator as PDF documents, conformed to USEPA Level IV reporting and are referred to as expanded deliverables. in addition to the method QC data and other information included in the SEDD 2a deliverables, these expanded deliverables also included instrument calibration data and instrument raw data (e.g., sample chromatograms). While the Functional Guidelines describe the process for conducting a full validation of Level IV deliverables, the relevant portions of these guidelines were used to validate the data (both the SEDD 2a deliverables and the laboratory data packages) at the level of reporting consistent with SEDD 2a (i.e., method QC data only, comparable to what in the past has been referred to as EPA Level II reporting). As allowed under the Functional Guidelines, professional judgment was used in some instances to modify qualifications resulting from ADR® processing.

The extent of variability between each paired set of results for a given sample and its field duplicate was evaluated by calculating the relative percent difference (%RPD) between results for a given analyte or, at low levels (i.e., when one or both results was no more than five times the magnitude of the reporting limit), the absolute difference in results. For solid samples (i.e., MIS, sediment, and subsurface soil), the extent of variability between paired results was considered acceptable if the %RPD was less than 50% or if the absolute difference in results was less than twice the magnitude of the reporting limit. This evaluation was performed separately from the ADR process, due to the inability of ADR to evaluate variability at low levels in a meaningful way (i.e., the version of ADR used for this project is capable of evaluating %RPD only and not absolute differences between paired results).

The specific data review qualifier codes used for qualifying sample results are summarized as follows. Only some of these qualifiers were needed for this particular project.

Data Review Qualifier	**Definition or Application**
U	When applied by the validator to data not originally coded with a U by the laboratory, the U qualifier indicates that the result was reported by the laboratory as a detection but was classified as a non-detection, due to the detection of the analyte in one or more blanks associated with the sample result (and the assumption that the analyte's presence was due to contamination).
UJ	When applied by the validator to data not originally coded with a UJ by the laboratory, the "UJ" qualifier indicates that the result was reported by the laboratory as a non-detection or was classified as a non-detection due to the detection of the analyte in one or more blanks associated with the sample result, with further classification of the result as qualitative due to one or more quality issues.
J	The result is a detection and is considered qualitative because it is between the laboratory's method detection limit (MDL) and method reporting limit (MRL) and / or because it was believed impacted by one or more quality issues. The direction of potential bias is not known or not applicable.
J-	The result is a detection and has been classified as qualitative based on one or more quality issues, with the nature of the quality issue(s) suggesting negative bias. The actual concentration may be higher than reported.
J+	The result is a detection and has been classified as qualitative based on one or more quality issues, with the nature of the quality issue(s) suggesting positive bias. The actual concentration may be lower than reported.
R	The result is inconclusive and is classified as unusable, due to one or more quality issues, including evidence of significant analytical error.

3.0 DATA REVIEW AND ASSESSMENT

3.1 REVIEW OF DAILY QUALITY CONTROL REPORTS (DQCRs)

Daily Quality Control Reports (DQCRs) were prepared for each day of field activities. These forms were reviewed for accuracy and completeness and found to be acceptable in all but a few very minor instances, all of which were correctable after-the-fact and had no impact on the quality of the analytical data.

3.2 CONDITION UPON RECEIPT, CHAIN-OF-CUSTODY FORMS, AND SAMPLE LOG-IN

All sample shipments were received by the contract laboratory in good condition and at acceptable temperatures (6 °C or less). In most cases, samples were correctly logged in and analyzed for the methods and analytes of interest indicated on the chain-of-custody (COC) forms. For three of the seven sample delivery groups (SDGs) received by the laboratory, the Orlando facility forwarded samples for metals analysis to their New Jersey laboratory under the mistaken assumption that analysis by EPA Method 6020A, rather than EPA Method 6010C, was required. Both methods are based on inductively-coupled plasma (ICP) technology but differ in the type of detector used (Method 6010C specifies atomic emission spectrometry [AES] whereas Method 6020A specifies mass spectrometry [MS]). Method 6020A is performed by Accutest only at their New Jersey laboratory. This error was corrected for the first of these two SDGs (results reported in laboratory data reports F85318 and F85502); however, in the interest of time, the samples were not returned to the Orlando facility but were analyzed at the New Jersey laboratory by the correct method (EPA 6010C). The third SDG was for a re-sampling event that occurred on October 11 and, because the initial error had not been corrected in the laboratory's electronic information management system, these samples also were forwarded to the New Jersey laboratory, where they were were analyzed by EPA Method 6020A.

3.3 EVALUATION OF FIELD-GENERATED BLANKS

Three field blanks and six equipment rinsates were collected. The field blanks were collected on August 15, 16, and 17 and are considered applicable to all samples collected during the August event. The six equipment rinsates were associated with subsurface soil sampling as both MIS and sediment samples were collected using dedicated sampling equipment.

With the exception of a low level detection of copper in the equipment blank collected on August 18 (2.5 micrograms per liter [ug/L]), no target analytes were detected in any of these field-generated blanks. The laboratory performed a duplicate analysis of the equipment blank for QC purposes and obtained a similar result (2.4 ug/L). The concentrations of copper in surficial soil samples collected in association with this equipment blank were sufficiently high that they would not have been impacted by any low-level contamination on the order suggested by the equipment blank and, thus, no qualification of sample data based on the equipment blank finding was necessary. It is possible that the source of copper in the equipment blank was from the laboratory as a similarly low level of copper was detected in one laboratory method blank (discussed below).

3.3 EVALUATION OF FIELD DUPLICATES (FDs)

Duplicate samples are collected from a subset of sampling locations and analyzed as discrete samples to allow an assessment of cumulative (field and laboratory) precision. Field duplicates were collected from ten sampling locations. Acceptable cumulative precision, determined as described in Section 2.0, was indicated in but three instances (Table 1). These discrepancies are attributed primarily to sample nonhomogeneity, which is common with soil or solid samples. No data were qualified based on field duplicate results. The results are perhaps more useful as an indication of the extent of variability of target analytes at the sampled locations than a reflection of analytical error or bias.

3.5 ASSESSMENT OF ANALYTICAL DATA

Soil / sludge data and associated field QC samples were reported by each of the three laboratories in seven data packages. These deliverables met USACE requirements for definitive data and included the following laboratory information or QC data:

- condition of samples upon receipt and laboratory case narrative
- copies of fully-executed chain-of-custody forms (COCs)
- dates of collection, preparation / extraction, and analysis
- results of laboratory method blanks
- blank spike / blank spike duplicate (BS / BSD) recoveries (for MIS samples only)

- laboratory control sample / laboratory control sample duplicate (LCS / LCSD) recoveries
- matrix spike / matrix spike duplicate (MS/MSD) recoveries and precision (%RPD)
- surrogate recoveries
- sample duplicates (percent solids)
- dilution factors
- sample results with corresponding method detection limits (MDLs) and reporting limits
- instrument calibration data, including initial calibration verifications and continuing calibration checks and continuing calibration blanks
- results for internal standards and other laboratory QC samples associated with metals analyses (interference check samples, post-digestion spike analyses, serial dilutions, and detection limit confirmation samples)
- raw instrument data for standards, client samples, and laboratory QC samples

The above-listed items, excluding the last three, were assessed by processing the electronic data (SEDD 2a deliverables) through ADR® and supplementing this with a manual review of the corresponding information in the hard copy reports. Particular attention was given to laboratory case narratives and information recorded on COCs or documenting sample log-in.

In total, 338 results (8.3% of the data) were qualified due to one or more quality issues (Table 2). None of the reasons for qualification were considered serious or outside the norm of routine environmental analyses. Because the majority of the Level 2a QC data reported by the laboratory was acceptable and the reasons for qualification were limited to a few issues, discussion in the following paragraphs focuses on those instances in which qualification was necessary.

<u>Detections at Low Levels</u>

Several detections were reported by the laboratory with a “J” qualifier, which indicates that, while the presence of the analyte is not in doubt, the result is between the method detection limit (MDL) and reporting limit (RL) and is an estimated value. These included three results for nitroglycerin, two results for copper, and 96 results for lead (seven of these results also were qualified for other reasons). These data are qualitatively usable.

Laboratory Control Samples (Explosives)

The largest number of qualified data resulting from the third-party data review were for four explosives analyzed by Method 8330B (16 analytes were included in the method). This method requires substantial sample preparation by the laboratory, including drying and grinding of samples and selection of a representative subset of the dried, ground material for analysis. A solid material that is analyte-free and representative of a soil or sediment matrix is spiked with the analytes of interest and carried through the entire preparation and analysis procedure to provide information about potential analyte loss during the grinding and drying process. This sample is identified by the laboratory as a laboratory control sample (LCS) and is purchased ready-made from a vendor. A blank spike (BS) also is analyzed and is similar to the LCS but bypasses the drying and grinding step (e.g., it includes all procedural steps after grinding). While BS recoveries were acceptable, the LCS recoveries for four analytes (2,4,6-trinitrotoluene, 4-amino-2-6-dinitrotoluene, nitrobenzene, and nitroglycerin) were, in several instances, lower than the lower acceptance limits established in the ADR project library (although they typically were within the laboratory's acceptance limits in effect at the time the analyses were performed and reported in the laboratory reports). The analytical results for these four analytes that were associated with low LCS recoveries – all of which were findings of non-detect – were classified as qualitative (each result coded with a "UJ" in Table 2), as the absence of trace levels of one or more of these four analytes at concentrations near the MDLs was believed not firmly established. Instances in which LCS or BS recoveries exceeded the upper acceptance limits for these or other explosives were not used to qualify sample data as there were no detections of explosives in such instances, and any high analytical bias would not have affected the ability of the laboratory to detect the analytes.

Method Blanks

With one exception, no target analytes were detected in any laboratory method blanks. Low levels of copper and lead were detected in one method blank associated with metals analyses (1.2 milligrams per kilogram [mg/Kg] and 0.69 mg/Kg, respectively). Twenty samples were analyzed for copper and lead in association with this method blank, with all 40 results reported by the laboratory as detections and flagged with a "B" (to inform the reader as to the method blank findings). As neither of the detections in the method blank exceeded the laboratory's practical quantitation limits (PQLs) for copper or lead (1.3 mg/Kg and 1.0 mg/Kg, respectively) and the detections were limited to only one of 15 method blanks analyzed for metals, the low-level contamination was concluded by the laboratory to be an isolated incident, and corrective action was deemed unnecessary.

As a result of the validation process, sample data for copper and lead were classified as qualitative when the result was less than five times the amount detected in the method blank, after compensating for dilutions. Of the 40 results potentially affected, eight detections of copper and 18 detections of lead were coded with a "J" validation qualifier to indicate that the results may have been affected by low-level laboratory contamination; i.e., the actual concentrations in the samples could be slightly lower than reported (Table 2). For example, the result of 56.3 mg/Kg copper reported for sample WTA196 (location WTA-SE-ZSB-001) was coded with a "J" because the amount of copper detected in the sample by the instrument (5.63 mg/Kg, following a ten-fold dilution needed to minimize matrix interferences) was less than five times the amount detected in the method blank by the instrument (1.2 mg/Kg x 5 = 6.0 mg/Kg). The result of 34.6 mg/Kg lead reported for this same sample, although flagged by the laboratory with a "B", was not qualified by the validator, because the amount observed by the analyst on the instrument following the ten-fold dilution of the sample (3.4 mg/Kg) was greater than the amount registered on the instrument by the blank (0.69 x 5 = 3.4 mg/Kg); i.e., it was concluded that any affect of low level contamination on the order suggested by the method blank result would have been insubstantial and did not warrant qualification of the result. Although the ADR® software, using commonly accepted validation logic described in the EPA Functional Guidelines, applies a "U" to such data, indicating that the reported result should be interpreted as a non-detection at that concentration, professional judgment was used by the validator to report these results as detections with a "J" qualifier. Reporting the results as detections that may have been impacted by low-level laboratory contamination rather than as non-detections is believed to be a more accurate representation of site conditions, given that copper and lead were detected in all other MIS, sediment, and subsurface soil samples collected during the August and October 2011 events.

Matrix Spikes

Two detections of lead and one detection of copper were classified as qualitative due to matrix spike data suggesting slight loss of analytical accuracy or precision attributable to matrix effects (Table 2). Qualification was limited to only the results for the parent sample used for spiking and was not applied to other results for lead generated within the same preparation batch, given the uncertainty in assuming the same matrix effects were present to the same degree in all samples. However, the possibility of similar matrix effects should be taken into consideration when interpreting all metals data. There were several instances in which matrix spike recoveries for copper or lead were not within data review acceptance limits established in the ADR® library; however, no qualification was made to the parent sample results, as the amount spiked was less than four times the amount in the parent (unspiked) sample and thus, there was no realistic possibility of recovering the spiked amount with any accuracy. Sample nonhomogeneity, as well as matrix interferences, likely also contributed to erratic MS/MSD recoveries.

<u>Dilutions</u>

Dilutions were required in the analysis of 202 samples for copper and lead and in the analysis of an additional seven samples for copper (411 results in total; refer to Table 3). The dilution factors ranged from two to ten and were needed to minimize matrix interferences (evidenced by the results of laboratory QC samples such as serial dilutions and post-digestion spike samples). In all instances, the affected target analytes were reported as detections; i.e., no results for copper or lead were diluted beyond detection. In 96 instances, all of which involved lead, the reported results were between the MDL and the PQL and thus were qualified with a “J” to indicate that the reported values are estimates detected at low levels.

6.0 SUMMARY AND RECOMMENDATIONS

This RI/FS involved the collection and analysis of a large number of soil and sediment samples for copper, lead, and explosives residues. Of 4062 discrete data, 338 results, or 8.3% of the data, were classified as qualitative based on one or more laboratory issues, none of which were considered to be outside the norm for commercial environmental laboratories. Excluding 93 instances in which data were classified as qualitative because the results were less than the PQLs, only 6% of the data required qualification. For data comprising soil or sediment matrices, which often present analytical challenges, this level of qualification is considered very good. No results were rejected (classified as unusable), and completeness in terms of usable data for each sampled location for the parameters of interest is 100%.

Most of the qualifications were for findings of non-detect for four explosives analyzed by Method 8330B and for which slight negative bias was suggested. The laboratory control sample used by the laboratory in the analysis of explosives by EPA 8330B is purchased ready-made from a vendor. As such, its concentration is certified, and any loss of recovery is attributed for the most part to the preparation steps (drying and grinding) and likely unavoidable. The recovery data are useful for recognizing that the presence of one or more of these analytes (2,4,6-trinitrotoluene, 4-amino-2,5-dinitrotoluene, nitrobenzene, and nitroglycerin) at concentrations near the detection limits in the affected samples was not firmly established, although greater certainty of non-detection at the PQLs may be sufficient for decision-making purposes.

The laboratory encountered matrix interferences in the analysis of several soil and sediment samples for metals analyses that required that the samples be reanalyzed at dilutions. This is not unusual as these matrices can be complex and often require balancing several competing factors to achieve the best data that can reasonably be expected of a commercial laboratory. Dilution factors ranged from two to ten and were not considered excessive, as no target metals were diluted beyond detection. On-instrument readings must be multiplied by dilution factors and, thus, dilutions should never be any higher than necessary to minimize the effect of interferences. Although any analytical error at the instrument level is magnified by the dilution factor, a more accurate result is believed obtained by diluting the sample sufficiently than by analyzing a sample at a lower dilution factor insufficient to mitigate the effect of interferences. The laboratory did not unilaterally dilute all samples by the same factor but instead selected a different factor for each sample sufficient to allow both copper and lead to be reported from a single dilution. However, in 96 instances involving lead, the dilutions necessary to eliminate interferences sufficiently for analyzing copper resulted in lead being detected at concentrations of between the MDL and PQL (i.e., reported as estimated values). It is not expected that the laboratory would analyze each of these samples twice to optimize the dilution factors for copper and lead individually; thus, it is concluded that the laboratory performed acceptably in generating data that, on balance, met project objectives in terms of detection limits and usability.

The possibility exists that some results for metals that were not qualified were nevertheless affected to some degree by matrix interferences. In the future, for soil or sediment samples for which multiple metals by ICP are requested, it may be desirable to request Method 6020A (ICP-MS) rather than Method 6010C (ICP-AES), as MS is less susceptible to matrix interferences as AES and less likely to require dilutions.

It is suggested that, for future projects, Zapata consider simplifying the sample identification process for all non-MIS samples. For example, it is recommended that all containers comprising samples from an individual location be considered the same sample and not distinguished from one another by sample ID on the chain-of-custody form, with the laboratory responsible for assigning unique laboratory identifications to individual containers (as is required by the National Environmental Laboratory Accrediting Committee, or NELAC).

7.0 REFERENCES

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Table 1. Comparison of Results for Samples Collected and Analyzed in Duplicate

Waikane Training Area RI / FS
Island of Oahu, Hawaii

Analyte		WTA-BKG-ZSD-008				%RPD	/S-D/	RL	Extent of Variability
		WTA031		WTA033					
6010C (mg/kg):									
	LEAD	2.0	I J	1.5	I J	--	0.50	2.6	Acceptable
	COPPER	84.4		86.5		2.5	--	3.3	Acceptable

Analyte		WTA-BKG-ZSB-010				%RPD	/S-D/	RL	Extent of Variability
		WTA076		WTA078					
6010C (mg/kg):									
	LEAD	5.0		5.7	I J	--	0.70	6.0	Acceptable
	COPPER	80.6		137		51.8	--	7.5	High

Analyte		WTA-BKG-ZSB-015				%RPD	/S-D/	RL	Extent of Variability
		WTA119		WTA120					
6010C (mg/kg):									
	LEAD	3.5	I J	4.7	I J	--	1.20	6.9	Acceptable
	COPPER	76.6		87.0		12.7	--	8.6	Acceptable

Analyte		WTA-WM-ZSD-002				%RPD	/S-D/	RL	Extent of Variability
		WTA165		WTA166					
6010C (mg/kg):									
	LEAD	2.7	I J	9.1		--	6.40	7.4	Acceptable
	COPPER	95.5		121		23.6	--	9.3	Acceptable

Analyte		WTA-SI-ZSB-004				%RPD	/S-D/	RL	Extent of Variability
		WTA183		WTA184					
6010C (mg/kg):									
	LEAD	0.73	I J	1.2	I J	--	0.47	6.3	Acceptable
	COPPER	81.2		67.9		17.8	--	7.9	Acceptable

Analyte		WTA-WM-ZSD-012				%RPD	/S-D/	RL	Extent of Variability
		WTA192		WTA193					
6010C (mg/kg):									
	LEAD	1.1	I J	1.6	I J	--	0.50	9.8	Acceptable
	COPPER	75.6		69.8		8.0	--	12	Acceptable

Analyte		WTA-SE-ZSB-009				%RPD	/S-D/	RL	Extent of Variability
		WTA211		WTA212					
6010C (mg/kg):									
	LEAD	19.6	J	29.6	J	--	10.0	13	Acceptable
	COPPER	38.1	J	57.6	J	--	19.5	16	Acceptable

Table 1. Comparison of Results for Samples Collected and Analyzed in Duplicate

Waikane Training Area RI / FS
Island of Oahu, Hawaii

Analyte		WTA-SE-ZSB-026				%RPD	/S-D/	RL	Extent of Variability
		WTA233		WTA234					
6010C (mg/kg):									
	LEAD	101		78.2		25.4	--	12	Acceptable
	COPPER	71.5		90.5		--	19	15	Acceptable
8330A (ug/Kg):									
	2,4,6-TRINITR	180	U	213		--	33	200	Acceptable
	4-AMINO-2,6-	232		617		--	385	200	Acceptable
	2-AMINO-4,6-	371		953		--	582	200	High

Analyte		WTA-SE-ZSB-028				%RPD	/S-D/	RL	Extent of Variability
		WTA238		WTA239					
6010C (mg/kg):									
	LEAD	223		120		60.1	--	10	High
	COPPER	74.4		68.5		8.3	--	13	Acceptable
8330A (ug/Kg):									
	NITROGLYCER	1500	U	1380	I J	--	120	1700	Acceptable

Analyte		WTA-SE-ZSD-002				%RPD	/S-D/	RL	Extent of Variability
		WTA287		WTA288					
6010C (mg/kg):									
	LEAD	10.8		11.4		5.4	--	2.1	Acceptable
	COPPER	100		102		2.0	--	13	Acceptable

%RPD means the relative percent difference, calculated by dividing the absolute value of the difference in result between sample (S) and

/S-D/ means the absolute difference between the sample and duplicate result. When one or both results is less than 5x the RL, the extent of

RL = Reporting Limit.

I The result is between the method detection limit and reporting limit and is an estimate.

J The reported value has been classified as qualitative due to one or more quality issues.

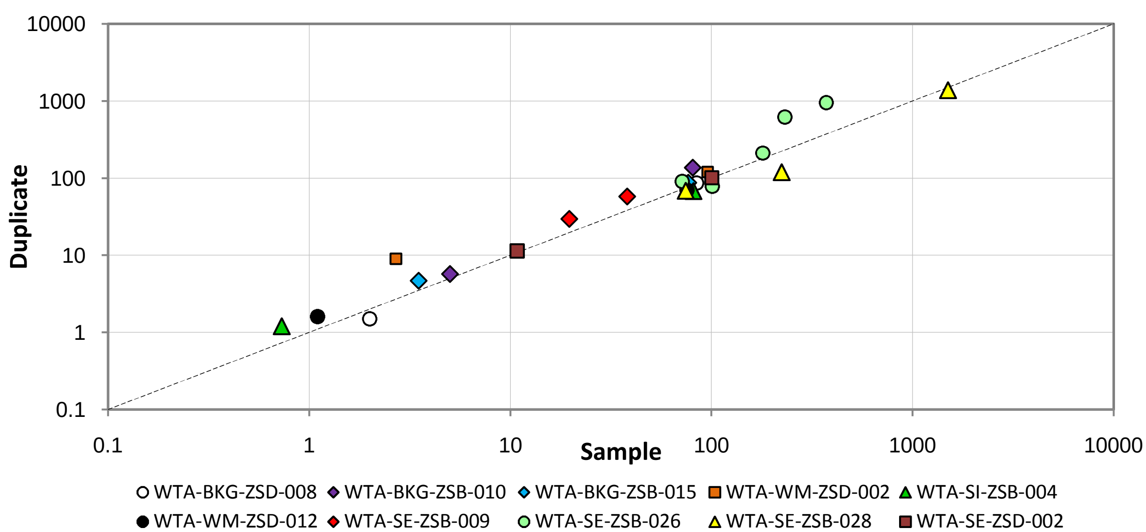

Table 2. Summary of Qualified Data for Samples Collected August 15 - November 7, 2011

Waikane Training Area RI / FS
Waikane, Hawaii

Lab Report ID	Location ID	COC ID	Lab Sample ID	Method	Client Analyte ID	Analyte Name	Detection Limit	Reporting Limit	Reported Result	Lab Qualifiers	Final Validation Qualifier	Temperature Upon Receipt	Condition Upon Receipt	Holding Time	Method Blanks	Surrogate Recoveries	MS / MSD Recovery	MS / MSD %RPD	LCS / LCSD Recovery	LCS / LCSD %RPD	Reporting Limits	Field Blanks	Equipment Rinsates	Field Duplicates	Lab Duplicates	Professional Judgment
F85318	WTA-BKG-ZSD-001	WTA001	F85318-1	6010C	7439-92-1	LEAD	0.091	1.8	0.80	J	J										J					
F85318	WTA-BKG-ZSD-002	WTA003	F85318-3	6010C	7439-92-1	LEAD	0.10	2.1	1.4	J	J										J					
F85318	WTA-BKG-ZSD-006	WTA011	F85318-11	6010C	7439-92-1	LEAD	0.12	2.4	1.6	J	J										J					
F85318	WTA-BKG-ZIS-001	WTA015	F85318-15	6010C	7439-92-1	LEAD	0.42	8.3	4.9	J	J										J					
F85318	WTA-BKG-ZIS-001	WTA015	F85318-15A	8330B	118-96-7	2,4,6-TRINITROTOLUENE	40	99	99	U	UJ								UJ							
F85318	WTA-BKG-ZIS-001	WTA015	F85318-15A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85318	WTA-BKG-ZIS-001	WTA016	F85318-16	6010C	7439-92-1	LEAD	0.43	8.7	5.7	J	J										J					
F85318	WTA-BKG-ZIS-001	WTA016	F85318-16A	8330B	118-96-7	2,4,6-TRINITROTOLUENE	39	98	98	U	UJ								UJ							
F85318	WTA-BKG-ZIS-001	WTA016	F85318-16A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	39	98	98	U	UJ								UJ							
F85318	WTA-BKG-ZIS-001	WTA017	F85318-17A	8330B	118-96-7	2,4,6-TRINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZIS-001	WTA017	F85318-17A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZSB-001	WTA018	F85318-18	6010C	7439-92-1	LEAD	0.31	6.1	4.7	J	J										J					
F85318	WTA-BKG-ZIS-002	WTA020	F85318-20A	8330B	118-96-7	2,4,6-TRINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZIS-002	WTA020	F85318-20A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZIS-002	WTA021	F85318-21A	8330B	118-96-7	2,4,6-TRINITROTOLUENE	39	98	98	U	UJ								UJ							
F85318	WTA-BKG-ZIS-002	WTA021	F85318-21A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	39	98	98	U	UJ								UJ							
F85318	WTA-BKG-ZIS-002	WTA022	F85318-22A	8330B	118-96-7	2,4,6-TRINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZIS-002	WTA022	F85318-22A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZSB-003	WTA025	F85318-25	6010C	7439-92-1	LEAD	0.31	6.2	1.8	J	J										J					
F85318	WTA-BKG-ZSD-008	WTA031	F85318-31	6010C	7439-92-1	LEAD	0.13	2.6	2.0	J	J										J					
F85318	WTA-BKG-ZSD-008	WTA033	F85318-33	6010C	7439-92-1	LEAD	0.13	2.5	1.5	J	J										J					
F85318	WTA-BKG-ZSD-008	WTA037	F85318-35	6010C	7439-92-1	LEAD	0.24	4.8	1.5	J	J										J					
F85318	WTA-BKG-ZSD-009	WTA039	F85318-37	6010C	7439-92-1	LEAD	0.25	4.9	2.5	J	J										J					
F85318	WTA-BKG-ZSD-010	WTA041	F85318-39	6010C	7439-92-1	LEAD	0.29	5.8	4.0	J	J										J					
F85318	WTA-BKG-ZSD-011	WTA043	F85318-41	6010C	7439-92-1	LEAD	0.24	4.9	2.1	J	J										J					
F85318	WTA-BKG-ZSD-012	WTA045	F85318-43	6010C	7439-92-1	LEAD	0.23	4.5	3.1	J	J										J					
F85318	WTA-BKG-ZSD-013	WTA047	F85318-45	6010C	7439-92-1	LEAD	0.26	5.2	1.7	J	J										J					
F85318	WTA-BKG-ZSD-015	WTA051	F85318-49	6010C	7439-92-1	LEAD	0.29	5.8	2.1	J	J										J					
F85318	WTA-BKG-ZIS-003	WTA053	F85318-51	6010C	7439-92-1	LEAD	0.48	9.5	3.8	J	J										J					
F85318	WTA-BKG-ZIS-003	WTA053	F85318-51A	8330B	55-63-0	NITROGLYCERINE	250	990	990	U	UJ								UJ							
F85318	WTA-BKG-ZIS-003	WTA053	F85318-51A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85318	WTA-BKG-ZIS-003	WTA054	F85318-52	6010C	7439-92-1	LEAD	0.39	7.8	3.3	J	J										J					
F85318	WTA-BKG-ZIS-003	WTA054	F85318-52A	8330B	55-63-0	NITROGLYCERINE	250	990	990	U	UJ								UJ							
F85318	WTA-BKG-ZIS-003	WTA054	F85318-52A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85318	WTA-BKG-ZIS-003	WTA055	F85318-53	6010C	7439-92-1	LEAD	0.50	10	3.1	J	J										J					
F85318	WTA-BKG-ZIS-003	WTA055	F85318-53A	8330B	55-63-0	NITROGLYCERINE	250	1000	1000	U	UJ								UJ							
F85318	WTA-BKG-ZIS-003	WTA055	F85318-53A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZIS-004	WTA056	F85318-54	6010C	7439-92-1	LEAD	0.41	8.1	3.9	J	J										J					
F85318	WTA-BKG-ZIS-004	WTA056	F85318-54A	8330B	55-63-0	NITROGLYCERINE	250	1000	1000	U	UJ								UJ							
F85318	WTA-BKG-ZIS-004	WTA056	F85318-54A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZIS-004	WTA057	F85318-55	6010C	7439-92-1	LEAD	0.42	8.5	3.3	J	J										J					
F85318	WTA-BKG-ZIS-004	WTA057	F85318-55A	8330B	55-63-0	NITROGLYCERINE	250	1000	1000	U	UJ								UJ							
F85318	WTA-BKG-ZIS-004	WTA057	F85318-55A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZIS-004	WTA058	F85318-56	6010C	7439-92-1	LEAD	0.39	7.8	3.7	J	J										J					
F85318	WTA-BKG-ZIS-004	WTA058	F85318-56A	8330B	55-63-0	NITROGLYCERINE	250	990	990	U	UJ								UJ							
F85318	WTA-BKG-ZIS-004	WTA058	F85318-56A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85318	WTA-BKG-ZSB-004	WTA060	F85318-57	6010C	7439-92-1	LEAD	0.28	5.7	1.7	J	J										J					
F85318	WTA-BKG-ZSB-005	WTA062	F85318-59	6010C	7439-92-1	LEAD	0.25	4.9	3.2	J	J										J					
F85318	WTA-BKG-ZSB-010	WTA078	F85318-75	6010C	7439-92-1	LEAD	0.30	6.0	5.7	J	J										J			OutX		
F85318	WTA-BKG-ZIS-005	WTA086	F85318-81	6010C	7439-92-1	LEAD	0.42	8.3	6.9	J	J										J					
F85318	WTA-BKG-ZIS-005	WTA086	F85318-81A	8330B	55-63-0	NITROGLYCERINE	250	980	980	U	UJ								UJ							
F85318	WTA-BKG-ZIS-005	WTA086	F85318-81A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	39	98	98	U	UJ								UJ							
F85318	WTA-BKG-ZIS-005	WTA087	F85318-82	6010C	7439-92-1	LEAD	0.35	7.0	6.2	J	J										J					
F85318	WTA-BKG-ZIS-005	WTA087	F85318-82A	8330B	55-63-0	NITROGLYCERINE	250	980	980	U	UJ								UJ							
F85318	WTA-BKG-ZIS-005	WTA087	F85318-82A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	39	98	98	U	UJ								UJ							
F85318	WTA-BKG-ZIS-005	WTA088	F85318-83	6010C	7439-92-1	LEAD	0.49	9.7	5.3	J	J										J					
F85318	WTA-BKG-ZIS-005	WTA088	F85318-83A	8330B	55-63-0	NITROGLYCERINE	250	1000	1000	U	UJ								UJ							

Table 2. Summary of Qualified Data for Samples Collected August 15 - November 7, 2011

Waikane Training Area RI / FS
Waikane, Hawaii

Lab Report ID	Location ID	COC ID	Lab Sample ID	Method	Client Analyte ID	Analyte Name	Detection Limit	Reporting Limit	Reported Result	Lab Qualifiers	Final Validation Qualifier	Temperature Upon Receipt	Condition Upon Receipt	Holding Time	Method Blanks	Surrogate Recoveries	MS / MSD Recovery	MS / MSD %RPD	LCS / LCSD Recovery	LCS / LCSD %RPD	Reporting Limits	Field Blanks	Equipment Rinsates	Field Duplicates	Lab Duplicates	Professional Judgment
F85318	WTA-BKG-ZIS-005	WTA088	F85318-83A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZIS-006	WTA089	F85318-84	6010C	7439-92-1	LEAD	0.44	8.8	6.6	J	J										J					
F85318	WTA-BKG-ZIS-006	WTA089	F85318-84A	8330B	55-63-0	NITROGLYCERINE	250	990	990	U	UJ								UJ							
F85318	WTA-BKG-ZIS-006	WTA089	F85318-84A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85318	WTA-BKG-ZIS-006	WTA090	F85318-85	6010C	7439-92-1	LEAD	0.44	8.8	6.0	J	J										J					
F85318	WTA-BKG-ZIS-006	WTA090	F85318-85A	8330B	55-63-0	NITROGLYCERINE	250	990	990	U	UJ								UJ							
F85318	WTA-BKG-ZIS-006	WTA090	F85318-85A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85318	WTA-BKG-ZIS-006	WTA091	F85318-86	6010C	7439-92-1	LEAD	0.50	10	5.7	J	J										J					
F85318	WTA-BKG-ZIS-006	WTA091	F85318-86A	8330B	55-63-0	NITROGLYCERINE	250	990	990	U	UJ								UJ							
F85318	WTA-BKG-ZIS-006	WTA091	F85318-86A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85318	WTA-BKG-ZIS-007	WTA092	F85318-87	6010C	7439-92-1	LEAD	0.46	9.2	6.2	J	J										J					
F85318	WTA-BKG-ZIS-007	WTA092	F85318-87A	8330B	55-63-0	NITROGLYCERINE	250	990	990	U	UJ								UJ							
F85318	WTA-BKG-ZIS-007	WTA092	F85318-87A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85318	WTA-BKG-ZIS-007	WTA093	F85318-88	6010C	7439-92-1	LEAD	0.42	8.3	6.4	J	J										J					
F85318	WTA-BKG-ZIS-007	WTA093	F85318-88A	8330B	55-63-0	NITROGLYCERINE	250	980	980	U	UJ								UJ							
F85318	WTA-BKG-ZIS-007	WTA093	F85318-88A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	39	98	98	U	UJ								UJ							
F85318	WTA-BKG-ZIS-007	WTA094	F85318-89	6010C	7439-92-1	LEAD	0.45	8.9	5.4	J	J										J					
F85318	WTA-BKG-ZIS-007	WTA094	F85318-89A	8330B	55-63-0	NITROGLYCERINE	250	990	990	U	UJ								UJ							
F85318	WTA-BKG-ZIS-007	WTA094	F85318-89A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85318	WTA-BKG-ZIS-008	WTA095	F85318-90A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85318	WTA-BKG-ZIS-008	WTA095	F85318-90	6010C	7439-92-1	LEAD	0.33	6.7	5.8	J	J										J					
F85318	WTA-BKG-ZIS-008	WTA095	F85318-90A	8330B	55-63-0	NITROGLYCERINE	250	990	990	U	UJ								UJ							
F85318	WTA-BKG-ZIS-008	WTA096	F85318-91A	8330B	55-63-0	NITROGLYCERINE	250	1000	1000	U	UJ								UJ							
F85318	WTA-BKG-ZIS-008	WTA096	F85318-91A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZIS-008	WTA096	F85318-91	6010C	7439-92-1	LEAD	0.44	8.8	5.5	J	J										J					
F85318	WTA-BKG-ZIS-008	WTA097	F85318-92	6010C	7439-92-1	LEAD	0.39	7.8	6.0	J	J										J					
F85318	WTA-BKG-ZIS-008	WTA097	F85318-92A	8330B	55-63-0	NITROGLYCERINE	250	1000	1000	U	UJ								UJ							
F85318	WTA-BKG-ZIS-008	WTA097	F85318-92A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZIS-009	WTA098	F85318-93	6010C	7439-92-1	LEAD	0.47	9.3	5.8	J	J										J					
F85318	WTA-BKG-ZIS-009	WTA098	F85318-93A	8330B	55-63-0	NITROGLYCERINE	250	1000	1000	U	UJ								UJ							
F85318	WTA-BKG-ZIS-009	WTA098	F85318-93A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZIS-009	WTA099	F85318-94	6010C	7439-92-1	LEAD	0.40	7.9	6.0	J	J										J					
F85318	WTA-BKG-ZIS-009	WTA099	F85318-94A	8330B	55-63-0	NITROGLYCERINE	250	1000	1000	U	UJ								UJ							
F85318	WTA-BKG-ZIS-009	WTA099	F85318-94A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZIS-009	WTA100	F85318-95	6010C	7439-92-1	LEAD	0.33	6.5	5.7	J	J										J					
F85318	WTA-BKG-ZIS-009	WTA100	F85318-95A	8330B	55-63-0	NITROGLYCERINE	250	990	990	U	UJ								UJ							
F85318	WTA-BKG-ZIS-009	WTA100	F85318-95A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85318	WTA-BKG-ZIS-010	WTA105	F85318-100A	8330B	55-63-0	NITROGLYCERINE	240	970	970	U	UJ								UJ							
F85318	WTA-BKG-ZIS-010	WTA105	F85318-100A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	39	97	97	U	UJ								UJ							
F85318	WTA-BKG-ZIS-010	WTA106	F85318-101A	8330B	55-63-0	NITROGLYCERINE	250	1000	1000	U	UJ								UJ							
F85318	WTA-BKG-ZIS-010	WTA106	F85318-101A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZIS-010	WTA107	F85318-102A	8330B	55-63-0	NITROGLYCERINE	250	990	990	U	UJ								UJ							
F85318	WTA-BKG-ZIS-010	WTA107	F85318-102A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85318	WTA-BKG-ZIS-011	WTA108	F85318-103	6010C	7439-92-1	LEAD	0.37	7.5	6.3	J	J										J					
F85318	WTA-BKG-ZIS-011	WTA108	F85318-103A	8330B	55-63-0	NITROGLYCERINE	250	1000	1000	U	UJ								UJ							
F85318	WTA-BKG-ZIS-011	WTA108	F85318-103A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZIS-011	WTA109	F85318-104	6010C	7439-92-1	LEAD	0.34	6.8	4.4	J	J										J					
F85318	WTA-BKG-ZIS-011	WTA109	F85318-104A	8330B	55-63-0	NITROGLYCERINE	250	1000	1000	U	UJ								UJ							
F85318	WTA-BKG-ZIS-011	WTA109	F85318-104A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85318	WTA-BKG-ZIS-011	WTA110	F85318-105A	8330B	55-63-0	NITROGLYCERINE	250	990	990	U	UJ								UJ							
F85318	WTA-BKG-ZIS-011	WTA110	F85318-105A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85380	WTA-BKG-ZSB-013	WTA115	F85380-1	8330A	55-63-0	NITROGLYCERINE	470	1900	940	J	J										J					
F85380	WTA-BKG-ZSB-015	WTA119	F85380-2	6010C	7439-92-1	LEAD	0.25	5.0	3.5	J	J										J					
F85380	WTA-BKG-ZSB-015	WTA120	F85380-3	6010C	7439-92-1	LEAD	0.35	6.9	4.7	J	J										J					
F85380	WTA-BKG-ZIS-012	WTA123	F85380-5A	8330B	55-63-0	NITROGLYCERINE	250	990	990	U	UJ								UJ							
F85380	WTA-BKG-ZIS-012	WTA123	F85380-5A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85380	WTA-BKG-ZIS-012	WTA124	F85380-6	6010C	7439-92-1	LEAD	0.39	7.8	4.0	J	J										J					

Table 2. Summary of Qualified Data for Samples Collected August 15 - November 7, 2011

Waikane Training Area RI / FS
Waikane, Hawaii

Lab Report ID	Location ID	COC ID	Lab Sample ID	Method	Client Analyte ID	Analyte Name	Detection Limit	Reporting Limit	Reported Result	Lab Qualifiers	Final Validation Qualifier	Temperature Upon Receipt	Condition Upon Receipt	Holding Time	Method Blanks	Surrogate Recoveries	MS / MSD Recovery	MS / MSD %RPD	LCS / LCSD Recovery	LCS / LCSD %RPD	Reporting Limits	Field Blanks	Equipment Rinsates	Field Duplicates	Lab Duplicates	Professional Judgment
F85380	WTA-BKG-ZIS-012	WTA124	F85380-6A	8330B	55-63-0	NITROGLYCERINE	250	1000	1000	U	UJ								UJ							
F85380	WTA-BKG-ZIS-012	WTA124	F85380-6A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85380	WTA-BKG-ZIS-012	WTA125	F85380-7	6010C	7439-92-1	LEAD	0.43	8.5	4.8	J	J										J					
F85380	WTA-BKG-ZIS-012	WTA125	F85380-7A	8330B	55-63-0	NITROGLYCERINE	250	990	990	U	UJ								UJ							
F85380	WTA-BKG-ZIS-012	WTA125	F85380-7A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85380	Equipment Blank	WTA128	F85380-8	6010C	7440-50-8	COPPER	2.0	25.0	2.5	J	J										J					
F85428	WTA-SI-ZSD-001	WTA130	F85428-1	6010C	7439-92-1	LEAD	0.25	5.1	2.1	J	J										J					
F85428	WTA-SI-ZSD-003	WTA132	F85428-3	6010C	7439-92-1	LEAD	0.38	7.6	2.9	J	J										J					
F85428	WTA-WM-ZSD-013	WTA133	F85428-4	6010C	7439-92-1	LEAD	0.24	4.9	2.4	J	J										J					
F85428	WTA-WM-ZIS-003	WTA134	F85428-5	6010C	7439-92-1	LEAD	0.17	3.4	3.1	J	J							J			J					
F85428	WTA-WM-ZIS-003	WTA134	F85428-5A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85428	WTA-WM-ZIS-003	WTA134	F85428-5A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85428	WTA-WM-ZIS-003	WTA135	F85428-6	6010C	7439-92-1	LEAD	0.49	9.7	4.8	J	J										J					
F85428	WTA-WM-ZIS-003	WTA135	F85428-6A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85428	WTA-WM-ZIS-003	WTA135	F85428-6A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85428	WTA-WM-ZIS-003	WTA136	F85428-7	6010C	7439-92-1	LEAD	0.34	6.8	5.3	J	J										J					
F85428	WTA-WM-ZIS-003	WTA136	F85428-7A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85428	WTA-WM-ZIS-003	WTA136	F85428-7A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85428	WTA-SI-ZIS-002	WTA137	F85428-8A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZIS-002	WTA137	F85428-8A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZIS-002	WTA138	F85428-9	6010C	7439-92-1	LEAD	0.35	7.0	3.7	J	J										J					
F85428	WTA-SI-ZIS-002	WTA138	F85428-9A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZIS-002	WTA138	F85428-9A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZIS-002	WTA139	F85428-10	6010C	7439-92-1	LEAD	0.50	10	3.6	J	J										J					
F85428	WTA-SI-ZIS-002	WTA139	F85428-10A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	39	98	98	U	UJ								UJ							
F85428	WTA-SI-ZIS-002	WTA139	F85428-10A	8330B	98-95-3	NITROBENZENE	39	98	98	U	UJ								UJ							
F85428	WTA-SI-ZIS-003	WTA140	F85428-11	6010C	7439-92-1	LEAD	0.40	8.0	2.9	J	J										J					
F85428	WTA-SI-ZIS-003	WTA140	F85428-11A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZIS-003	WTA140	F85428-11A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZIS-003	WTA141	F85428-12	6010C	7439-92-1	LEAD	0.39	7.8	2.4	J	J										J					
F85428	WTA-SI-ZIS-003	WTA141	F85428-12A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85428	WTA-SI-ZIS-003	WTA141	F85428-12A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85428	WTA-SI-ZIS-003	WTA142	F85428-13	6010C	7439-92-1	LEAD	0.44	8.8	3.5	J	J										J					
F85428	WTA-SI-ZIS-003	WTA142	F85428-13A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85428	WTA-SI-ZIS-003	WTA142	F85428-13A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85428	WTA-SI-ZIS-004	WTA143	F85428-14	6010C	7439-92-1	LEAD	0.41	8.3	5.3	J	J										J					
F85428	WTA-SI-ZIS-004	WTA143	F85428-14A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZIS-004	WTA143	F85428-14A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZIS-004	WTA144	F85428-15	6010C	7439-92-1	LEAD	0.40	8.1	5.4	J	J										J					
F85428	WTA-SI-ZIS-004	WTA144	F85428-15A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZIS-004	WTA144	F85428-15A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZIS-004	WTA145	F85428-16A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85428	WTA-SI-ZIS-004	WTA145	F85428-16A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85428	WTA-SI-ZIS-005	WTA146	F85428-17	6010C	7439-92-1	LEAD	0.20	4.0	2.4	J	J										J					
F85428	WTA-SI-ZIS-005	WTA146	F85428-17A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZIS-005	WTA146	F85428-17A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZIS-005	WTA147	F85428-18	6010C	7439-92-1	LEAD	0.22	4.4	3.3	J	J										J					
F85428	WTA-SI-ZIS-005	WTA147	F85428-18A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZIS-005	WTA147	F85428-18A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZIS-005	WTA148	F85428-19	6010C	7439-92-1	LEAD	0.39	7.8	5.3	J	J										J					
F85428	WTA-SI-ZIS-005	WTA148	F85428-19A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZIS-005	WTA148	F85428-19A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85428	WTA-SI-ZSB-001	WTA149	F85428-20	6010C	7439-92-1	LEAD	0.21	4.3	2.5	J	J										J					
F85428	WTA-SI-ZSD-005	WTA151	F85428-22	6010C	7439-92-1	LEAD	0.29	5.7	4.0	J	J										J					
F85428	WTA-SI-ZSD-006	WTA152	F85428-23	6010C	7439-92-1	LEAD	0.36	7.3	5.0	J	J										J					
F85502	WTA-WM-ZIS-001	WTA154	F85502-2	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85502	WTA-WM-ZIS-001	WTA154	F85502-2	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							

Table 2. Summary of Qualified Data for Samples Collected August 15 - November 7, 2011

Waikane Training Area RI / FS
Waikane, Hawaii

Lab Report ID	Location ID	COC ID	Lab Sample ID	Method	Client Analyte ID	Analyte Name	Detection Limit	Reporting Limit	Reported Result	Lab Qualifiers	Final Validation Qualifier	Temperature Upon Receipt	Condition Upon Receipt	Holding Time	Method Blanks	Surrogate Recoveries	MS / MSD Recovery	MS / MSD %RPD	LCS / LCSD Recovery	LCS / LCSD %RPD	Reporting Limits	Field Blanks	Equipment Rinsates	Field Duplicates	Lab Duplicates	Professional Judgment
F85502	WTA-WM-ZIS-001	WTA155	F85502-3	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85502	WTA-WM-ZIS-001	WTA155	F85502-3	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85502	WTA-WM-ZIS-001	WTA156	F85502-4	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85502	WTA-WM-ZIS-001	WTA156	F85502-4	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85502	WTA-SI-ZSB-003	WTA157	F85502-5	6010C	7439-92-1	LEAD	0.20	3.9	3.8	J	J										J					
F85502	WTA-SI-ZIS-001	WTA160	F85502-8	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85502	WTA-SI-ZIS-001	WTA160	F85502-8	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85502	WTA-SI-ZIS-001	WTA161	F85502-9	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85502	WTA-SI-ZIS-001	WTA161	F85502-9	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85502	WTA-SI-ZIS-001	WTA162	F85502-10	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85502	WTA-SI-ZIS-001	WTA162	F85502-10	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85502	Equipment Blank	WTA164	F85502-12	6010C	7440-50-8	COPPER	2.0	25.0	2.2	J	J										J					
F85710	WTA-WM-ZSD-002	WTA165	F85710-1	6010C	7439-92-1	LEAD	0.24	4.9	2.7	J	J										J					
F85710	WTA-WM-ZSD-002	WTA168	F85710-3	6010C	7439-92-1	LEAD	0.29	5.7	2.1	J	J										J					
F85710	WTA-WM-ZSD-003	WTA169	F85710-4	6010C	7439-92-1	LEAD	0.29	5.8	1.1	J	J										J					
F85710	WTA-WM-ZSD-004	WTA170	F85710-5	6010C	7439-92-1	LEAD	0.26	5.1	1.7	J	J										J					
F85710	WTA-WM-ZSD-005	WTA171	F85710-6	6010C	7439-92-1	LEAD	0.28	5.7	0.87	J	J										J					
F85710	WTA-WM-ZSD-006	WTA172	F85710-7	6010C	7439-92-1	LEAD	0.29	5.7	1.5	J	J										J					
F85710	WTA-WM-ZSB-001	WTA173	F85710-8	6010C	7439-92-1	LEAD	0.27	5.5	3.8	J	J										J					
F85710	WTA-WM-ZSB-002	WTA174	F85710-9	6010C	7439-92-1	LEAD	0.37	7.3	2.5	J	J										J					
F85710	WTA-WM-ZIS-002	WTA175	F85710-10	6010C	7439-92-1	LEAD	0.41	8.2	3.0	J	J										J					
F85710	WTA-WM-ZIS-002	WTA175	F85710-10A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	39	98	98	U	UJ								UJ							
F85710	WTA-WM-ZIS-002	WTA175	F85710-10A	8330B	98-95-3	NITROBENZENE	39	98	98	U	UJ								UJ							
F85710	WTA-WM-ZIS-002	WTA176	F85710-11	6010C	7439-92-1	LEAD	0.40	8.0	3.4	J	J										J					
F85710	WTA-WM-ZIS-002	WTA176	F85710-11A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85710	WTA-WM-ZIS-002	WTA176	F85710-11A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85710	WTA-WM-ZIS-002	WTA177	F85710-12	6010C	7439-92-1	LEAD	0.35	7.1	3.0	J	J										J					
F85710	WTA-WM-ZIS-002	WTA177	F85710-12A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85710	WTA-WM-ZIS-002	WTA177	F85710-12A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85710	WTA-WM-ZSD-007	WTA178	F85710-13	6010C	7439-92-1	LEAD	0.25	5.0	2.2	J	J										J					
F85710	WTA-WM-ZSD-008	WTA179	F85710-14	6010C	7439-92-1	LEAD	0.30	6.1	1.9	J	J										J					
F85710	WTA-WM-ZSD-010	WTA181	F85710-16	6010C	7439-92-1	LEAD	0.39	7.7	1.9	J	J										J					
F85710	WTA-WM-ZSD-011	WTA182	F85710-17	6010C	7439-92-1	LEAD	0.76	15	5.8	J	J										J					
F85710	WTA-SI-ZSB-004	WTA183	F85710-18	6010C	7439-92-1	LEAD	0.22	4.5	0.73	J	J										J					
F85710	WTA-SI-ZSB-004	WTA184	F85710-19	6010C	7439-92-1	LEAD	0.32	6.3	1.2	J	J										J					
F85710	WTA-SI-ZSB-004	WTA186	F85710-20	6010C	7439-92-1	LEAD	0.31	6.1	1.4	J	J										J					
F85710	WTA-SI-ZSB-005	WTA187	F85710-21	6010C	7439-92-1	LEAD	0.34	6.8	3.4	J	J										J					
F85710	WTA-SI-ZSB-006	WTA188	F85710-22	6010C	7439-92-1	LEAD	0.35	7.0	2.7	J	J										J					
F85710	WTA-SI-ZSB-007	WTA189	F85710-23	6010C	7439-92-1	LEAD	0.37	7.4	3.6	J	J										J					
F85710	WTA-SI-ZSB-008	WTA190	F85710-24	6010C	7439-92-1	LEAD	0.90	18	4.1	JB	J				J						J					J
F85710	WTA-SI-ZSB-009	WTA191	F85710-25	6010C	7439-92-1	LEAD	0.67	13	5.4	JB	J				J						J					J
F85710	WTA-WM-ZSD-012	WTA192	F85710-26	6010C	7439-92-1	LEAD	0.37	7.4	1.1	JB	J				J						J					J
F85710	WTA-WM-ZSD-012	WTA193	F85710-27	6010C	7439-92-1	LEAD	0.49	9.8	1.6	JB	J				J						J					J
F85710	WTA-WM-ZSD-012	WTA195	F85710-28	6010C	7439-92-1	LEAD	0.43	8.5	1.6	JB	J				J						J					J
F85710	WTA-SE-ZSB-001	WTA196	F85710-29	6010C	7440-50-8	COPPER	1.1	13	56.3	B	J				J											J
F85710	WTA-SE-ZIS-001	WTA197	F85710-30A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85710	WTA-SE-ZIS-001	WTA197	F85710-30A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85710	WTA-SE-ZIS-001	WTA198	F85710-31A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85710	WTA-SE-ZIS-001	WTA198	F85710-31A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85710	WTA-SE-ZIS-001	WTA199	F85710-32A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85710	WTA-SE-ZIS-001	WTA199	F85710-32A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85710	WTA-SE-ZSB-002	WTA200	F85710-33	6010C	7439-92-1	LEAD	0.75	15	28.0	B	J				J											J
F85710	WTA-SE-ZSB-003	WTA201	F85710-34	6010C	7439-92-1	LEAD	0.70	14	7.3	JB	J				J						J					J
F85710	WTA-SE-ZIS-002	WTA202	F85710-35A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85710	WTA-SE-ZIS-002	WTA202	F85710-35A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85710	WTA-SE-ZIS-002	WTA203	F85710-36A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85710	WTA-SE-ZIS-002	WTA203	F85710-36A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							

Table 2. Summary of Qualified Data for Samples Collected August 15 - November 7, 2011

Waikane Training Area RI / FS
Waikane, Hawaii

Lab Report ID	Location ID	COC ID	Lab Sample ID	Method	Client Analyte ID	Analyte Name	Detection Limit	Reporting Limit	Reported Result	Lab Qualifiers	Final Validation Qualifier	Temperature Upon Receipt	Condition Upon Receipt	Holding Time	Method Blanks	Surrogate Recoveries	MS / MSD Recovery	MS / MSD %RPD	LCS / LCSD Recovery	LCS / LCSD %RPD	Reporting Limits	Field Blanks	Equipment Rinsates	Field Duplicates	Lab Duplicates	Professional Judgment
F85710	WTA-SE-ZIS-002	WTA204	F85710-37A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85710	WTA-SE-ZIS-002	WTA204	F85710-37A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85710	WTA-SE-ZSB-004	WTA206	F85710-38	6010C	7439-92-1	LEAD	0.56	11	11.6	B	J				J											J
F85710	WTA-SE-ZSB-005	WTA207	F85710-39	6010C	7439-92-1	LEAD	0.41	8.3	27.3	B	J				J											J
F85710	WTA-SE-ZSB-007	WTA209	F85710-41	6010C	7440-50-8	COPPER	1.2	15	52.0	B	J				J											J
F85710	WTA-SE-ZSB-007	WTA209	F85710-41	6010C	7439-92-1	LEAD	0.58	12	16.6	B	J				J											J
F85710	WTA-SE-ZSB-008	WTA210	F85710-42	6010C	7440-50-8	COPPER	0.99	12	58.5	B	J				J											J
F85710	WTA-SE-ZSB-008	WTA210	F85710-42	6010C	7439-92-1	LEAD	0.49	9.9	26.8	B	J				J											J
F85710	WTA-SE-ZSB-009	WTA211	F85710-43	6010C	7440-50-8	COPPER	0.98	12	38.1	B	J				J											J
F85710	WTA-SE-ZSB-009	WTA211	F85710-43	6010C	7439-92-1	LEAD	0.49	9.8	19.6	B	J				J											J
F85710	WTA-SE-ZSB-009	WTA212	F85710-44	6010C	7440-50-8	COPPER	1.3	16	57.6	B	J				J											J
F85710	WTA-SE-ZSB-009	WTA212	F85710-44	6010C	7439-92-1	LEAD	0.63	13	29.6	B	J				J											J
F85710	WTA-SE-ZSB-009	WTA214	F85710-45	6010C	7440-50-8	COPPER	1.1	14	46.8	B	J				J											J
F85710	WTA-SE-ZSB-009	WTA214	F85710-45	6010C	7439-92-1	LEAD	0.54	11	17.4	B	J				J											J
F85710	WTA-SE-ZSB-010	WTA215	F85710-46	6010C	7439-92-1	LEAD	0.52	10	5.6	JB	J				J						J					J
F85710	WTA-SE-ZSB-011	WTA216	F85710-47	6010C	7439-92-1	LEAD	0.46	9.3	11.5	B	J				J											J
F85710	WTA-SE-ZSB-012	WTA217	F85710-48	6010C	7440-50-8	COPPER	1.1	14	58.4	B	J				J											J
F85710	WTA-SE-ZSB-012	WTA217	F85710-48	6010C	7439-92-1	LEAD	0.57	11	17.3	B	J				J											J
F85710	WTA-SE-ZSB-013	WTA218	F85710-49	6010C	7440-50-8	COPPER	1.0	13	50.2	B	J				J											J
F85710	WTA-SE-ZSB-013	WTA218	F85710-49	6010C	7439-92-1	LEAD	0.50	10	16.7	B	J				J											J
F85710	WTA-SE-ZSB-014	WTA219	F85710-50	6010C	7439-92-1	LEAD	0.39	7.8	44.1		J+						J+									
F85710	WTA-SE-ZSB-024	WTA229	F85710-60	6010C	7439-92-1	LEAD	0.52	10	8.9	J	J										J					
F85718	WTA-SE-ZSB-028	WTA239	F85718-6	8330A	55-63-0	NITROGLYCERINE	430	1700	1380	J	J										J			OutX		
F85718	WTA-SE-ZIS-003	WTA242	F85718-8A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-003	WTA242	F85718-8A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-003	WTA243	F85718-9A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	99	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-003	WTA243	F85718-9A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-003	WTA244	F85718-10A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-003	WTA244	F85718-10A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-004	WTA245	F85718-11A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-004	WTA245	F85718-11A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-004	WTA246	F85718-12A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-004	WTA246	F85718-12A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-004	WTA247	F85718-13A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-004	WTA247	F85718-13A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-005	WTA248	F85718-14A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-005	WTA248	F85718-14A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-005	WTA249	F85718-15A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-005	WTA249	F85718-15A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-005	WTA250	F85718-16A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-005	WTA250	F85718-16A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-006	WTA251	F85718-17A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-006	WTA251	F85718-17A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-006	WTA252	F85718-18A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-006	WTA252	F85718-18A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-006	WTA253	F85718-19A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-006	WTA253	F85718-19A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-007	WTA254	F85718-20A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-007	WTA254	F85718-20A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-007	WTA255	F85718-21A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-007	WTA255	F85718-21A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-007	WTA256	F85718-22A	8330B	55-63-0	NITROGLYCERINE	250	990	466	J	J										J					
F85718	WTA-SE-ZIS-007	WTA256	F85718-22A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-007	WTA256	F85718-22A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-008	WTA257	F85718-23A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	39	98	98	U	UJ								UJ							
F85718	WTA-SE-ZIS-008	WTA257	F85718-23A	8330B	98-95-3	NITROBENZENE	39	98	98	U	UJ								UJ							
F85718	WTA-SE-ZIS-008	WTA258	F85718-24A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							

Table 2. Summary of Qualified Data for Samples Collected August 15 - November 7, 2011

Waikane Training Area RI / FS
Waikane, Hawaii

Lab Report ID	Location ID	COC ID	Lab Sample ID	Method	Client Analyte ID	Analyte Name	Detection Limit	Reporting Limit	Reported Result	Lab Qualifiers	Final Validation Qualifier	Temperature Upon Receipt	Condition Upon Receipt	Holding Time	Method Blanks	Surrogate Recoveries	MS / MSD Recovery	MS / MSD %RPD	LCS / LCSD Recovery	LCS / LCSD %RPD	Reporting Limits	Field Blanks	Equipment Rinsates	Field Duplicates	Lab Duplicates	Professional Judgment
F85718	WTA-SE-ZIS-008	WTA258	F85718-24A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-008	WTA259	F85718-25A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-008	WTA259	F85718-25A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-009	WTA260	F85718-26A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-009	WTA260	F85718-26A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-009	WTA261	F85718-27A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-009	WTA261	F85718-27A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-009	WTA262	F85718-28A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-009	WTA262	F85718-28A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-010	WTA263	F85718-29A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-010	WTA263	F85718-29A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-010	WTA264	F85718-30A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-010	WTA264	F85718-30A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-010	WTA265	F85718-31A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-010	WTA265	F85718-31A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-011	WTA266	F85718-32A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-011	WTA266	F85718-32A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-011	WTA267	F85718-33A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-011	WTA267	F85718-33A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-011	WTA268	F85718-34A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-011	WTA268	F85718-34A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-012	WTA269	F85718-35A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-012	WTA269	F85718-35A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-012	WTA270	F85718-36A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-012	WTA270	F85718-36A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-012	WTA271	F85718-37A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-012	WTA271	F85718-37A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-013	WTA273	F85718-38A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-013	WTA273	F85718-38A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-013	WTA274	F85718-39A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-013	WTA274	F85718-39A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-013	WTA275	F85718-40A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-013	WTA275	F85718-40A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-014	WTA276	F85718-41A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-014	WTA276	F85718-41A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-014	WTA277	F85718-42	6010C	7439-92-1	LEAD	0.41	8.2	6.0	J	J										J					
F85718	WTA-SE-ZIS-014	WTA277	F85718-42A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	39	98	98	U	UJ								UJ							
F85718	WTA-SE-ZIS-014	WTA277	F85718-42A	8330B	98-95-3	NITROBENZENE	39	98	98	U	UJ								UJ							
F85718	WTA-SE-ZIS-014	WTA278	F85718-43A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-014	WTA278	F85718-43A	8330B	98-95-3	NITROBENZENE	40	100	100	U	UJ								UJ							
F85718	WTA-SE-ZIS-015	WTA279	F85718-44A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-015	WTA279	F85718-44A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-015	WTA280	F85718-45A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-015	WTA280	F85718-45A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-015	WTA281	F85718-46A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-015	WTA281	F85718-46A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-016	WTA282	F85718-47A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-016	WTA282	F85718-47A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-016	WTA283	F85718-48A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-016	WTA283	F85718-48A	8330B	98-95-3	NITROBENZENE	40	99	99	U	UJ								UJ							
F85718	WTA-SE-ZIS-016	WTA284	F85718-49A	8330B	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	39	98	98	U	UJ								UJ							
F85718	WTA-SE-ZIS-016	WTA284	F85718-49A	8330B	98-95-3	NITROBENZENE	39	98	98	U	UJ								UJ							
F86860	WTA-WM-ZIS-001	WTA154B	F86860-1	6020A	7440-50-8	COPPER	0.20	4.9	105		J						J+	J								
											TOTAL	0	0	0	26	0	2	2	216	0	101	0	0	0	0	26

Table 3. Summary of Results Reported from Dilutions

Waikane Training Area RI / FS
Island of Oahu, Hawaii

File Name	Lab Sample ID	Location ID	COC ID	Dilution Factor	Copper			Lead		
					MDL	PQL	Result	MDL	PQL	Result
F85318	F85318-15	WTA-BKG-ZIS-001	WTA015	10	0.83	10	67.8	0.42	8.3	4.9 J
F85318	F85318-16	WTA-BKG-ZIS-001	WTA016	10	0.87	11	75.8	0.43	8.7	5.7 J
F85318	F85318-17	WTA-BKG-ZIS-001	WTA017	10	0.69	8.6	74.4	0.34	6.9	14.1
F85318	F85318-20	WTA-BKG-ZIS-002	WTA020	10	0.81	10	111	0.41	8.1	39.4
F85318	F85318-21	WTA-BKG-ZIS-002	WTA021	10	0.83	10	114	0.41	8.3	15.5
F85318	F85318-22	WTA-BKG-ZIS-002	WTA022	10	0.81	10	133	0.4	8.1	8.7
F85318	F85318-51	WTA-BKG-ZIS-003	WTA053	10	0.95	12	101	0.48	9.5	3.8 J
F85318	F85318-52	WTA-BKG-ZIS-003	WTA054	10	0.78	9.8	83.2	0.39	7.8	3.3 J
F85318	F85318-53	WTA-BKG-ZIS-003	WTA055	10	1	13	95	0.5	10	3.1 J
F85318	F85318-54	WTA-BKG-ZIS-004	WTA056	10	0.81	10	94.8	0.41	8.1	3.9 J
F85318	F85318-55	WTA-BKG-ZIS-004	WTA057	10	0.85	11	95.6	0.42	8.5	3.3 J
F85318	F85318-56	WTA-BKG-ZIS-004	WTA058	10	0.78	9.8	98.8	0.39	7.8	3.7 J
F85318	F85318-81	WTA-BKG-ZIS-005	WTA086	10	0.83	10	111	0.42	8.3	6.9 J
F85318	F85318-82	WTA-BKG-ZIS-005	WTA087	10	0.7	8.8	108	0.35	7	6.2 J
F85318	F85318-83	WTA-BKG-ZIS-005	WTA088	10	0.97	12	103	0.49	9.7	5.3 J
F85318	F85318-84	WTA-BKG-ZIS-006	WTA089	10	0.88	11	111	0.44	8.8	6.6 J
F85318	F85318-85	WTA-BKG-ZIS-006	WTA090	10	0.88	11	108	0.44	8.8	6.0 J
F85318	F85318-86	WTA-BKG-ZIS-006	WTA091	10	1	13	117	0.5	10	5.7 J
F85318	F85318-87	WTA-BKG-ZIS-007	WTA092	10	0.92	11	103	0.46	9.2	6.2 J
F85318	F85318-88	WTA-BKG-ZIS-007	WTA093	10	0.83	10	114	0.42	8.3	6.4 J
F85318	F85318-89	WTA-BKG-ZIS-007	WTA094	10	0.89	11	272	0.45	8.9	5.4 J
F85318	F85318-90	WTA-BKG-ZIS-008	WTA095	10	0.67	8.3	116	0.33	6.7	5.8 J
F85318	F85318-91	WTA-BKG-ZIS-008	WTA096	10	0.88	11	105	0.44	8.8	5.5 J
F85318	F85318-92	WTA-BKG-ZIS-008	WTA097	10	0.78	9.8	91.9	0.39	7.8	6.0 J
F85318	F85318-93	WTA-BKG-ZIS-009	WTA098	10	0.93	12	109	0.47	9.3	5.8 J
F85318	F85318-94	WTA-BKG-ZIS-009	WTA099	10	0.79	9.9	87	0.4	7.9	6.0 J
F85318	F85318-95	WTA-BKG-ZIS-009	WTA100	10	0.65	8.2	92.3	0.33	6.5	5.7 J
F85318	F85318-100	WTA-BKG-ZIS-010	WTA105	10	0.63	7.9	57.2	0.32	6.3	8.3
F85318	F85318-101	WTA-BKG-ZIS-010	WTA106	10	0.66	8.3	56.1	0.33	6.6	7.4
F85318	F85318-102	WTA-BKG-ZIS-010	WTA107	10	0.65	8.1	52.9	0.32	6.5	8.8
F85318	F85318-103	WTA-BKG-ZIS-011	WTA108	10	0.75	9.3	79.5	0.37	7.5	6.3 J
F85318	F85318-104	WTA-BKG-ZIS-011	WTA109	10	0.68	8.5	87.3	0.34	6.8	4.4 J
F85318	F85318-105	WTA-BKG-ZIS-011	WTA110	10	0.79	9.9	71.9	0.4	7.9	9.5
F85318	F85318-18	WTA-BKG-ZSB-001	WTA018	4	0.61	7.7	87	0.31	6.1	4.7 J
F85318	F85318-23	WTA-BKG-ZSB-002	WTA023	2	0.29	3.6	102	0.15	2.9	59
F85318	F85318-25	WTA-BKG-ZSB-003	WTA025	4	0.62	7.7	89.8	0.31	6.2	1.8 J
F85318	F85318-57	WTA-BKG-ZSB-004	WTA060	4	0.57	7.1	89.6	0.28	5.7	1.7 J
F85318	F85318-59	WTA-BKG-ZSB-005	WTA062	4	0.49	6.2	86.2	0.25	4.9	3.2 J
F85318	F85318-61	WTA-BKG-ZSB-006	WTA064	2	0.23	2.9	60.5	--	--	--
F85318	F85318-67	WTA-BKG-ZSB-007	WTA070	4	0.51	6.4	93.2	0.26	5.1	5.6
F85318	F85318-69	WTA-BKG-ZSB-008	WTA072	4	0.37	4.6	72.3	0.18	3.7	4.3
F85318	F85318-71	WTA-BKG-ZSB-009	WTA074	4	0.56	7	103	0.28	5.6	9.8
F85318	F85318-73	WTA-BKG-ZSB-010	WTA076	4	0.44	5.5	80.6	0.22	4.4	5
F85318	F85318-75	WTA-BKG-ZSB-010	WTA078	4	0.6	7.5	137	0.3	6	5.7 J
F85318	F85318-77	WTA-BKG-ZSB-010	WTA082	2	0.31	3.8	110	0.15	3.1	3.7 J
F85318	F85318-79	WTA-BKG-ZSB-011	WTA084	4	0.4	5.1	50	0.2	4	4.7
F85318	F85318-96	WTA-BKG-ZSB-012	WTA101	4	0.46	5.7	69.8	0.23	4.6	5.9
F85318	F85318-98	WTA-BKG-ZSB-014	WTA103	4	0.37	4.7	68	0.19	3.7	3.7
F85318	F85318-1	WTA-BKG-ZSD-001	WTA001	2	0.18	2.3	50.7	0.091	1.8	0.80 J
F85318	F85318-3	WTA-BKG-ZSD-002	WTA003	2	0.21	2.6	68.2	0.1	2.1	1.4 J
F85318	F85318-5	WTA-BKG-ZSD-003	WTA005	2	0.2	2.5	62	0.1	2	2.6
F85318	F85318-7	WTA-BKG-ZSD-004	WTA007	2	0.36	4.5	74.3	--	--	--
F85318	F85318-9	WTA-BKG-ZSD-005	WTA009	2	0.18	2.3	55.8	0.092	1.8	2
F85318	F85318-11	WTA-BKG-ZSD-006	WTA011	2	0.24	3	66.9	0.12	2.4	1.6 J
F85318	F85318-13	WTA-BKG-ZSD-007	WTA013	2	0.23	2.9	59.6	0.12	2.3	5.2
F85318	F85318-31	WTA-BKG-ZSD-008	WTA031	2	0.26	3.3	84.4	0.13	2.6	2.0 J
F85318	F85318-33	WTA-BKG-ZSD-008	WTA033	2	0.25	3.2	86.5	0.13	2.5	1.5 J
F85318	F85318-35	WTA-BKG-ZSD-008	WTA037	4	0.48	5.9	89.1	0.24	4.8	1.5 J
F85318	F85318-37	WTA-BKG-ZSD-009	WTA039	4	0.49	6.1	84.6	0.25	4.9	2.5 J

Table 3. Summary of Results Reported from Dilutions

Waikane Training Area RI / FS
Island of Oahu, Hawaii

File Name	Lab Sample ID	Location ID	COC ID	Dilution Factor	Copper			Lead		
					MDL	PQL	Result	MDL	PQL	Result
F85318	F85318-39	WTA-BKG-ZSD-010	WTA041	4	0.58	7.2	83.2	0.29	5.8	4.0 J
F85318	F85318-41	WTA-BKG-ZSD-011	WTA043	4	0.49	6.1	86.2	0.24	4.9	2.1 J
F85318	F85318-43	WTA-BKG-ZSD-012	WTA045	4	0.45	5.6	72.9	0.23	4.5	3.1 J
F85318	F85318-45	WTA-BKG-ZSD-013	WTA047	4	0.52	6.5	89.7	0.26	5.2	1.7 J
F85318	F85318-47	WTA-BKG-ZSD-014	WTA049	2	0.24	3	74.2	--	--	--
F85318	F85318-49	WTA-BKG-ZSD-015	WTA051	4	0.58	7.2	107	0.29	5.8	2.1 J
F85380	F85380-5	WTA-BKG-ZIS-012	WTA123	10	0.78	9.7	70.7	0.39	7.8	7.9
F85380	F85380-6	WTA-BKG-ZIS-012	WTA124	10	0.78	9.7	90.7	0.39	7.8	4.0 J
F85380	F85380-7	WTA-BKG-ZIS-012	WTA125	10	0.85	11	97	0.43	8.5	4.8 J
F85380	F85380-1	WTA-BKG-ZSB-013	WTA115	5	0.77	9.7	75.8	0.39	7.7	13.8
F85380	F85380-2	WTA-BKG-ZSB-015	WTA119	5	0.5	6.3	76.6	0.25	5	3.5 J
F85380	F85380-3	WTA-BKG-ZSB-015	WTA120	5	0.69	8.6	87	0.35	6.9	4.7 J
F85380	F85380-4	WTA-BKG-ZSB-016	WTA122	5	0.53	6.6	57.4	0.27	5.3	7.6
F85428	F85428-5	WTA-SI-ZIS-001	WTA134	5	0.34	4.2	96.8	0.17	3.4	3.1 J
F85428	F85428-6	WTA-SI-ZIS-001	WTA135	10	0.97	12	97.3	0.49	9.7	4.8 J
F85428	F85428-7	WTA-SI-ZIS-001	WTA136	10	0.68	8.4	91.4	0.34	6.8	5.3 J
F85428	F85428-8	WTA-SI-ZIS-002	WTA137	5	0.4	5	86	0.2	4	7.7
F85428	F85428-9	WTA-SI-ZIS-002	WTA138	10	0.7	8.8	87.5	0.35	7	3.7 J
F85428	F85428-10	WTA-SI-ZIS-002	WTA139	10	1	13	85.5	0.5	10	3.6 J
F85428	F85428-11	WTA-SI-ZIS-003	WTA140	10	0.8	10	91.8	0.4	8	2.9 J
F85428	F85428-12	WTA-SI-ZIS-003	WTA141	10	0.78	9.8	102	0.39	7.8	2.4 J
F85428	F85428-13	WTA-SI-ZIS-003	WTA142	10	0.88	11	96.1	0.44	8.8	3.5 J
F85428	F85428-14	WTA-SI-ZIS-004	WTA143	10	0.83	10	80.8	0.41	8.3	5.3 J
F85428	F85428-15	WTA-SI-ZIS-004	WTA144	10	0.81	10	77.7	0.4	8.1	5.4 J
F85428	F85428-16	WTA-SI-ZIS-004	WTA145	10	0.79	9.9	74.9	0.4	7.9	8.1
F85428	F85428-17	WTA-SI-ZIS-005	WTA146	5	0.4	5	86.2	0.2	4	2.4 J
F85428	F85428-18	WTA-SI-ZIS-005	WTA147	5	0.44	5.5	105	0.22	4.4	3.3 J
F85428	F85428-19	WTA-SI-ZIS-005	WTA148	10	0.78	9.7	97.5	0.39	7.8	5.3 J
F85428	F85428-20	WTA-SI-ZSB-001	WTA149	4	0.43	5.3	74.1	0.21	4.3	2.5 J
F85428	F85428-1	WTA-SI-ZSD-001	WTA130	4	0.51	6.3	76.9	0.25	5.1	2.1 J
F85428	F85428-2	WTA-SI-ZSD-002	WTA131	4	0.6	7.5	71.2	--	--	--
F85428	F85428-3	WTA-SI-ZSD-003	WTA132	4	0.76	9.5	123	0.38	7.6	2.9 J
F85428	F85428-4	WTA-SI-ZSD-004	WTA133	4	0.49	6.1	86.2	0.24	4.9	2.4 J
F85428	F85428-22	WTA-SI-ZSD-005	WTA151	5	0.57	7.1	88.6	0.29	5.7	4.0 J
F85428	F85428-23	WTA-SI-ZSD-006	WTA152	5	0.73	9.1	89	0.36	7.3	5.0 J
F85428	F85428-21	WTA-WM-ZSB-002	WTA150	4	0.49	6.1	66.3	0.24	4.9	9.8
F85502	F85502-5	WTA-SI-ZSB-003	WTA157	4	0.39	4.9	119	0.2	3.9	3.8 J
F85502	F85502-6	WTA-SI-ZSD-007	WTA158	5	1.3	16	126	--	--	--
F85502	F85502-7	WTA-SI-ZSD-008	WTA159	5	0.91	11	88	--	--	--
F85502	F85502-1	WTA-WM-ZSD-001	WTA153	5	0.7	8.8	63.4	--	--	--
F85710	F85710-30	WTA-SE-ZIS-001	WTA197	10	0.7	8.7	55.8	0.35	7	12.3
F85710	F85710-31	WTA-SE-ZIS-001	WTA198	10	0.79	9.9	70.2	0.4	7.9	9.5
F85710	F85710-32	WTA-SE-ZIS-001	WTA199	10	0.78	9.7	54.7	0.39	7.8	9.6
F85710	F85710-35	WTA-SE-ZIS-002	WTA202	10	0.81	10	56.6	0.4	8.1	11.9
F85710	F85710-36	WTA-SE-ZIS-002	WTA203	10	0.84	11	50.1	0.42	8.4	11.8
F85710	F85710-37	WTA-SE-ZIS-002	WTA204	10	0.87	11	46.4	0.43	8.7	11
F85710	F85710-29	WTA-SE-ZSB-001	WTA196	10	1.1	13	56.3 J	0.53	11	34.5
F85710	F85710-33	WTA-SE-ZSB-002	WTA200	10	1.5	19	62.6	0.75	15	28.0 J
F85710	F85710-34	WTA-SE-ZSB-003	WTA201	10	1.4	17	81.5	0.7	14	7.3 J
F85710	F85710-38	WTA-SE-ZSB-004	WTA206	10	1.1	14	77.8	0.56	11	11.6 J
F85710	F85710-39	WTA-SE-ZSB-005	WTA207	10	0.83	10	61.5	0.41	8.3	27.3 J
F85710	F85710-40	WTA-SE-ZSB-006	WTA208	10	1	13	102	0.51	10	46.4
F85710	F85710-41	WTA-SE-ZSB-007	WTA209	10	1.2	15	52.0 J	0.58	12	16.6 J
F85710	F85710-42	WTA-SE-ZSB-008	WTA210	10	0.99	12	58.5 J	0.49	9.9	26.8 J
F85710	F85710-43	WTA-SE-ZSB-009	WTA211	10	0.98	12	38.1 J	0.49	9.8	19.6 J
F85710	F85710-44	WTA-SE-ZSB-009	WTA212	10	1.3	16	57.6 J	0.63	13	29.6 J
F85710	F85710-45	WTA-SE-ZSB-009	WTA214	10	1.1	14	46.8 J	0.54	11	17.4 J
F85710	F85710-46	WTA-SE-ZSB-010	WTA215	10	1	13	104	0.52	10	5.6 J
F85710	F85710-47	WTA-SE-ZSB-011	WTA216	10	0.93	12	75.4	0.46	9.3	11.5 J

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Waikane Training Area RI / FS
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File Name	Lab Sample ID	Location ID	COC ID	Dilution Factor	Copper			Lead		
					MDL	PQL	Result	MDL	PQL	Result
F85710	F85710-48	WTA-SE-ZSB-012	WTA217	10	1.1	14	58.4 J	0.57	11	17.3 J
F85710	F85710-49	WTA-SE-ZSB-013	WTA218	10	1	13	50.2 J	0.5	10	16.7 J
F85710	F85710-50	WTA-SE-ZSB-014	WTA219	10	0.78	9.7	44.6	0.39	7.8	44.1 J+
F85710	F85710-51	WTA-SE-ZSB-015	WTA220	10	1.2	15	46	0.6	12	110
F85710	F85710-52	WTA-SE-ZSB-016	WTA221	10	1.1	14	196	0.54	11	1830
F85710	F85710-53	WTA-SE-ZSB-017	WTA222	10	0.94	12	50.5	0.47	9.4	48
F85710	F85710-54	WTA-SE-ZSB-018	WTA223	10	0.91	11	94.1	0.45	9.1	35.8
F85710	F85710-55	WTA-SE-ZSB-019	WTA224	10	1	13	40.2	0.5	10	38
F85710	F85710-56	WTA-SE-ZSB-020	WTA225	10	0.87	11	39	0.44	8.7	25
F85710	F85710-57	WTA-SE-ZSB-021	WTA226	10	1.1	14	64.6	0.55	11	26.2
F85710	F85710-58	WTA-SE-ZSB-022	WTA227	10	0.97	12	44.6	0.48	9.7	21.2
F85710	F85710-59	WTA-SE-ZSB-023	WTA228	10	1.1	14	65.8	0.57	11	69.1
F85710	F85710-60	WTA-SE-ZSB-024	WTA229	10	1	13	37.4	0.52	10	8.9 J
F85710	F85710-61	WTA-SE-ZSB-025	WTA230	10	0.86	11	43.3	0.43	8.6	18
F85710	F85710-18	WTA-SI-ZSB-004	WTA183	5	0.45	5.6	81.2	0.22	4.5	0.73 J
F85710	F85710-19	WTA-SI-ZSB-004	WTA184	5	0.63	7.9	67.9	0.32	6.3	1.2 J
F85710	F85710-20	WTA-SI-ZSB-004	WTA186	5	0.61	7.7	76.3	0.31	6.1	1.4 J
F85710	F85710-21	WTA-SI-ZSB-005	WTA187	5	0.68	8.5	89.9	0.34	6.8	3.4 J
F85710	F85710-22	WTA-SI-ZSB-006	WTA188	5	0.7	8.7	111	0.35	7	2.7 J
F85710	F85710-23	WTA-SI-ZSB-007	WTA189	5	0.74	9.3	79.7	0.37	7.4	3.6 J
F85710	F85710-24	WTA-SI-ZSB-008	WTA190	10	1.8	22	101	0.9	18	4.1 J
F85710	F85710-25	WTA-SI-ZSB-009	WTA191	10	1.3	17	123	0.67	13	5.4 J
F85710	F85710-10	WTA-WM-ZIS-002	WTA175	10	0.82	10	85.5	0.41	8.2	3.0 J
F85710	F85710-11	WTA-WM-ZIS-002	WTA176	10	0.8	10	78.9	0.4	8	3.4 J
F85710	F85710-12	WTA-WM-ZIS-002	WTA177	10	0.71	8.9	81.6	0.35	7.1	3.0 J
F85710	F85710-8	WTA-WM-ZSB-001	WTA173	5	0.55	6.9	85.8	0.27	5.5	3.8 J
F85710	F85710-9	WTA-WM-ZSB-002	WTA174	5	0.73	9.2	113	0.37	7.3	2.5 J
F85710	F85710-1	WTA-WM-ZSD-002	WTA165	5	0.49	6.1	95.5	0.24	4.9	2.7 J
F85710	F85710-2	WTA-WM-ZSD-002	WTA166	5	0.74	9.3	121	0.37	7.4	9.1
F85710	F85710-3	WTA-WM-ZSD-002	WTA168	5	0.57	7.1	102	0.29	5.7	2.1 J
F85710	F85710-4	WTA-WM-ZSD-003	WTA169	5	0.58	7.2	95.9	0.29	5.8	1.1 J
F85710	F85710-5	WTA-WM-ZSD-004	WTA170	5	0.51	6.4	105	0.26	5.1	1.7 J
F85710	F85710-6	WTA-WM-ZSD-005	WTA171	5	0.57	7.1	82.1	0.28	5.7	0.87 J
F85710	F85710-7	WTA-WM-ZSD-006	WTA172	5	0.57	7.1	105	0.29	5.7	1.5 J
F85710	F85710-13	WTA-WM-ZSD-007	WTA178	5	0.5	6.2	87.8	0.25	5	2.2 J
F85710	F85710-14	WTA-WM-ZSD-008	WTA179	5	0.61	7.6	98	0.3	6.1	1.9 J
F85710	F85710-15	WTA-WM-ZSD-009	WTA180	5	0.75	9.4	110	0.38	7.5	10.1
F85710	F85710-16	WTA-WM-ZSD-010	WTA181	5	0.77	9.6	66.9	0.39	7.7	1.9 J
F85710	F85710-17	WTA-WM-ZSD-011	WTA182	5	1.5	19	189	0.76	15	5.8 J
F85710	F85710-26	WTA-WM-ZSD-012	WTA192	10	0.74	9.2	75.6	0.37	7.4	1.1 J
F85710	F85710-27	WTA-WM-ZSD-012	WTA193	10	0.98	12	69.8	0.49	9.8	1.6 J
F85710	F85710-28	WTA-WM-ZSD-012	WTA195	10	0.85	11	80.6	0.43	8.5	1.6 J
F85718	F85718-8	WTA-SE-ZIS-003	WTA242	10	0.68	8.5	57.7	0.34	6.8	325
F85718	F85718-9	WTA-SE-ZIS-003	WTA243	10	0.72	9	57.6	0.36	7.2	210
F85718	F85718-10	WTA-SE-ZIS-003	WTA244	10	0.7	8.7	44.3	0.35	7	99.4
F85718	F85718-11	WTA-SE-ZIS-004	WTA245	10	0.71	8.9	143	0.36	7.1	17.8
F85718	F85718-12	WTA-SE-ZIS-004	WTA246	10	0.81	10	66.2	0.41	8.1	15.3
F85718	F85718-13	WTA-SE-ZIS-004	WTA247	10	0.7	8.8	50.4	0.35	7	14.5
F85718	F85718-14	WTA-SE-ZIS-005	WTA248	10	0.76	9.5	44.3	0.38	7.6	15.2
F85718	F85718-15	WTA-SE-ZIS-005	WTA249	10	0.93	12	45.6	0.46	9.3	14.8
F85718	F85718-16	WTA-SE-ZIS-005	WTA250	10	0.67	8.3	43	0.33	6.7	16.9
F85718	F85718-17	WTA-SE-ZIS-006	WTA251	10	0.73	9.1	31	0.36	7.3	15.6
F85718	F85718-18	WTA-SE-ZIS-006	WTA252	10	0.96	12	36.8	0.48	9.6	14.2
F85718	F85718-19	WTA-SE-ZIS-006	WTA253	10	0.75	9.3	32	0.37	7.5	16.1
F85718	F85718-20	WTA-SE-ZIS-007	WTA254	10	0.72	9.1	46.2	0.36	7.2	13.9
F85718	F85718-21	WTA-SE-ZIS-007	WTA255	10	0.91	11	58.6	0.45	9.1	15.8
F85718	F85718-22	WTA-SE-ZIS-007	WTA256	10	0.69	8.7	71.4	0.35	6.9	20.9
F85718	F85718-23	WTA-SE-ZIS-008	WTA257	10	0.83	10	108	0.41	8.3	30.2
F85718	F85718-24	WTA-SE-ZIS-008	WTA258	10	0.83	10	188	0.42	8.3	27.8

Table 3. Summary of Results Reported from Dilutions

Waikane Training Area RI / FS
Island of Oahu, Hawaii

File Name	Lab Sample ID	Location ID	COC ID	Dilution Factor	Copper			Lead		
					MDL	PQL	Result	MDL	PQL	Result
F85718	F85718-25	WTA-SE-ZIS-008	WTA259	10	0.85	11	102	0.43	8.5	30.5
F85718	F85718-26	WTA-SE-ZIS-009	WTA260	10	0.88	11	76.4	0.44	8.8	12.4
F85718	F85718-27	WTA-SE-ZIS-009	WTA261	10	0.84	11	83.2	0.42	8.4	13.6
F85718	F85718-28	WTA-SE-ZIS-009	WTA262	10	0.87	11	68	0.43	8.7	11.5
F85718	F85718-29	WTA-SE-ZIS-010	WTA263	10	0.83	10	55.9	0.42	8.3	26.6
F85718	F85718-30	WTA-SE-ZIS-010	WTA264	10	0.79	9.9	69.1	0.4	7.9	31.7
F85718	F85718-31	WTA-SE-ZIS-010	WTA265	10	0.72	9.1	65.1	0.36	7.2	74.3
F85718	F85718-32	WTA-SE-ZIS-011	WTA266	10	0.94	12	48.9	0.47	9.4	11.2
F85718	F85718-33	WTA-SE-ZIS-011	WTA267	10	0.87	11	44	0.43	8.7	11.7
F85718	F85718-34	WTA-SE-ZIS-011	WTA268	10	0.66	8.3	38.3	0.33	6.6	13.4
F85718	F85718-35	WTA-SE-ZIS-012	WTA269	10	0.92	11	103	0.46	9.2	38.6
F85718	F85718-36	WTA-SE-ZIS-012	WTA270	10	0.9	11	75.4	0.45	9	24.8
F85718	F85718-37	WTA-SE-ZIS-012	WTA271	10	0.88	11	79.9	0.44	8.8	20.3
F85718	F85718-38	WTA-SE-ZIS-013	WTA273	10	0.65	8.1	124	0.32	6.5	10
F85718	F85718-39	WTA-SE-ZIS-013	WTA274	10	0.93	12	115	0.46	9.3	12.3
F85718	F85718-40	WTA-SE-ZIS-013	WTA275	10	0.69	8.7	62	0.35	6.9	16.4
F85718	F85718-41	WTA-SE-ZIS-014	WTA276	10	0.78	9.7	68.9	0.39	7.8	14.5
F85718	F85718-42	WTA-SE-ZIS-014	WTA277	10	0.82	10	71.9	0.41	8.2	6.0 J
F85718	F85718-43	WTA-SE-ZIS-014	WTA278	10	0.63	7.8	101	0.31	6.3	17.1
F85718	F85718-44	WTA-SE-ZIS-015	WTA279	10	0.94	12	61.4	0.47	9.4	52.1
F85718	F85718-45	WTA-SE-ZIS-015	WTA280	10	0.7	8.8	64.5	0.35	7	30.9
F85718	F85718-46	WTA-SE-ZIS-015	WTA281	10	0.63	7.8	48.3	0.31	6.3	28.3
F85718	F85718-47	WTA-SE-ZIS-016	WTA282	10	0.68	8.6	362	0.34	6.8	22.5
F85718	F85718-48	WTA-SE-ZIS-016	WTA283	10	0.75	9.4	111	0.38	7.5	20.4
F85718	F85718-49	WTA-SE-ZIS-016	WTA284	10	0.72	9	91.7	0.36	7.2	17
F85718	F85718-1	WTA-SE-ZSB-026	WTA233	10	1.2	15	71.5	0.61	12	101
F85718	F85718-2	WTA-SE-ZSB-026	WTA234	10	1.2	15	90.5	0.58	12	78.2
F85718	F85718-3	WTA-SE-ZSB-026	WTA236	10	0.85	11	66.5	0.43	8.5	50.8
F85718	F85718-4	WTA-SE-ZSB-027	WTA237	10	0.73	9.1	170	0.37	7.3	84.7
F85718	F85718-5	WTA-SE-ZSB-028	WTA238	10	0.98	12	74.4	0.49	9.8	223
F85718	F85718-6	WTA-SE-ZSB-028	WTA239	10	1	13	68.5	0.51	10	120
F85718	F85718-7	WTA-SE-ZSB-028	WTA241	10	0.96	12	78.1	0.48	9.6	131

All results in milligrams per kilogram (mg/Kg).
Instances in which results were not reported from dilutions are indicated with dashes.
MDL method detection limit
PQL practical quantitation limit (also referred to as reporting limit)

ATTACHMENT A

ADR® Project Library

Library Data Review Criteria: Holding Times

Library Group ID : Waikane Valley   All Methods

Sample Matrix : AQ

Analytical Method	Sampling To Extraction	Extraction To Analysis	Sampling To Analysis	Units	Rejection Point	Rejection Point Criteria
6010C			180	Days	2	GT
6020A			180	Days	2	GT
6850			28	Days	2	GT
8330A	7	40		Days	2	GT
8330B	7	40		Days	2	GT
8332	7	40		Days	2	GT

Legend

Rejection Point Criteria
LT : Less Than   *GT : Greater Than*
LE : Less Than or Equal   *GE : Greater Than or Equal*

Library Data Review Criteria: Holding Times

Library Group ID : Waikane Valley — All Methods

Sample Matrix : SO

Analytical Method	Sampling To Extraction	Extraction To Analysis	Sampling To Analysis	Units	Rejection Point	Rejection Point Criteria
6010C			180	Days	2	GT
6020A			180	Days	2	GT
6850M			28	Days	2	GT
8330A	14	40		Days	2	GT
8330B	14	40		Days	2	GT
8332	14	40		Days	2	GT

Legend

Rejection Point Criteria
LT : Less Than — *GT : Greater Than*
LE : Less Than or Equal — *GE : Greater Than or Equal*

Library Data Review Criteria: Reporting and Detection Limits

Library Group ID : Waikane Valley   All Methods

Sample Matrix : AQ

Analytical Method	Client Analyte ID	Analyte Name	Reporting Limit Criteria	Reporting Limit Type	Units
6010C	7440-50-8	COPPER	8	MRL	ug/L
	7439-92-1	Lead	1	MRL	ug/L
6020A	7440-50-8	COPPER	8	MRL	ug/L
	7439-92-1	Lead	1	MRL	ug/L
6850	14797-73-0	PERCHLORATE	0.2	MRL	ug/L
8330A	99-35-4	1,3,5-TRINITROBENZENE	0.2	MRL	ug/L
	99-65-0	1,3-DINITROBENZENE	0.2	MRL	ug/L
	118-96-7	2,4,6-TRINITROTOLUENE	0.2	MRL	ug/L
	121-14-2	2,4-DINITROTOLUENE	0.2	MRL	ug/L
	606-20-2	2,6-DINITROTOLUENE	0.2	MRL	ug/L
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	0.2	MRL	ug/L
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	0.2	MRL	ug/L
	2691-41-0	HMX	0.2	MRL	ug/L
	99-08-1	m-Nitrotoluene	0.2	MRL	ug/L
	98-95-3	NITROBENZENE	0.2	MRL	ug/L
	55-63-0	NITROGLYCERINE	2	MRL	ug/L
	88-72-2	o-Nitrotoluene	0.2	MRL	ug/L
	78-11-5	PETN	2	MRL	ug/L
	99-99-0	p-Nitrotoluene	0.2	MRL	ug/L
	121-82-4	RDX	0.2	MRL	ug/L
	479-45-8	Tetryl	0.2	MRL	ug/L
8330B	99-35-4	1,3,5-TRINITROBENZENE	0.2	MRL	ug/L
	99-65-0	1,3-DINITROBENZENE	0.2	MRL	ug/L
	118-96-7	2,4,6-TRINITROTOLUENE	0.2	MRL	ug/L
	121-14-2	2,4-DINITROTOLUENE	0.2	MRL	ug/L
	606-20-2	2,6-DINITROTOLUENE	0.2	MRL	ug/L
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	0.2	MRL	ug/L
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	0.2	MRL	ug/L
	2691-41-0	HMX	0.2	MRL	ug/L
	99-08-1	m-Nitrotoluene	0.2	MRL	ug/L
	98-95-3	NITROBENZENE	0.2	MRL	ug/L
	55-63-0	NITROGLYCERINE	2	MRL	ug/L
	88-72-2	o-Nitrotoluene	0.2	MRL	ug/L
	78-11-5	PETN	2	MRL	ug/L
	99-99-0	p-Nitrotoluene	0.2	MRL	ug/L
	121-82-4	RDX	0.2	MRL	ug/L
	479-45-8	Tetryl	0.2	MRL	ug/L
8332	55-63-0	NITROGLYCERINE	2	MRL	ug/L
	78-11-5	PETN	2	MRL	ug/L

Library Data Review Criteria: Reporting and Detection Limits

Library Group ID : Waikane Valley — All Methods

Sample Matrix : SO

Analytical Method	Client Analyte ID	Analyte Name	Reporting Limit Criteria	Reporting Limit Type	Units
6010C	7440-50-8	COPPER	1.25	MRL	mg/kg
	7439-92-1	LEAD	1	MRL	mg/kg
6020A	7440-50-8	COPPER	1.25	MRL	mg/Kg
	7439-92-1	Lead	1	MRL	mg/Kg
6850M	14797-73-0	PERCHLORATE	2	MRL	ug/Kg
8330A	99-35-4	1,3,5-TRINITROBENZENE	200	MRL	ug/Kg
	99-65-0	1,3-DINITROBENZENE	200	MRL	ug/Kg
	118-96-7	2,4,6-TRINITROTOLUENE	200	MRL	ug/Kg
	121-14-2	2,4-DINITROTOLUENE	200	MRL	ug/Kg
	606-20-2	2,6-DINITROTOLUENE	200	MRL	ug/Kg
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	200	MRL	ug/Kg
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	200	MRL	ug/Kg
	2691-41-0	HMX	200	MRL	ug/Kg
	99-08-1	m-Nitrotoluene	200	MRL	ug/Kg
	98-95-3	NITROBENZENE	200	MRL	ug/Kg
	55-63-0	NITROGLYCERINE	1000	MRL	ug/Kg
	88-72-2	o-Nitrotoluene	200	MRL	ug/Kg
	78-11-5	PETN	1000	MRL	ug/Kg
	99-99-0	p-Nitrotoluene	200	MRL	ug/Kg
	121-82-4	RDX	200	MRL	ug/Kg
	479-45-8	Tetryl	200	MRL	ug/Kg
8330B	99-35-4	1,3,5-TRINITROBENZENE	100	MRL	ug/Kg
	99-65-0	1,3-DINITROBENZENE	100	MRL	ug/Kg
	118-96-7	2,4,6-TRINITROTOLUENE	100	MRL	ug/Kg
	121-14-2	2,4-DINITROTOLUENE	100	MRL	ug/Kg
	606-20-2	2,6-DINITROTOLUENE	100	MRL	ug/Kg
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	100	MRL	ug/Kg
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	100	MRL	ug/Kg
	2691-41-0	HMX	100	MRL	ug/Kg
	99-08-1	m-Nitrotoluene	100	MRL	ug/Kg
	98-95-3	NITROBENZENE	100	MRL	ug/Kg
	55-63-0	NITROGLYCERINE	1000	MRL	ug/Kg
	88-72-2	o-Nitrotoluene	100	MRL	ug/Kg
	78-11-5	PETN	1000	MRL	ug/Kg
	99-99-0	p-Nitrotoluene	100	MRL	ug/Kg
	121-82-4	RDX	100	MRL	ug/Kg
	479-45-8	Tetryl	100	MRL	ug/Kg
8332	55-63-0	NITROGLYCERINE	2000	MRL	ug/Kg
	78-11-5	PETN	2000	MRL	ug/Kg

Library Data Review Criteria: Method Blanks

Library Group ID : Waikane Valley — All Methods
Sample Matrix : AQ

Analytical Method	Client Analyte ID	Analyte Name	5X or 10X Rule
6010C	7440-50-8	COPPER	5
	7439-92-1	Lead	5
6020A	7440-50-8	COPPER	5
	7439-92-1	Lead	5
6850	14797-73-0	PERCHLORATE	5
8330A	99-35-4	1,3,5-TRINITROBENZENE	5
	99-65-0	1,3-DINITROBENZENE	5
	118-96-7	2,4,6-TRINITROTOLUENE	5
	121-14-2	2,4-DINITROTOLUENE	5
	606-20-2	2,6-DINITROTOLUENE	5
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	5
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	5
	2691-41-0	HMX	5
	99-08-1	m-Nitrotoluene	5
	98-95-3	NITROBENZENE	5
	55-63-0	NITROGLYCERINE	5
	88-72-2	o-Nitrotoluene	5
	78-11-5	PETN	5
	99-99-0	p-Nitrotoluene	5
	121-82-4	RDX	5
	479-45-8	Tetryl	5
8330B	99-35-4	1,3,5-TRINITROBENZENE	5
	99-65-0	1,3-DINITROBENZENE	5
	118-96-7	2,4,6-TRINITROTOLUENE	5
	121-14-2	2,4-DINITROTOLUENE	5
	606-20-2	2,6-DINITROTOLUENE	5
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	5
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	5
	2691-41-0	HMX	5
	99-08-1	m-Nitrotoluene	5
	98-95-3	NITROBENZENE	5
	55-63-0	NITROGLYCERINE	5
	88-72-2	o-Nitrotoluene	5
	78-11-5	PETN	5
	99-99-0	p-Nitrotoluene	5
	121-82-4	RDX	5
	479-45-8	Tetryl	5
8332	55-63-0	NITROGLYCERINE	5
	78-11-5	PETN	5

Library Data Review Criteria: Method Blanks

Library Group ID : Waikane Valley All Methods
Sample Matrix : SO

Analytical Method	Client Analyte ID	Analyte Name	5X or 10X Rule
6010C	7440-50-8	COPPER	5
	7439-92-1	LEAD	5
6020A	7440-50-8	COPPER	5
	7439-92-1	Lead	5
6850M	14797-73-0	PERCHLORATE	5
8330A	99-35-4	1,3,5-TRINITROBENZENE	5
	99-65-0	1,3-DINITROBENZENE	5
	118-96-7	2,4,6-TRINITROTOLUENE	5
	121-14-2	2,4-DINITROTOLUENE	5
	606-20-2	2,6-DINITROTOLUENE	5
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	5
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	5
	2691-41-0	HMX	5
	99-08-1	m-Nitrotoluene	5
	98-95-3	NITROBENZENE	5
	55-63-0	NITROGLYCERINE	5
	88-72-2	o-Nitrotoluene	5
	78-11-5	PETN	5
	99-99-0	p-Nitrotoluene	5
	121-82-4	RDX	5
	479-45-8	Tetryl	5
8330B	99-35-4	1,3,5-TRINITROBENZENE	5
	99-65-0	1,3-DINITROBENZENE	5
	118-96-7	2,4,6-TRINITROTOLUENE	5
	121-14-2	2,4-DINITROTOLUENE	5
	606-20-2	2,6-DINITROTOLUENE	5
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	5
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	5
	2691-41-0	HMX	5
	99-08-1	m-Nitrotoluene	5
	98-95-3	NITROBENZENE	5
	55-63-0	NITROGLYCERINE	5
	88-72-2	o-Nitrotoluene	5
	78-11-5	PETN	5
	99-99-0	p-Nitrotoluene	5
	121-82-4	RDX	5
	479-45-8	Tetryl	5
8332	55-63-0	NITROGLYCERINE	5
	78-11-5	PETN	5

Library Data Review Criteria: Laboratory Control Samples / Duplicates

Library Group ID : Waikane Valley | All Methods

Sample Matrix : AQ

Analytical Method	Client Analyte ID	Analyte Name	Rejection Point	Rejection Point Criteria	Percent Recovery Lower Limit	Percent Recovery Upper Limit	RPD
6010C	7440-50-8	COPPER	10	LT	80	120	20
	7439-92-1	Lead	10	LT	80	120	20
6020A	7440-50-8	COPPER	10	LT	80	120	20
	7439-92-1	Lead	10	LT	80	120	20
6850	14797-73-0	PERCHLORATE	10	LT	74	126	20
8330A	99-35-4	1,3,5-TRINITROBENZENE	10	LT	85	127	21
	99-65-0	1,3-DINITROBENZENE	10	LT	84	123	23
	118-96-7	2,4,6-TRINITROTOLUENE	10	LT	71	128	21
	121-14-2	2,4-DINITROTOLUENE	10	LT	77	116	26
	606-20-2	2,6-DINITROTOLUENE	10	LT	84	133	23
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	10	LT	78	117	28
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	10	LT	84	123	27
	2691-41-0	HMX	10	LT	74	152	21
	99-08-1	m-Nitrotoluene	10	LT	74	124	32
	98-95-3	NITROBENZENE	10	LT	76	128	28
	55-63-0	NITROGLYCERINE	10	LT	67	121	15
	88-72-2	o-Nitrotoluene	10	LT	76	120	30
	78-11-5	PETN	10	LT	72	120	15
	99-99-0	p-Nitrotoluene	10	LT	81	125	34
	121-82-4	RDX	10	LT	80	124	20
	479-45-8	Tetryl	10	LT	62	117	28
8330B	99-35-4	1,3,5-TRINITROBENZENE	10	LT	85	127	21
	99-65-0	1,3-DINITROBENZENE	10	LT	84	123	23
	118-96-7	2,4,6-TRINITROTOLUENE	10	LT	71	128	21
	121-14-2	2,4-DINITROTOLUENE	10	LT	77	116	26
	606-20-2	2,6-DINITROTOLUENE	10	LT	84	133	23
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	10	LT	78	117	28
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	10	LT	84	123	27
	2691-41-0	HMX	10	LT	74	152	21
	99-08-1	m-Nitrotoluene	10	LT	74	124	32
	98-95-3	NITROBENZENE	10	LT	76	128	28
	55-63-0	NITROGLYCERINE	10	LT	67	121	15
	88-72-2	o-Nitrotoluene	10	LT	76	120	30
	78-11-5	PETN	10	LT	72	120	15
	99-99-0	p-Nitrotoluene	10	LT	81	125	34
	121-82-4	RDX	10	LT	80	124	20
	479-45-8	Tetryl	10	LT	62	117	28
8332	55-63-0	NITROGLYCERINE	10	LT	67	121	13
	78-11-5	PETN	10	LT	72	120	13

Legend

Rejection Point Criteria
LT : Less Than — *GT : Greater Than*
LE : Less Than or Equal — *GE : Greater Than or Equal*

Library Data Review Criteria: Laboratory Control Samples / Duplicates

Library Group ID : Waikane Valley   All Methods

Sample Matrix : SO

Analytical Method	Client Analyte ID	Analyte Name	Rejection Point	Rejection Point Criteria	Percent Recovery Lower Limit	Percent Recovery Upper Limit	RPD
6010C	7440-50-8	COPPER	10	LT	80	120	20
	7439-92-1	LEAD	10	LT	80	120	20
6020A	7440-50-8	COPPER	10	LT	80	120	20
	7439-92-1	Lead	10	LT	80	120	20
6850M	14797-73-0	PERCHLORATE	10	LT	66	130	30
8330A	99-35-4	1,3,5-TRINITROBENZENE	10	LT	81	138	24
	99-65-0	1,3-DINITROBENZENE	10	LT	82	134	20
	118-96-7	2,4,6-TRINITROTOLUENE	10	LT	70	137	29
	121-14-2	2,4-DINITROTOLUENE	10	LT	74	129	18
	606-20-2	2,6-DINITROTOLUENE	10	LT	86	142	17
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	10	LT	83	123	22
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	10	LT	85	137	18
	2691-41-0	HMX	10	LT	75	156	27
	99-08-1	m-Nitrotoluene	10	LT	85	120	20
	98-95-3	NITROBENZENE	10	LT	82	138	19
	55-63-0	NITROGLYCERINE	10	LT	71	126	21
	88-72-2	o-Nitrotoluene	10	LT	85	129	21
	78-11-5	PETN	10	LT	54	132	29
	99-99-0	p-Nitrotoluene	10	LT	86	133	19
	121-82-4	RDX	10	LT	77	131	28
	479-45-8	Tetryl	10	LT	53	124	22
8330B	99-35-4	1,3,5-TRINITROBENZENE	10	LT	81	138	24
	99-65-0	1,3-DINITROBENZENE	10	LT	77	134	20
	118-96-7	2,4,6-TRINITROTOLUENE	10	LT	70	137	29
	121-14-2	2,4-DINITROTOLUENE	10	LT	74	129	18
	606-20-2	2,6-DINITROTOLUENE	10	LT	81	142	17
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	10	LT	78	123	22
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	10	LT	80	137	18
	2691-41-0	HMX	10	LT	75	156	27
	99-08-1	m-Nitrotoluene	10	LT	75	136	22
	98-95-3	NITROBENZENE	10	LT	77	138	19
	55-63-0	NITROGLYCERINE	10	LT	71	126	21
	88-72-2	o-Nitrotoluene	10	LT	75	129	21
	78-11-5	PETN	10	LT	54	132	29
	99-99-0	p-Nitrotoluene	10	LT	76	133	19
	121-82-4	RDX	10	LT	72	131	28
	479-45-8	Tetryl	10	LT	53	129	22
8332	55-63-0	NITROGLYCERINE	10	LT	71	121	21
	78-11-5	PETN	10	LT	64	132	29

Legend

Rejection Point Criteria
LT : Less Than   *GT : Greater Than*
LE : Less Than or Equal   *GE : Greater Than or Equal*

Library Data Review Criteria: Matrix Spike /Matrix Spike Duplicates

Library Group ID : Waikane Valley

Sample Matrix : AQ

All Methods

Analytical Method	Client Analyte ID	Analyte Name	Rejection Point	Rejection Point Criteria	Percent Recovery Lower Limit	Percent Recovery Upper Limit	RPD
6010C	7440-50-8	COPPER	0	LT	80	120	20
	7439-92-1	Lead	0	LT	80	120	20
6020A	7440-50-8	COPPER	0	LT	80	120	20
	7439-92-1	Lead	0	LT	80	120	20
6850	14797-73-0	PERCHLORATE	0	LT	74	126	20
8330A	99-35-4	1,3,5-TRINITROBENZENE	10	LT	85	127	21
	99-65-0	1,3-DINITROBENZENE	10	LT	84	123	23
	118-96-7	2,4,6-TRINITROTOLUENE	10	LT	71	128	21
	121-14-2	2,4-DINITROTOLUENE	10	LT	77	116	26
	606-20-2	2,6-DINITROTOLUENE	10	LT	84	133	23
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	10	LT	78	117	28
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	10	LT	84	123	27
	2691-41-0	HMX	10	LT	74	152	21
	99-08-1	m-Nitrotoluene	10	LT	74	124	32
	98-95-3	NITROBENZENE	10	LT	76	128	28
	55-63-0	NITROGLYCERINE	10	LT	67	121	15
	88-72-2	o-Nitrotoluene	10	LT	76	120	30
	78-11-5	PETN	10	LT	72	120	15
	99-99-0	p-Nitrotoluene	10	LT	81	125	34
	121-82-4	RDX	10	LT	80	124	20
	479-45-8	Tetryl	10	LT	62	117	28
8330B	99-35-4	1,3,5-TRINITROBENZENE	10	LT	85	127	21
	99-65-0	1,3-DINITROBENZENE	10	LT	84	123	23
	118-96-7	2,4,6-TRINITROTOLUENE	10	LT	71	128	21
	121-14-2	2,4-DINITROTOLUENE	10	LT	77	116	26
	606-20-2	2,6-DINITROTOLUENE	10	LT	84	133	23
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	10	LT	78	117	28
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	10	LT	84	123	27
	2691-41-0	HMX	10	LT	74	152	21
	99-08-1	m-Nitrotoluene	10	LT	74	124	32
	98-95-3	NITROBENZENE	10	LT	76	128	28
	55-63-0	NITROGLYCERINE	10	LT	67	121	15
	88-72-2	o-Nitrotoluene	10	LT	76	120	30
	78-11-5	PETN	10	LT	72	120	15
	99-99-0	p-Nitrotoluene	10	LT	81	125	34
	121-82-4	RDX	10	LT	80	124	20
	479-45-8	Tetryl	10	LT	62	117	28
8332	55-63-0	NITROGLYCERINE	0	LT	67	121	13

Legend *Rejection Point Criteria*

LT : Less Than *GT : Greater Than*

LE : Less Than or Equal *GE : Greater Than or Equal*

Library Data Review Criteria: Matrix Spike /Matrix Spike Duplicates

Library Group ID : Waikane Valley

Sample Matrix : AQ

All Methods

Analytical Method	Client Analyte ID	Analyte Name	Rejection Point	Rejection Point Criteria	Percent Recovery Lower Limit	Percent Recovery Upper Limit	RPD
8332	78-11-5	PETN	0	LT	72	120	13

Legend *Rejection Point Criteria*

LT : Less Than *GT : Greater Than*

LE : Less Than or Equal *GE : Greater Than or Equal*

Library Data Review Criteria: Matrix Spike /Matrix Spike Duplicates

Library Group ID : Waikane Valley

Sample Matrix : SO

All Methods

Analytical Method	Client Analyte ID	Analyte Name	Rejection Point	Rejection Point Criteria	Percent Recovery Lower Limit	Percent Recovery Upper Limit	RPD
6010C	7440-50-8	COPPER	0	LT	80	120	20
	7439-92-1	LEAD	0	LT	80	120	20
6020A	7440-50-8	COPPER	0	LT	80	120	20
	7439-92-1	Lead	0	LT	80	120	20
6850M	14797-73-0	PERCHLORATE	0	LT	66	130	30
8330A	99-35-4	1,3,5-TRINITROBENZENE	10	LT	81	138	24
	99-65-0	1,3-DINITROBENZENE	10	LT	82	134	20
	118-96-7	2,4,6-TRINITROTOLUENE	10	LT	70	137	29
	121-14-2	2,4-DINITROTOLUENE	10	LT	74	129	18
	606-20-2	2,6-DINITROTOLUENE	10	LT	86	142	17
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	10	LT	83	123	22
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	10	LT	85	137	18
	2691-41-0	HMX	10	LT	75	156	27
	99-08-1	m-Nitrotoluene	10	LT	85	120	20
	98-95-3	NITROBENZENE	10	LT	82	138	19
	55-63-0	NITROGLYCERINE	10	LT	71	126	21
	88-72-2	o-Nitrotoluene	10	LT	85	129	21
	78-11-5	PETN	10	LT	54	132	29
	99-99-0	p-Nitrotoluene	10	LT	86	133	19
	121-82-4	RDX	10	LT	77	131	28
	479-45-8	Tetryl	10	LT	53	124	22
8330B	99-35-4	1,3,5-TRINITROBENZENE	10	LT	81	138	24
	99-65-0	1,3-DINITROBENZENE	10	LT	77	134	20
	118-96-7	2,4,6-TRINITROTOLUENE	10	LT	70	137	29
	121-14-2	2,4-DINITROTOLUENE	10	LT	74	129	18
	606-20-2	2,6-DINITROTOLUENE	10	LT	81	142	17
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	10	LT	78	123	22
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	10	LT	80	137	18
	2691-41-0	HMX	10	LT	75	156	27
	99-08-1	m-Nitrotoluene	10	LT	75	136	22
	98-95-3	NITROBENZENE	10	LT	77	138	19
	55-63-0	NITROGLYCERINE	10	LT	71	126	21
	88-72-2	o-Nitrotoluene	10	LT	75	129	21
	78-11-5	PETN	10	LT	54	132	29
	99-99-0	p-Nitrotoluene	10	LT	76	133	19
	121-82-4	RDX	10	LT	72	131	28
	479-45-8	Tetryl	10	LT	53	129	22
8332	55-63-0	NITROGLYCERINE	0	LT	71	121	21

Legend *Rejection Point Criteria*
LT : Less Than *GT : Greater Than*
LE : Less Than or Equal *GE : Greater Than or Equal*

Library Data Review Criteria: Matrix Spike /Matrix Spike Duplicates

Library Group ID : Waikane Valley

Sample Matrix : SO

All Methods

Analytical Method	Client Analyte ID	Analyte Name	Rejection Point	Rejection Point Criteria	Percent Recovery		RPD
					Lower Limit	Upper Limit	
8332	78-11-5	PETN	0	LT	64	132	29

Legend *Rejection Point Criteria*

LT : Less Than *GT : Greater Than*

LE : Less Than or Equal *GE : Greater Than or Equal*

Library Data Review Critera: Laboratory and Field Duplicates

Library: **Waikane Valley** All Methods

Matrix: **AQ**

Analytical Method	Client Analyte ID	Analyte Name	Lab Duplicate RPD	Field Duplicate RPD
6010C	7440-50-8	COPPER	20	35
	7439-92-1	Lead	20	35
6020A	7440-50-8	COPPER	20	35
	7439-92-1	Lead	20	35
6850	14797-73-0	PERCHLORATE	20	35
8330A	99-35-4	1,3,5-TRINITROBENZENE	21	35
	99-65-0	1,3-DINITROBENZENE	23	35
	118-96-7	2,4,6-TRINITROTOLUENE	21	35
	121-14-2	2,4-DINITROTOLUENE	26	35
	606-20-2	2,6-DINITROTOLUENE	23	35
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	28	35
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	27	35
	2691-41-0	HMX	20	35
	99-08-1	m-Nitrotoluene	32	35
	98-95-3	NITROBENZENE	28	35
	55-63-0	NITROGLYCERINE	15	35
	88-72-2	o-Nitrotoluene	30	35
	78-11-5	PETN	15	35
	99-99-0	p-Nitrotoluene	34	35
	121-82-4	RDX	20	35
	479-45-8	Tetryl	28	35
8330B	99-35-4	1,3,5-TRINITROBENZENE	21	35
	99-65-0	1,3-DINITROBENZENE	23	35
	118-96-7	2,4,6-TRINITROTOLUENE	21	35
	121-14-2	2,4-DINITROTOLUENE	26	35
	606-20-2	2,6-DINITROTOLUENE	23	35
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	28	35
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	27	35
	2691-41-0	HMX	20	35
	99-08-1	m-Nitrotoluene	32	35
	98-95-3	NITROBENZENE	28	35
	55-63-0	NITROGLYCERINE	15	35
	88-72-2	o-Nitrotoluene	30	35
	78-11-5	PETN	15	35
	99-99-0	p-Nitrotoluene	34	35
	121-82-4	RDX	20	35
	479-45-8	Tetryl	28	35
8332	55-63-0	NITROGLYCERINE	13	35
	78-11-5	PETN	13	35

Library Data Review Critera: Laboratory and Field Duplicates

Library: **Waikane Valley** All Methods

Matrix: **SO**

Analytical Method	Client Analyte ID	Analyte Name	Lab Duplicate RPD	Field Duplicate RPD
6010C	7440-50-8	COPPER	20	35
	7439-92-1	LEAD	20	35
6020A	7440-50-8	COPPER	20	35
	7439-92-1	Lead	20	35
6850M	14797-73-0	PERCHLORATE	30	35
8330A	99-35-4	1,3,5-TRINITROBENZENE	25	35
	99-65-0	1,3-DINITROBENZENE	25	35
	118-96-7	2,4,6-TRINITROTOLUENE	29	35
	121-14-2	2,4-DINITROTOLUENE	25	35
	606-20-2	2,6-DINITROTOLUENE	20	35
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	22	35
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	25	35
	2691-41-0	HMX	25	35
	99-08-1	m-Nitrotoluene	20	35
	98-95-3	NITROBENZENE	25	35
	55-63-0	NITROGLYCERINE	21	35
	88-72-2	o-Nitrotoluene	25	35
	78-11-5	PETN	29	35
	99-99-0	p-Nitrotoluene	25	35
	121-82-4	RDX	28	35
	479-45-8	Tetryl	22	35
8330B	99-35-4	1,3,5-TRINITROBENZENE	25	35
	99-65-0	1,3-DINITROBENZENE	25	35
	118-96-7	2,4,6-TRINITROTOLUENE	28	35
	121-14-2	2,4-DINITROTOLUENE	25	35
	606-20-2	2,6-DINITROTOLUENE	20	35
	35572-78-2	2-AMINO-4,6-DINITROTOLUENE	25	35
	19406-51-0	4-AMINO-2,6-DINITROTOLUENE	25	35
	2691-41-0	HMX	25	35
	99-08-1	m-Nitrotoluene	25	35
	98-95-3	NITROBENZENE	25	35
	55-63-0	NITROGLYCERINE	21	35
	88-72-2	o-Nitrotoluene	25	35
	78-11-5	PETN	29	35
	99-99-0	p-Nitrotoluene	25	35
	121-82-4	RDX	35	35
	479-45-8	Tetryl	22	35
8332	55-63-0	NITROGLYCERINE	20	35
	78-11-5	PETN	29	35

Library Data Review Criteria: Surrogates

Library Group ID : Waikane Valley

Sample Matrix : AQ

Analytical Method	Client Analyte ID	Analyte Name	Rejection Point	Rejection Point Criteria	Percent Recovery Lower Limit	Percent Recovery Upper Limit
8330A	610-39-9	3,4-DINITROTOLUENE	0	LT	70	136
8330B	610-39-9	3,4-DINITROTOLUENE	0	LT	70	136
8332	610-39-9	3,4-DINITROTOLUENE	0	LT	70	136

Legend

Rejection Point Criteria
LT : Less Than *GT : Greater Than*
LE : Less Than or Equal *GE : Greater Than or Equal*

Library Data Review Criteria: Surrogates

Library Group ID : Waikane Valley

Sample Matrix : SO

Analytical Method	Client Analyte ID	Analyte Name	Rejection Point	Rejection Point Criteria	Percent Recovery Lower Limit	Percent Recovery Upper Limit
8330A	610-39-9	3,4-DINITROTOLUENE	0	LT	72	145
8330B	610-39-9	3,4-DINITROTOLUENE	0	LT	72	145
8332	610-39-9	3,4-DINITROTOLUENE	0	LT	72	145

Legend

Rejection Point Criteria
LT : Less Than *GT : Greater Than*
LE : Less Than or Equal *GE : Greater Than or Equal*

APPENDIX C

INSTITUTIONAL CONTROL PLAN

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Institutional Control Plan
Waikane Training Area Munitions Response Area

1.0 INSTITUTIONAL CONTROL PLAN

This Institutional Control Plan (ICP) was prepared as part of the Remedial Investigation (RI) at the Waikane Training Area (WTA) Munitions Response Area (MRA), Oahu, Hawaii. This ICP presents specific institutional controls that may be used at the site. Further, it identifies the local, state, Federal, or private agencies, or individuals who will be involved in the implementation, administration, enforcement, and/or maintenance of the institutional controls.

1.1 SITE BOUNDARIES

The WTA MRA is located in Waikane Valley in the District of Koolaupoko on the windward side of the island of Oahu, Hawaii. The WTA MRA is a portion of the former Waikane Valley Training Area (WVTA), which consisted of approximately 1,061 acres that were used from 1942 to 1976 by the Department of Defense as a training and artillery impact area. Live fire at the WVTA reportedly ceased in the early 1960s, but numerous types of munitions have since been recovered from the site, including 37mm and 75mm High Explosive (HE) rounds, 60mm HE mortars, M28 High Explosive Anti-Tank (HEAT) grenades, 2.36-inch and 3.5-inch HEAT rockets, M9A1 AT rifle grenades, 3.5-inch practice rockets, and M29 practice rifle grenades. The WTA MRA covers approximately 933 acres[1] of the WVTA and is the property that was evaluated during this Remedial Investigation (RI). The remainder of the WVTA is currently owned by the U.S. Marine Corps (USMC) and is therefore not an eligible property under the Defense Environmental Restoration Program-Formerly Used Defense Sites (DERP-FUDSs) program.

The U.S. Army Corps of Engineers (USACE) has designated the WTA MRA as Formerly Used Defense Site (FUDS) Property Number H09HI0354. The WTA MRA consists of three Munitions Response Sites (MRSs) (Figure A-1, Appendix A):

- **Southeastern Region MRS** (RMIS ID: H09HI035401R01-1), including:
  - Potential 2.36-inch Rocket Firing Point Expansion Area and
  - Stream Characterization Expansion Area;
- **Southern Impact Region MRS** (RMIS ID: H09HI035402R02-2); and
- **Western/Mountainous Region MRS** (RMIS ID: H09HI035402R03-3).

1.2 SITE SPECIFIC INSTITUTIONAL CONTROLS AND RISK REDUCTION

1.2.1 Managing risks related to MEC hazards can be accomplished through conventional removal, access control, public education or a combination of these strategies. Three causative factors to avoid and understand that help prevent any MEC-related accidents:

- Presence of MEC
- Access to MEC
- Behavior with MEC

[1] Of the 1,061 acres of the WVTA, only 873.64 were considered eligible under DERP-FUDS. During the EE/CA investigation, the Munitions Response Sites were refined and acreage increased to 933 acres.

1.2.2 If there is no MEC on a site there is no possibility for an MEC related accident, and conversely if there is MEC present and public access, there is the risk of an MEC related accident. If site access is restricted and people are educated about the MEC risk, the chance of MEC related accident could be reduced.

1.2.3 Institutional Control Alternatives and recommendations presented in this plan are based on the assumption that public access to the WTV MRSA will be generally unrestricted. It was confirmed that there is a locked gate with warning signs at the entrance to limit public access into the WTA MRA. Although the majority of the area consists of inaccessible terrain, there are locations where unauthorized individuals can access the WTA MRA via numerous paths and dirt trails from all directions including around the locked gate. Current land use, and projected land use, potential response alternatives, and restrictions are provided in Table 1.

TABLE 1 - MUNITIONS RESPONSE SITE (MRS) LAND USE MATRIX

Munitions Response Site (MRS)	Current Land Use	Projected Land Use	Potential Response Alternatives	Restrictions
Southeastern Region MRS	Residential, recreational, agricultural, open space, and nature preserve areas	Residential, recreational, agricultural, open space, and nature preserve areas	Signage, community MEC education awareness, and safety training	Unrestricted Site Access
Southern Impact Region MRS	Residential, recreational, agricultural, open space, and nature preserve areas	Residential, recreational, agricultural, open space, and nature preserve areas	Signage, community MEC education awareness, and safety training	Unrestricted Site Access
Western/Mountainous Region MRS	Recreational, and nature preserve area	Residential, recreational, and nature preserve area	Signage, community MEC education awareness, and safety training	Unrestricted Site Access

1.2.4 Three general response categories for potential MEC remaining on former training sites include:

- Removal
- Access Control
- Behavior Modification

1.2.5 The removal of all MEC from a former training site is the ultimate goal, however, on most sites this cannot be guaranteed. Some sites may be too rugged and steeply sloped to identify all the possible MEC, site access may be another issue for some sites.

1.2.6 When the complete removal of all MEC cannot be carried out, Access Control and Behavior Modifications become necessary. Access Controls and Behavior Modifications are also known as institutional controls. Institutional Controls can be implemented as simply as placing signs around an area to warn of the possible dangers, to restricting access to the area of concern, to recommendations for deed restrictions or special requirements to grant construction permits. Institutional Controls must be performed with a joint effort of the property owner(s), local and/or state officials. Institutional Controls are not effective if one does not have the complete participation from all parties.

1.2.7 Like all response plans, institutional controls must start with data collection, including obtaining responses to the following questions from the Institutional Control Survey.

- Date survey was taken
- Agency survey was given to
- Point of Contact
- Phone Number
- Agency Authority and Basis of Authority
- Agencies Mission
- Geographical Jurisdiction
- Public safety Function (if applicable)
- Land use Control Function (knowledge of current controls)
- Ability to Partner with other Agencies (which ones)
- Financial Capability
- Desire to Implement Proposed Controls

1.2.8 There are many ways to protect the public from MEC related accidents. The institutional controls provided in this plan are the best way to protect the public and other personnel, while still maintaining the site's day-to-day operations. The following sections briefly describe the proposed actions and controls for the WTA MRA.

1.2.9 Warning Signs

1.2.9.1 Signs are an effective way to inform personnel of the hazards in the area. They can also keep unauthorized personnel from entering a hazardous area. Warning signs should be placed on the outer boundary of the site warning the public of the possible danger if they come closer to the site.

1.2.9.2 Additional warning signs posted on the outer perimeter of a site would contribute to educating the public of the potential exposure at a site. This could be one of the least expensive controls to implement. It is also the most ineffective control especially when used alone. The ultimate effectiveness of institutional controls depends entirely on local agencies and private landowner support, involvement, and willingness to enforce and maintain institutional controls implemented to eliminate public interaction with MEC. Long-term implementation of institutional controls will be the responsibility of landowners and U.S. Army Corps of Engineers, Honolulu District (CEPOH).

1.2.9.3 As noted during the field activities, warning signs reading "No Trespassing" or "Danger Explosives" are currently in place at the gated entrances into the property. Additional warning signs may be added along the road traversing across the WTA MRA, if acceptable. The total roadway distance is approximately four miles in length. Placing signs every 400-feet along the roads (on both sides) would total to 80 signs.

1.2.10 Educational Programs

1.2.10.1 The use of educational programs is an effective means to reduce risk from public exposure to MEC. Education can be tailored to meet site-specific needs. Examples of educational programs include public notices and formal education sessions. Educating the local community is an important aspect of any institutional control program. Public awareness of the hazards associated with a site will encourage the public to take the necessary precautions to avoid exposure. Educational programs may be audience specific and can be performed as often as necessary to educate those with the greatest risk for exposure to MEC, e.g., local homeowners, farmers, children, and developers. Educational efforts can be a stand-alone institutional control, but they can also improve the effectiveness of other controls.

1.2.10.2 Producing and distributing an educational/awareness pamphlet would be a means of educating individuals in the recognition of MEC, describing the types of MEC found at the WTA MRA , and the actions to be taken upon discovering MEC items. Recognizing the hazard is essential for implementing appropriate responses to contain and dispose of MEC. Distinguishing between MEC and other debris that may be encountered at the site will ensure that authorities are notified and actions will be taken to dispose of the MEC without harm to anyone involved.

1.2.10.3 The pamphlets would be distributed to any person, company, or agency planning to work within the Waikane Valley. In addition, the pamphlets would be available to anyone upon request.

1.2.10.4 Public Notices

The local community can be educated through implementation of a public-notice campaign that may include mailings of informational pamphlets, installation of display cases, public service announcements, or recurrent notices in local newspapers. These educational media can serve to educate the local community and visitors to the area. A method that can be used at sites with a high public turnover rate is to notify any new residents to the area once they have contacted the local utility to start a new service. Once the utility company has received the request for the new service, they can provide (in their initial mailing to new customers) a brochure outlining the site-specific hazards and what should be done in the event of an emergency. The following paragraphs provide details concerning various types of public notices that can be used to educate and inform local communities.

1.2.10.5 Community Awareness Meetings

Community awareness meetings are normally held when significant site remediation documents are released to the public and provide information regarding:

- How this information was evaluated in the RI and FS reports;

- MEC previously recovered at the site;
- Options available to remove MEC (if required) and enhance public safety; and
- Recommendations being made to address a particular site.

1.2.10.6 Letter Notifications, Informational Pamphlets, and Fact Sheets

1.2.10.6.1 Letter notifications (US certified mail) are an effective means of informing property owners of the results of the RI and FS investigations and the types of MEC that have been found. Letter notifications can be mailed to each landowner within or adjacent to a MEC site to inform them of the investigation results and the proposed recommendations for the area.

1.2.10.6.2 Informational pamphlets and fact sheets can be developed and distributed to support safety briefings and/or speaking engagements and can be effective as stand-alone educational materials. Informational pamphlets and fact sheets can warn the public of the hazards of MEC and provide information relating to the former military operations that occurred at a site. Informational pamphlets and fact sheets can be mailed to residents in the vicinity of a MEC site or they can be distributed from central locations such as libraries, or posted at strategic locations (e.g., US Post Office). Effective pamphlets or fact sheets contain photographs and/or drawings of typical ordnance items that the public might encounter and previously recovered MEC locations on a map. A telephone number for the appropriate local authority should be included in the informational pamphlet or fact sheet.

1.2.10.7 Formal Education Sessions

Formal education sessions may include community education classes. The classes can be given to a variety of audiences including public forums, local government, emergency response personnel, property owners, developers and real estate agents, and children at the local schools. The training sessions can be tailored to meet the specific interests/concerns of the audience, and can be an effective method to communicate the nature and extent of the hazards associated with MEC and the precautions to be taken in the event a person comes into contact with MEC. The training sessions may either be provided live by personnel knowledgeable in the site-specific conditions or through the distribution of MEC safety awareness training pamphlets or videos to local organizations and public libraries. To be effective, educational sessions need to be recurrent (e.g., annually) so the public does not become complacent about the hazards associated with MEC. Formal education sessions that are consistently performed are also successful in educating new homeowners and visitors to the area.

1.3 ROLES, RESPONSIBILITIES AND AUTHORITIES FOR INSTITUTIONAL CONTROLS

Several agencies and/or organizations would have a role in institutional control alternatives implemented at the WTA MRA. The roles, responsibilities, and authorities that each organization will have in implementing, maintaining, monitoring, and enforcing institutional controls are provided in Table 2. Legal, administrative, and engineering controls are not likely to be implemented as the sole institutional control option. During the alternative identification process, both components of these institutional controls and the alternative in its entirety will be considered in terms of their relevance and appropriateness to the response action objectives. Five-year reviews will be conducted to monitor the effectiveness of the remedy.

TABLE 2 - ROLES, RESPONSIBILITIES AND AUTHORITIES FOR IMPLEMENTATION OF INSTITUTIONAL CONTROL

Agency/ Institution	Role	Responsibility	Authority
USACE	Represents federal government in execution, oversight, and procurement of munitions response actions at the WTA MRA.	• Initiate the Decision Document, if necessary in the future • Inspect condition of signage • Report new discoveries of MEC to HDOH and EPA • Disseminate information and instructional pamphlets at meetings.	• Fund MEC response actions • Perform MEC investigations and munitions response actions
HDOH	Represent respective State government agencies conducting regulatory oversight of munitions response actions at the WTA MRA.	• Permit, report, variance and application review. • Participate in Public Meetings	• Approval authority on Decision Documents • Enforcement of environmental laws
Landowners	Represent issues related to site use for recreational purposes and the impacts of Institutional Controls on these uses.	• Allow installation of signage alerting recreational users and others of the MEC hazards at the site.	• Institute and enforce controls on site visitors.

Notes:
State of Hawaii, Department of Health (HDOH).

1.4 FUNDING SOURCES AND COST

1.4.1 The Defense Environmental Restoration Account (DERA) funds the FUDS program, and will provide funding. The funding is programmed annually and funded with congressional appropriations. Programming is also reviewed annually and can be modified if necessary.

1.4.2 The short-term and long-term cost for each of institutional controls can vary greatly. The cost analysis of the proposed institutional controls (signage and educational programs) will be provided, in detail, during the Feasibility Study.

1.5 REQUIREMENTS AND SCHEDULE FOR IMPLEMENTATION AND INSPECTION OF THE INSTITUTIONAL CONTROLS

In order for an institutional control to be effective in protecting the public from residual contamination at a site, periodic monitoring and inspection activities are required. Maintaining access to the site may be accomplished through the use of an easement or Monitoring and inspection activities under a right-of-entry agreement; however such an agreement is binding only on the current landowner and may be voided if the property is sold. In contrast, a properly executed easement will run with the land, ensuring access to the property for the extent of long-term monitoring required by institutional controls.

1.5.1 Inspection Type

Engineering controls such as signs will require periodic site visits which, in addition to an assessment of land use and site activities, will also include inspection of the integrity of the physical control.

1.5.1.1 Inspection Areas

All areas containing residual contamination which is being controlled by an institutional control will be included in a site inspection. It may also be appropriate to observe surrounding land use during the inspection to evaluate whether the assumptions made at the time the institutional control plan was developed are valid and whether the chosen control is still protective of human health.

1.5.1.2 Frequency of Inspections

When potential contamination is left in place and an institutional control program has been used to limit the risk, the Federal Government is required to review the remedy at least every five years. More frequent inspections may be necessary in case when the site is located in an area of rapid or continual development. Five year periodic reviews are planned for the WTA MRA. CEPOH is responsible for coordinating these inspections and reviews.

1.6 DURATION OF INSTITUTIONAL CONTROLS

The risk from MEC is long-term and MEC items are expected to remain hazardous for an indefinite period of time. Although munitions components may deteriorate through weathering and corrosion to a point that the munition will not function as intended, there is no easy way to know how long this process may take, and deterioration does not necessarily mean that the munition is not hazardous. The nature of MEC seems to preclude the possibility that institutional controls implemented to prevent exposure to these items can be completely eliminated, unless advances in MEC detection and clearance technology make detection and removal of these items more economical, complete, and safe.

1.7 MODIFICATION OR TERMINATION OF INSTITUTIONAL CONTROLS

Over time, it may become necessary to modify or terminate an institutional control program. Modification to the institutional control due to changes in local land use may be required to ensure that the controls that are in place are still protective of human health and the environment. Advances in detection, removal, and destruction technologies may make additional site cleanup economical and safe at some point in the future. Institutional control modifications will be accessed during the five year periodic reviews.

In order to determine the correct institutional controls for the WTA MRA, the following issues will be considered:

- Future land use
- Possible Public Access to the Site
- Restricting Personnel on Site

After these issues have been dealt with, the proper institutional controls can be implemented with the cooperation of the landowner, local and/or state officials.

APPENDIX D
MEC HA SCORING TABLES

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MEC HA Summary Information

Comments

Site ID: H09HI035402R01-1
Date: 9/16/2011

Please identify the single specific area to be assessed in this hazard assessment. From this point forward, all references to "site" or "MRS" refer to the specific area that you have defined.

A. Enter a unique identifier for the site:

Southeastern Impact Region MRS

Provide a list of information sources used for this hazard assessment. As you are completing the worksheets, use the "Select Ref(s)" buttons at the ends of each subsection to select the applicable information sources from the list below.

Ref. No.	Title (include version, publication date)
1	INPR 2004
2	Engineering Evaluation/Cost Analysis (EE/CA) 2006
3	USMC Site Inspection 2008
4	Abbreviated Site Inspection 2008
5	Surface Clearance 1976 and 1984
6	CEPOH Removal Action
7	NAVFAC Remedial Investigation
8	
9	
10	
11	
12	

B. Briefly describe the site:

1. Area (include units): 151 acres
2. Past munitions-related use:
Maneuver Areas
3. Current land-use activities (list all that occur):
Recreation, hunting, hiking, ATVs, City and County personnel access
4. Are changes to the future land-use planned? no
5. What is the basis for the site boundaries?
MEC/MD concentrations, anomaly concentrations, historical land use, and geographical boundaries (EE/CA 2006)
6. How certain are the site boundaries?
MEC/MD concentrations, anomaly concentrations, historical land use, and geographical boundaries (EE/CA 2006)

Reference(s) for Part B:
Inventory Project Report (INPR) 1996 and Supplemental INPR 2004 Engineering Evaluation/Cost Analysis (EE/CA) 2006

Select Ref(s)

C. Historical Clearances

1. Have there been any historical clearances at the site? Yes, subsurface clearance
2. If a clearance occurred:
   a. What year was the clearance performed? 2011
   b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of removed items, and whether metal detectors were used):
   Subsurface clearance completed August 2011 to depth of detection, 50 items located, Minelab metal detectors, average depth of items <0.5 ft.

Reference(s) for Part C:

Select Ref(s)

D. Attach maps of the site below (select 'Insert/Picture' on the menu bar.)

Site ID: **H09HI035402R01-1**
Date: **9/16/2011**

Cased Munitions Information

Item No.	Munition Type (e.g., mortar, projectile, etc.)	Munition Size	Munition Size Units	Mark/ Model	Energetic Material Type	Is Munition Fuzed?	Fuzing Type	Fuze Condition	Minimum Depth for Munition (ft)	Location of Munitions	Comments (include rationale for munitions that are "subsurface only")
1	Artillery	37	mm	Mk II	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
2	Artillery	75	mm	Mk I	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
3	Mortars	60	mm	M49A2	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
4	Mortars	81	mm	M43	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
5	Rockets	2.36	inches	M6A3	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
6	Rockets	3.5	inches	M28A2	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
7	Grenades			Mk II	High Explosive	Yes	Time	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
10	Grenades			M28	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

Reference(s) for table above:
Inventory Project Report (INPR) 1996 and Supplemental INPR 2004 Engineering **Inventory Project Report (INPR) 1996 and Supplemental INPR 2004**

Select Ref(s)

Bulk Explosive Information

Item No.	Explosive Type	Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Reference(s) for table above:

Select Ref(s)

Site ID: **H09HI035402R01-1**
Date: **9/16/2011**

Activities Currently Occurring at the Site

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Hunting	6	832	**4,992**	0	6 people/day x 104 day/yr x 8hr/day
2	Hiking	6	832	**4,992**	0	6 people/day x 104 day/yr x 4 hr/day
3	ATV	4	208	**832**	0.25	4 people/day x 104 day/yr x 2 hr/day
4	City and County Access	2	416	**832**	0	2 people/day x 52 day/yr x 8 hr/day
5	Unauthorized use	2	104	**208**	0	2 people/day x 104 day/yr x 1 hr/day
6	Agriculture	1	1,040	**1,040**	3	1 person x 20 hrs/wk x 52 wks/yr
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **12,896**
Maximum intrusive depth at site (ft): **3**

Reference(s) for table above:

Select Ref(s)

Activities Planned for the Future at the Site (If any are planned: see 'Summary Info' Worksheet, Question 4)

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

Select Ref(s)

Site ID: **H09HI035402R01-1**
Date: **9/16/2011**

Planned Remedial or Removal Actions

Response Action No.	Response Action Description	Expected Resulting Minimum MEC Depth (ft)	Expected Resulting Site Accessibility	Will land use activities change if this response action is implemented?
1	Subsurface Clearance (Baseline Condition)	1.5	Moderate Accessibility	Yes
2	Subsurface Clearance with LUCs	1.5	Limited Accessibility	Yes
3				
4				
5				
6				

According to the 'Summary Info' worksheet, no future land uses are planned. For those alternatives where you answered 'No' in Column E, the land use activities will be assessed against current land uses.

Reference(s) for table above:

What is the expected scope of cleanup?	Comments
cleanup of MECs located both on the surface and subsurface	
cleanup of MECs located both on the surface and subsurface	

Select Ref(s)

Site ID: **H09HI035402R01-1**
Date: **9/16/2011**

This worksheet needs to be completed for each remedial/removal action alternative listed in the 'Remedial-Removal Action' worksheet that will cause a change in land use.

Land Use Activities Planned After Response Alternative #1: Subsurface Clearance (Baseline Condition)

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Agriculture	1	1040	**1,040**	3	1 person x 20 hrs/wk x 52 wks/yr
2	Hunting	6	832	**4,992**	0	6 people/day x 104 day/yr x 8hr/day
3	Hiking	6	832	**4,992**	0	6 people/day x 104 day/yr x 4 hr/day
4	ATV	4	208	**832**	0.25	4 people/day x 104 day/yr x 2 hr/day
5	City and County Access	2	416	**832**	0	2 people/day x 52 day/yr x 8 hr/day
6	Unauthorized use	2	104	**208**	0	2 people/day x 104 day/yr x 1 hr/day
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **12,896**
Maximum intrusive depth at site (ft): **3**

Reference(s) for table above:

Select Ref(s)

Land Use Activities Planned After Response Alternative #2: Subsurface Clearance with LUCs

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Agriculture	1	1040	**1,040**	3	1 person x 20 hrs/wk x 52 wks/yr
2	Hunting	6	832	**4,992**	0	6 people/day x 104 day/yr x 8hr/day
3	Hiking	6	832	**4,992**	0	6 people/day x 104 day/yr x 4 hr/day
4	ATV	4	208	**832**	0.25	4 people/day x 104 day/yr x 2 hr/day
5	City and County Access	2	416	**832**	0	2 people/day x 52 day/yr x 8 hr/day
6	Unauthorized use	2	104	**208**	0	2 people/day x 104 day/yr x 1 hr/day
7						
8						
9						
10						
11						
12						
			Total Potential Contact Time (receptor hrs/yr):	**12,896**		
			Maximum intrusive depth at site (ft):		**3**	

Reference(s) for table above:

Select Ref(s)

Land Use Activities Planned After Response Alternative #3:

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Agriculture	1	1040	**1,040**	3	1 person x 20 hrs/wk x 52 wks/yr
2	Hunting	6	832	**4,992**	0	6 people/day x 104 day/yr x 8hr/day
3	Hiking	6	832	**4,992**	0	6 people/day x 104 day/yr x 4 hr/day
4	ATV	4	208	**832**	0.25	4 people/day x 104 day/yr x 2 hr/day
5	City and County Access	2	416	**832**	0	2 people/day x 52 day/yr x 8 hr/day
6	Unauthorized use	2	104	**208**	0	2 people/day x 104 day/yr x 1 hr/day
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **12,896**

Maximum intrusive depth at site (ft): **3**

Reference(s) for table above:

Select Ref(s)

Land Use Activities Planned After Response Alternative #4:

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Agriculture	1	1040	**1,040**	3	1 person x 20 hrs/wk x 52 wks/yr
2	Hunting	6	832	**4,992**	0	6 people/day x 104 day/yr x 8hr/day
3	Hiking	6	832	**4,992**	0	6 people/day x 104 day/yr x 4 hr/day
4	ATV	4	208	**832**	0.25	4 people/day x 104 day/yr x 2 hr/day
5	City and County Access	2	416	**832**	0	2 people/day x 52 day/yr x 8 hr/day
6	Unauthorized use	2	104	**208**	0	2 people/day x 104 day/yr x 1 hr/day
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **12,896**

Maximum intrusive depth at site (ft): **3**

Reference(s) for table above:

Select Ref(s)

Land Use Activities Planned After Response Alternative #5:

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

Select Ref(s)

Public Review Draft - Do Not Cite or Quote

Land Use Activities Planned After Response Alternative #6:

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

Select Ref(s)

	H09HI0354
Site ID:	02R01-1
Date:	9/16/2011

Energetic Material Type Input Factor Categories

The following table is used to determine scores associated with the energetic materials. Materials are listed in order from most hazardous to least hazardous.

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
High Explosive and Low Explosive Filler in Fragmenting Rounds	100	100	100
White Phosphorus	70	70	70
Pyrotechnic	60	60	60
Propellant	50	50	50
Spotting Charge	40	40	40
Incendiary	30	30	30

The most hazardous type of energetic material listed in the 'Munitions, Bulk Explosive Info' Worksheet falls under the category 'High Explosive and Low Explosive Filler in Fragmenting Rounds'.

	Score
Baseline Conditions:	**100**
Surface Cleanup:	**100**
Subsurface Cleanup:	**100**

Location of Additional Human Receptors Input Factor Categories

1. What is the Explosive Safety Quantity Distance (ESQD) from the Explosive Siting Plan or the Explosive Safety Submission for the MRS? 239 feet

2. Are there currently any features or facilities where people may congregate within the MRS, or within the ESQD arc? No

3. Please describe the facility or feature.

Unauthorized recreational use.

MEC Item(s) used to calculate the ESQD for current use activities

Select MEC(s)

75 mm HE

The following table is used to determine scores associated with the location of additional human receptors (current use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

4. Current use activities are 'Outside of the ESQD arc', based on Question 2.'

	Score
Baseline Conditions:	**0**
Surface Cleanup:	**0**
Subsurface Cleanup:	**0**

5. Are there future plans to locate or construct features or facilities where people may congregate within the MRS, or within the ESQD arc?

6. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for future use activities

Select MEC(s)

The following table is used to determine scores associated with the location of additional human receptors (future use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

7. Please answer Question 5 above to determine the scores.

	Score
Baseline Conditions:	
Surface Cleanup:	
Subsurface Cleanup:	

Site Accessibility Input Factor Categories

The following table is used to determine scores associated with site accessibility:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Full Accessibility	No barriers to entry, including signage but no fencing	80	80	80
Moderate Accessibility	Some barriers to entry, such as barbed wire fencing or rough terrain	55	55	55
Limited Accessibility	Significant barriers to entry, such as unguarded chain link fence or requirements for special transportation to reach the site	15	15	15
Very Limited Accessibility	A site with guarded chain link fence or terrain that requires special equipment and skills (e.g., rock climbing) to access	5	5	5

Current Use Activities — ***Score***

Select the category that best describes the site accessibility under the current use scenario:

Moderate Accessibility

	Score
Baseline Conditions:	**55**
Surface Cleanup:	**55**
Subsurface Cleanup:	**55**

Future Use Activities

Select the category that best describes the site accessibility under the future use scenario:

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Reference(s) for above information:

Select Ref(s)

Response Alternative No. 1: Subsurface Clearance (Baseline Condition)

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Moderate Accessibility'.

	Score
Baseline Conditions:	**55**
Surface Cleanup:	**55**
Subsurface Cleanup:	**55**

Response Alternative No. 2: Subsurface Clearance with LUCs

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Limited Accessibility'.

	Score
Baseline Conditions:	**15**
Surface Cleanup:	**15**
Subsurface Cleanup:	**15**

Response Alternative No. 3:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 4:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 5:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 6:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Potential Contact Hours Input Factor Categories

The following table is used to determine scores associated with the total potential contact time:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Many Hours	≥1,000,000 receptor-hrs/yr	120	90	30
Some Hours	100,000 to 999,999 receptor hrs/yr	70	50	20
Few Hours	10,000 to 99,999 receptor-hrs/yr	40	20	10
Very Few Hours	<10,000 receptor-hrs/yr	15	10	5

***Current Use Activities*:**

Input factors are only determined for baseline conditions for current use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: **12,896** receptor hrs/yr

Based on the table above, this corresponds to a input factor score for baseline conditions of: **40** Score

***Future Use Activities*:**

Input factors are only determined for baseline conditions for future use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: receptor hrs/yr

Based on the table above, this corresponds to a input factor score of: Score

Response Alternative No. 1: Subsurface Clearance (Baseline Condition)

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented. **12896**

Total Potential Contact Time, based on the contact time listed for this alternative (see 'Post-Response Land Use' Worksheet) **12,896**

Based on the table above, this corresponds to input factor scores of: ***Score***

Baseline Conditions: **40**
Surface Cleanup: **20**
Subsurface Cleanup: **10**

Response Alternative No. 2: Subsurface Clearance with LUCs

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.

Total Potential Contact Time, based on the contact time listed for this alternative (see 'Post-Response Land Use' Worksheet) **12,896**

Based on the table above, this corresponds to input factor scores of: ***Score***

Baseline Conditions: **40**
Surface Cleanup: **20**
Subsurface Cleanup: **10**

Response Alternative No. 3:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time

Based on the table above, this corresponds to input factor scores of: ***Score***

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 4:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time

Based on the table above, this corresponds to input factor scores of: ***Score***

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 5:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time

Based on the table above, this corresponds to input factor scores of: **Score**

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 6:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time

Based on the table above, this corresponds to input factor scores of: **Score**

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Amount of MEC Input Factor Categories

The following table is used to determine scores associated with the Amount of MEC:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Target Area	Areas at which munitions fire was directed	180	120	30
OB/OD Area	Sites where munitions were disposed of by open burn or open detonation methods. This category refers to the core activity area of an OB/OD area. See the "Safety Buffer Areas" category for safety fans and kick-outs.	180	110	30
Function Test Range	Areas where the serviceability of stored munitions or weapons systems are tested. Testing may include components, partial functioning or complete functioning of stockpile or developmental items.	165	90	25
Burial Pit	The location of a burial of large quantities of MEC items.	140	140	10
Maneuver Areas	Areas used for conducting military exercises in a simulated conflict area or war zone	115	15	5
Firing Points	The location from which a projectile, grenade, ground signal, rocket, guided missile, or other device is to be ignited, propelled, or released.	75	10	5
Safety Buffer Areas	Areas outside of target areas, test ranges, or OB/OD areas that were designed to act as a safety zone to contain munitions that do not hit targets or to contain kick-outs from OB/OD areas.	30	10	5
Storage	Any facility used for the storage of military munitions, such as earth-covered magazines, above-ground magazines, and open-air storage areas.	25	10	5
Explosive-Related Industrial Facility	Former munitions manufacturing or demilitarization sites and TNT production plants	20	10	5

Select the category that best describes the ***most hazardous*** amount of MEC: ***Score***

Maneuver Areas

Baseline Conditions: **115**
Surface Cleanup: **15**
Subsurface Cleanup: **5**

Minimum MEC Depth Relative to the Maximum Intrusive Depth Input Factor Categories

Current Use Activities

The shallowest minimum MEC depth, based on the 'Cased Munitions Information' Worksheet: **0** ft
The deepest intrusive depth: **3** ft
The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240	150	95
Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	240	50	25
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150	N/A	95
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.	50	N/A	25

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth will overlap after cleanup. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.' For 'Current Use Activities', only Baseline Conditions are considered. **240** ***Score***

Future Use Activities

Deepest intrusive depth: ft

Not enough information has been entered to determine the input factor category. ***Score***

Response Alternative No. 1: Subsurface Clearance (Baseline Condition)

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **1.5** ft

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.

Maximum Intrusive Depth, based on the maximum intrusive depth listed for this alternative (see 'Post-Response Land Use' Worksheet) **3** ft

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.'

Score

Baseline Conditions:

Surface Cleanup:

Subsurface Cleanup: **95**

Response Alternative No. 2: Subsurface Clearance with LUCs

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **1.5** ft

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.

Maximum Intrusive Depth, based on the maximum intrusive depth listed for this alternative (see 'Post-Response Land Use' Worksheet) **3** ft

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.'

Score

Baseline Conditions:

Surface Cleanup:

Subsurface Cleanup: **95**

Response Alternative No. 3:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:

Surface Cleanup:

Subsurface Cleanup:

Response Alternative No. 4:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:

Surface Cleanup:

Subsurface Cleanup:

Response Alternative No. 5:

Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

Score

Baseline Conditions:

Surface Cleanup:

Subsurface Cleanup:

Response Alternative No. 6:
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft
Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

	Score
Baseline Conditions:	
Surface Cleanup:	
Subsurface Cleanup:	

Migration Potential Input Factor Categories

Is there any physical or historical evidence that indicates it is possible for natural physical forces in the area (e.g., frost heave, erosion) to expose subsurface MEC items, or move surface or subsurface MEC items? Yes

If "yes", describe the nature of natural forces. Indicate key areas of potential migration (e.g., overland water flow) on a map as appropriate (attach a map to the bottom of this sheet, or as a separate worksheet).

Steep terrain present and flash flooding potential.

The following table is used to determine scores associated with the migration potential:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Possible	30	30	10
Unlikely	10	10	10

Based on the question above, migration potential is 'Possible.'

	Score
Baseline Conditions:	**30**
Surface Cleanup:	**30**
Subsurface Cleanup:	**10**

Reference(s) for above information:

Select Ref(s)

MEC Classification Input Factor Categories

Cased munitions information has been inputed into the 'Munitions, Bulk Explosive Info' Worksheet; therefore, bulk explosives do not comprise all MECs for this MRS.

The 'Amount of MEC' category is 'Maneuver Areas'. It is assumed that the MEC items in this MRS are DMM.

Has a technical assessment shown that MEC in the OB/OD Area is DMM?

Are any of the munitions listed in the 'Munitions, Bulk Explosive Info' Worksheet: Yes

- · Submunitions
- · Rifle-propelled 40mm projectiles (often called 40mm grenades)
- · Munitions with white phosphorus filler
- · High explosive anti-tank (HEAT) rounds
- · Hand grenades
- · Fuzes
- · Mortars

At least one item listed in the 'Munitions, Bulk Explosive Info' Worksheet was identified as 'fuzed'.

The following table is used to determine scores associated with MEC classification categories:

Fuzed DMM Special Case	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
UXO Special Case	180	180	180
UXO	110	110	110
Fuzed DMM Special Case	105	105	105
Fuzed DMM	55	55	55
Unfuzed DMM	45	45	45
Bulk Explosives	45	45	45

Based on your answers above, the MEC classification is 'Fuzed DMM Special Case'.

	Score
Baseline Conditions:	**105**
Surface Cleanup:	**105**
Subsurface Cleanup:	**105**

MEC Size Input Factor Categories

The following table is used to determine scores associated with MEC Size:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Small	Any munitions (from the 'Munitions, Bulk Explosive Info' Worksheet) weigh less than 90 lbs; small enough for a receptor to be able to move and initiate a detonation	40	40	40

Large	All munitions weigh more than 90 lbs; too large to move without equipment	0	0	0	

Based on the definitions above and the types of munitions at the site (see 'Munitions, Bulk Explosive Info' Worksheet), the MEC Size Input Factor is: Small

	Score
Baseline Conditions:	**40**
Surface Cleanup:	**40**
Subsurface Cleanup:	**40**

Scoring Summary

Site ID:	H09HI035402R01-1	a. Scoring Summary for Current Use Activities	
Date:	9/16/2011	Response Action Cleanup:	No Response Action
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		10,000 to 99,999 receptor-hrs/yr	40
V. Amount of MEC		Maneuver Areas	115
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240
VII. Migration Potential		Possible	30
VIII. MEC Classification		Fuzed DMM Special Case	105
IX. MEC Size		Small	40
		Total Score	725
		Hazard Level Category	3

Site ID:	H09HI035402R01-1	b. Scoring Summary for Future Use Activities	
Date:	9/16/2011	Response Action Cleanup:	No Response Action
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors			
III. Site Accessibility			
IV. Potential Contact Hours			
V. Amount of MEC		Maneuver Areas	115
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			
VII. Migration Potential		Possible	30
VIII. MEC Classification		Fuzed DMM Special Case	105
IX. MEC Size		Small	40
		Total Score	390
		Hazard Level Category	4

Site ID:	H09HI035402R01-1	c. Scoring Summary for Response Alternative 1: Subsurface Clearance (Baseline Condition)	
Date:	9/16/2011	Response Action Cleanup:	cleanup of MECs located both on the surface and subsurface
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Moderate Accessibility	55
IV. Potential Contact Hours		10,000 to 99,999 receptor-hrs/yr	10
V. Amount of MEC		Maneuver Areas	5
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	95
VII. Migration Potential		Possible	10
VIII. MEC Classification		Fuzed DMM Special Case	105
IX. MEC Size		Small	40
		Total Score	420
		Hazard Level Category	4

Site ID:	H09HI035402R01-1	d. Scoring Summary for Response Alternative 2: Subsurface Clearance with LUCs	
Date:	9/16/2011	Response Action Cleanup:	cleanup of MECs located both on the surface and subsurface
Input Factor		**Input Factor Category**	**Score**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Limited Accessibility	15
IV. Potential Contact Hours		10,000 to 99,999 receptor-hrs/yr	10
V. Amount of MEC		Maneuver Areas	5
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	95
VII. Migration Potential		Possible	10
VIII. MEC Classification		Fuzed DMM Special Case	105
IX. MEC Size		Small	40
		Total Score	**380**
		Hazard Level Category	**4**

Site ID:	H09HI035402R01-1	e. Scoring Summary for Response Alternative 3:	
Date:	9/16/2011	Response Action Cleanup:	
Input Factor		**Input Factor Category**	**Score**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	
II. Location of Additional Human Receptors		Outside of the ESQD arc	
III. Site Accessibility			
IV. Potential Contact Hours			
V. Amount of MEC		Maneuver Areas	
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			
VII. Migration Potential		Possible	
VIII. MEC Classification		Fuzed DMM Special Case	
IX. MEC Size		Small	
		Total Score	
		Hazard Level Category	

Site ID:	H09HI035402R01-1	f. Scoring Summary for Response Alternative 4:	
Date:	9/16/2011	Response Action Cleanup:	
Input Factor		**Input Factor Category**	**Score**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	
II. Location of Additional Human Receptors		Outside of the ESQD arc	
III. Site Accessibility			
IV. Potential Contact Hours			
V. Amount of MEC		Maneuver Areas	
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			
VII. Migration Potential		Possible	
VIII. MEC Classification		Fuzed DMM Special Case	
IX. MEC Size		Small	
		Total Score	
		Hazard Level Category	

Site ID: H09HI035402R01-1	g. Scoring Summary for Response Alternative 5:	
Date: 9/16/2011	Response Action Cleanup:	
Input Factor	**Input Factor Category**	**Score**
I. Energetic Material Type	High Explosive and Low Explosive Filler in Fragmenting Rounds	
II. Location of Additional Human Receptors	Outside of the ESQD arc	
III. Site Accessibility		
IV. Potential Contact Hours		
V. Amount of MEC	Maneuver Areas	
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		
VII. Migration Potential	Possible	
VIII. MEC Classification	Fuzed DMM Special Case	
IX. MEC Size	Small	
	Total Score	
	Hazard Level Category	

Site ID: H09HI035402R01-1	h. Scoring Summary for Response Alternative 6:	
Date: 9/16/2011	Response Action Cleanup:	
Input Factor	**Input Factor Category**	**Score**
I. Energetic Material Type	High Explosive and Low Explosive Filler in Fragmenting Rounds	
II. Location of Additional Human Receptors	Outside of the ESQD arc	
III. Site Accessibility		
IV. Potential Contact Hours		
V. Amount of MEC	Maneuver Areas	
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		
VII. Migration Potential	Possible	
VIII. MEC Classification	Fuzed DMM Special Case	
IX. MEC Size	Small	
	Total Score	
	Hazard Level Category	

MEC HA Hazard Level Determination		
Site ID: H09HI035402R01-1		
Date: 9/16/2011		
	Hazard Level Category	**Score**
a. Current Use Activities	3	725
b. Future Use Activities	4	390
c. Response Alternative 1: Subsurface Clearance (Baseline Condition)	4	420
d. Response Alternative 2: Subsurface Clearance with LUCs	4	380
e. Response Alternative 3:		
f. Response Alternative 4:		
g. Response Alternative 5:		
h. Response Alternative 6:		
Characteristics of the MRS		
Is critical infrastructure located within the MRS or within the ESQD arc?	No	
Are cultural resources located within the MRS or within the ESQD arc?	Yes	
Are significant ecological resources located within the MRS or within the ESQD arc?	No	

MEC HA Summary Information

Comments

Site ID: H09HI035402R02-2
Date: 9/16/2011

Please identify the single specific area to be assessed in this hazard assessment. From this point forward, all references to "site" or "MRS" refer to the specific area that you have defined.

A. Enter a unique identifier for the site:

Southern Impact Region MRS

Provide a list of information sources used for this hazard assessment. As you are completing the worksheets, use the "Select Ref(s)" buttons at the ends of each subsection to select the applicable information sources from the list below.

Ref. No.	Title (include version, publication date)
1	INPR 2004
2	Engineering Evaluation/Cost Analysis (EE/CA) 2006
3	USMC Site Inspection 2008
4	Abbreviated Site Inspection 2008
5	Surface Clearance 1976 and 1984
6	CEPOH Removal Action
7	NAVFAC Remedial Investigation
8	
9	
10	
11	
12	

B. Briefly describe the site:

1. Area (include units): 90 acres
2. Past munitions-related use:

Maneuver Areas

3. Current land-use activities (list all that occur):

Recreation, hunting, hiking, ATVs, City and County personnel access

4. Are changes to the future land-use planned? no
5. What is the basis for the site boundaries?

MEC/MD concentrations, anomaly concentrations, historical land use, and geographical boundaries (EE/CA 2006)

6. How certain are the site boundaries?

MEC/MD concentrations, anomaly concentrations, historical land use, and geographical boundaries (EE/CA 2006)

Reference(s) for Part B:

Inventory Project Report (INPR) 1996 and Supplemental INPR 2004 Engineering Evaluation/Cost Analysis (EE/CA) 2006

Select Ref(s)

C. Historical Clearances

1. Have there been any historical clearances at the site? Yes, subsurface clearance
2. If a clearance occurred:
   a. What year was the clearance performed? 2011
   b. Provide a description of the clearance activity (e.g., extent, depth, amount of munitions-related items removed, types and sizes of removed items, and whether metal detectors were used):

   Subsurface clearance completed August 2011 to depth of detection, 30 items located, Minelab metal detectors, average depth of items <0.5 ft.

Reference(s) for Part C:

Select Ref(s)

D. Attach maps of the site below (select 'Insert/Picture' on the menu bar.)

Site ID: **H09HI035402R02-2**
Date: **9/16/2011**

Cased Munitions Information

Item No.	Munition Type (e.g., mortar, projectile, etc.)	Munition Size	Munition Size Units	Mark/ Model	Energetic Material Type	Is Munition Fuzed?	Fuzing Type	Fuze Condition	Minimum Depth for Munition (ft)	Location of Munitions	Comments (include rationale for munitions that are "subsurface only")
1	Artillery	37	mm	Mk II	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
2	Artillery	75	mm	Mk I	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
3	Mortars	60	mm	M49A2	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
4	Mortars	81	mm	M43	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
5	Rockets	2.36	inches	M6A3	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
6	Rockets	3.5	inches	M28A2	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
7	Grenades			Mk II	High Explosive	Yes	Time	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
10	Grenades			M28	High Explosive	Yes	Impact	Armed	0	Surface and Subsurface	MD presence, No evidence of UXO located outside of 2011 Removal Action Area; UXO present in MRS during previous investigations.
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

Reference(s) for table above:
Inventory Project Report (INPR) 1996 and Supplemental INPR 2004 Engineering **Inventory Project Report (INPR) 1996 and Supplemental INPR 2004**

Select Ref(s)

Bulk Explosive Information

Item No.	Explosive Type	Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Reference(s) for table above:

Select Ref(s)

Site ID: **H09HI035402R02-2**
Date: **9/16/2011**

Activities Currently Occurring at the Site

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Hunting	6	832	**4,992**	0	6 people/day x 104 day/yr x 8hr/day
2	Hiking	6	832	**4,992**	0	6 people/day x 104 day/yr x 4 hr/day
3	ATV	4	208	**832**	0.25	4 people/day x 104 day/yr x 2 hr/day
4	City and County Access	2	416	**832**	0	2 people/day x 52 day/yr x 8 hr/day
5	Unauthorized use	2	104	**208**	0	2 people/day x 104 day/yr x 1 hr/day
6	Agricultural	1	1,040	**1,040**	3	1 person x 20 hrs/wk x 52 wks/yr
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **12,896**
Maximum intrusive depth at site (ft): **3**

Reference(s) for table above:

Select Ref(s)

Activities Planned for the Future at the Site (If any are planned: see 'Summary Info' Worksheet, Question 4)

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours per year a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

Select Ref(s)

Site ID: **H09HI035402R02-2**
Date: **9/16/2011**

Planned Remedial or Removal Actions

Response Action No.	Response Action Description	Expected Resulting Minimum MEC Depth (ft)	Expected Resulting Site Accessibility	Will land use activities change if this response action is implemented?
1	Subsurface Clearance (Baseline Condition)	1.5	Limited Accessibility	Yes
2	Subsurface Clearance with LUCs	1.5	Very Limited Accessibility	Yes
3				
4				
5				
6				

According to the 'Summary Info' worksheet, no future land uses are planned. For those alternatives where you answered 'No' in Column E, the land use activities will be assessed against current land uses.

Reference(s) for table above:

What is the expected scope of cleanup?	Comments
cleanup of MECs located both on the surface and subsurface	
cleanup of MECs located both on the surface and subsurface	

Select Ref(s)

Site ID: **H09HI035402R02-2**
Date: **9/16/2011**

This worksheet needs to be completed for each remedial/removal action alternative listed in the 'Remedial-Removal Action' worksheet that will cause a change in land use.

Land Use Activities Planned After Response Alternative #1: Subsurface Clearance (Baseline Condition)

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Agriculture	1	1040	**1,040**	3	1 person x 20 hrs/wk x 52 wks/yr
2	Hunting	6	832	**4,992**	0	6 people/day x 104 day/yr x 8hr/day
3	Hiking	6	832	**4,992**	0	6 people/day x 104 day/yr x 4 hr/day
4	ATV	4	208	**832**	0.25	4 people/day x 104 day/yr x 2 hr/day
5	City and County Access	2	416	**832**	0	2 people/day x 52 day/yr x 8 hr/day
6	Unauthorized use	2	104	**208**	0	2 people/day x 104 day/yr x 1 hr/day
7						
8						
9						
10						
11						
12						
			Total Potential Contact Time (receptor hrs/yr):	**12,896**		
			Maximum intrusive depth at site (ft):		**3**	

Reference(s) for table above:

Select Ref(s)

Land Use Activities Planned After Response Alternative #2: Subsurface Clearance with LUCs

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Agriculture	1	1040	**1,040**	3	1 person x 20 hrs/wk x 52 wks/yr
2	Hunting	6	832	**4,992**	0	6 people/day x 104 day/yr x 8hr/day
3	Hiking	6	832	**4,992**	0	6 people/day x 104 day/yr x 4 hr/day
4	ATV	4	208	**832**	0.25	4 people/day x 104 day/yr x 2 hr/day
5	City and County Access	2	416	**832**	0	2 people/day x 52 day/yr x 8 hr/day
6	Unauthorized use	2	104	**208**	0	2 people/day x 104 day/yr x 1 hr/day
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr): **12,896**

Maximum intrusive depth at site (ft): **3**

Reference(s) for table above:

Select Ref(s)

Land Use Activities Planned After Response Alternative #3:

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Agriculture	1	1040	1,040	3	1 person x 20 hrs/wk x 52 wks/yr
2	Hunting	6	832	4,992	0	6 people/day x 104 day/yr x 8hr/day
3	Hiking	6	832	4,992	0	6 people/day x 104 day/yr x 4 hr/day
4	ATV	4	208	832	0.25	4 people/day x 104 day/yr x 2 hr/day
5	City and County Access	2	416	832	0	2 people/day x 52 day/yr x 8 hr/day
6	Unauthorized use	2	104	208	0	2 people/day x 104 day/yr x 1 hr/day
7						
8						
9						
10						
11						
12						
	Total Potential Contact Time (receptor hrs/yr):			12,896		
	Maximum intrusive depth at site (ft):				3	

Reference(s) for table above:

Select Ref(s)

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Land Use Activities Planned After Response Alternative #4:

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1	Agriculture	1	1040	**1,040**	3	1 person x 20 hrs/wk x 52 wks/yr
2	Hunting	6	832	**4,992**	0	6 people/day x 104 day/yr x 8hr/day
3	Hiking	6	832	**4,992**	0	6 people/day x 104 day/yr x 4 hr/day
4	ATV	4	208	**832**	0.25	4 people/day x 104 day/yr x 2 hr/day
5	City and County Access	2	416	**832**	0	2 people/day x 52 day/yr x 8 hr/day
6	Unauthorized use	2	104	**208**	0	2 people/day x 104 day/yr x 1 hr/day
7						
8						
9						
10						
11						
12						
			Total Potential Contact Time (receptor hrs/yr):	**12,896**		
				Maximum intrusive depth at site (ft):	**3**	

Reference(s) for table above:

Select Ref(s)

Land Use Activities Planned After Response Alternative #5:

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

Select Ref(s)

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Land Use Activities Planned After Response Alternative #6:

Activity No.	Activity	Number of people per year who participate in the activity	Number of hours a single person spends on the activity	Potential Contact Time (receptor hours/year)	Maximum intrusive depth (ft)	Comments
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Total Potential Contact Time (receptor hrs/yr):

Maximum intrusive depth at site (ft):

Reference(s) for table above:

Select Ref(s)

H09HI0354

Site ID: 02R02-2

Date: 9/16/2011

Energetic Material Type Input Factor Categories

The following table is used to determine scores associated with the energetic materials. Materials are listed in order from most hazardous to least hazardous.

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
High Explosive and Low Explosive Filler in Fragmenting Rounds	100	100	100
White Phosphorus	70	70	70
Pyrotechnic	60	60	60
Propellant	50	50	50
Spotting Charge	40	40	40
Incendiary	30	30	30

The most hazardous type of energetic material listed in the 'Munitions, Bulk Explosive Info' Worksheet falls under the category 'High Explosive and Low Explosive Filler in Fragmenting Rounds'.

	Score
Baseline Conditions:	**100**
Surface Cleanup:	**100**
Subsurface Cleanup:	**100**

Location of Additional Human Receptors Input Factor Categories

1. What is the Explosive Safety Quantity Distance (ESQD) from the Explosive Siting Plan or the Explosive Safety Submission for the MRS? 239 feet

2. Are there currently any features or facilities where people may congregate within the MRS, or within the ESQD arc? No

3. Please describe the facility or feature.

Unauthorized recreational use.

MEC Item(s) used to calculate the ESQD for current use activities

Select MEC(s)

75 mm HE

The following table is used to determine scores associated with the location of additional human receptors (current use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

4. Current use activities are 'Outside of the ESQD arc', based on Question 2.'

	Score
Baseline Conditions:	**0**
Surface Cleanup:	**0**
Subsurface Cleanup:	**0**

5. Are there future plans to locate or construct features or facilities where people may congregate within the MRS, or within the ESQD arc?

6. Please describe the facility or feature.

MEC Item(s) used to calculate the ESQD for future use activities

Select MEC(s)

The following table is used to determine scores associated with the location of additional human receptors (future use activities):

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Inside the MRS or inside the ESQD arc	30	30	30
Outside of the ESQD arc	0	0	0

7. Please answer Question 5 above to determine the scores.

	Score
Baseline Conditions:	
Surface Cleanup:	
Subsurface Cleanup:	

Site Accessibility Input Factor Categories

The following table is used to determine scores associated with site accessibility:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Full Accessibility	No barriers to entry, including signage but no fencing	80	80	80
Moderate Accessibility	Some barriers to entry, such as barbed wire fencing or rough terrain	55	55	55
Limited Accessibility	Significant barriers to entry, such as unguarded chain link fence or requirements for special transportation to reach the site	15	15	15
Very Limited Accessibility	A site with guarded chain link fence or terrain that requires special equipment and skills (e.g., rock climbing) to access	5	5	5

Current Use Activities ***Score***

Select the category that best describes the site accessibility under the current use scenario:

Limited Accessibility

Baseline Conditions:	**15**
Surface Cleanup:	**15**
Subsurface Cleanup:	**15**

Future Use Activities

Select the category that best describes the site accessibility under the future use scenario:

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Reference(s) for above information:

Select Ref(s)

Response Alternative No. 1: Subsurface Clearance (Baseline Condition)

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Limited Accessibility'.

Baseline Conditions:	**15**
Surface Cleanup:	**15**
Subsurface Cleanup:	**15**

Response Alternative No. 2: Subsurface Clearance with LUCs

Based on the 'Planned Remedial or Removal Actions' Worksheet, this alternative will lead to 'Very Limited Accessibility'.

Baseline Conditions:	**5**
Surface Cleanup:	**5**
Subsurface Cleanup:	**5**

Response Alternative No. 3:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 4:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 5:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 6:

Please enter site accessibility information in the 'Planned Remedial or Removal Actions' Worksheet to continue.

Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Potential Contact Hours Input Factor Categories

The following table is used to determine scores associated with the total potential contact time:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Many Hours	≥1,000,000 receptor-hrs/yr	120	90	30
Some Hours	100,000 to 999,999 receptor hrs/yr	70	50	20
Few Hours	10,000 to 99,999 receptor-hrs/yr	40	20	10
Very Few Hours	<10,000 receptor-hrs/yr	15	10	5

***Current Use Activities*:**

Input factors are only determined for baseline conditions for current use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: **12,896** receptor hrs/yr
Based on the table above, this corresponds to a input factor score for baseline conditions of: **40** Score

***Future Use Activities*:**

Input factors are only determined for baseline conditions for future use activities. Based on the 'Current and Future Activities' Worksheet, the Total Potential Contact Time is: receptor hrs/yr
Based on the table above, this corresponds to a input factor score of: Score

Response Alternative No. 1: Subsurface Clearance (Baseline Condition)

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented. **12896**
Total Potential Contact Time, based on the contact time listed for this alternative (see 'Post-Response Land Use' Worksheet) **12,896**
Based on the table above, this corresponds to input factor scores of: ***Score***
Baseline Conditions: **40**
Surface Cleanup: **20**
Subsurface Cleanup: **10**

Response Alternative No. 2: Subsurface Clearance with LUCs

Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.
Total Potential Contact Time, based on the contact time listed for this alternative (see 'Post-Response Land Use' Worksheet) **12,896**
Based on the table above, this corresponds to input factor scores of: ***Score***
Baseline Conditions: **40**
Surface Cleanup: **20**
Subsurface Cleanup: **10**

Response Alternative No. 3:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: ***Score***
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 4:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: ***Score***
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 5:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: **Score**
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Response Alternative No. 6:

Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Total Potential Contact Time
Based on the table above, this corresponds to input factor scores of: **Score**
Baseline Conditions:
Surface Cleanup:
Subsurface Cleanup:

Amount of MEC Input Factor Categories

The following table is used to determine scores associated with the Amount of MEC:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Target Area	Areas at which munitions fire was directed	180	120	30
OB/OD Area	Sites where munitions were disposed of by open burn or open detonation methods. This category refers to the core activity area of an OB/OD area. See the "Safety Buffer Areas" category for safety fans and kick-outs.	180	110	30
Function Test Range	Areas where the serviceability of stored munitions or weapons systems are tested. Testing may include components, partial functioning or complete functioning of stockpile or developmental items.	165	90	25
Burial Pit	The location of a burial of large quantities of MEC items.	140	140	10
Maneuver Areas	Areas used for conducting military exercises in a simulated conflict area or war zone	115	15	5
Firing Points	The location from which a projectile, grenade, ground signal, rocket, guided missile, or other device is to be ignited, propelled, or released.	75	10	5
Safety Buffer Areas	Areas outside of target areas, test ranges, or OB/OD areas that were designed to act as a safety zone to contain munitions that do not hit targets or to contain kick-outs from OB/OD areas.	30	10	5
Storage	Any facility used for the storage of military munitions, such as earth-covered magazines, above-ground magazines, and open-air storage areas.	25	10	5
Explosive-Related Industrial Facility	Former munitions manufacturing or demilitarization sites and TNT production plants	20	10	5

Select the category that best describes the ***most hazardous*** amount of MEC: ***Score***

Maneuver Areas

Baseline Conditions:	**115**
Surface Cleanup:	**15**
Subsurface Cleanup:	**5**

Minimum MEC Depth Relative to the Maximum Intrusive Depth Input Factor Categories

Current Use Activities

The shallowest minimum MEC depth, based on the 'Cased Munitions Information' Worksheet: **0** ft

The deepest intrusive depth: **3** ft

The table below is used to determine scores associated with the minimum MEC depth relative to the maximum intrusive depth:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240	150	95
Baseline Condition: MEC located surface and subsurface, After Cleanup: Intrusive depth does not overlap with subsurface MEC.	240	50	25
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth overlaps with minimum MEC depth.	150	N/A	95
Baseline Condition: MEC located only subsurface. Baseline Condition or After Cleanup: Intrusive depth does not overlap with minimum MEC depth.	50	N/A	25

Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth will overlap after cleanup. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.' For 'Current Use Activities', only Baseline Conditions are considered. **240** ***Score***

Future Use Activities
Deepest intrusive depth: ft

Not enough information has been entered to determine the input factor category. ***Score***

Response Alternative No. 1: Subsurface Clearance (Baseline Condition)
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **1.5** ft
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.
Maximum Intrusive Depth, based on the maximum intrusive depth listed for this alternative (see 'Post-Response Land Use' Worksheet) **3** ft
Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.'

	Score
Baseline Conditions:	
Surface Cleanup:	
Subsurface Cleanup:	**95**

Response Alternative No. 2: Subsurface Clearance with LUCs
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): **1.5** ft
Based on the 'Planned Remedial or Removal Actions' Worksheet, land use activities will change if this alternative is implemented.
Maximum Intrusive Depth, based on the maximum intrusive depth listed for this alternative (see 'Post-Response Land Use' Worksheet) **3** ft
Because the shallowest minimum MEC depth is less than or equal to the deepest intrusive depth, the intrusive depth overlaps. MECs are located at both the surface and subsurface, based on the 'Munitions, Bulk Explosive Info' Worksheet. Therefore, the category for this input factor is 'Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.'

	Score
Baseline Conditions:	
Surface Cleanup:	
Subsurface Cleanup:	**95**

Response Alternative No. 3:
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft
Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

	Score
Baseline Conditions:	
Surface Cleanup:	
Subsurface Cleanup:	

Response Alternative No. 4:
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft
Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

	Score
Baseline Conditions:	
Surface Cleanup:	
Subsurface Cleanup:	

Response Alternative No. 5:
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft
Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

	Score
Baseline Conditions:	
Surface Cleanup:	
Subsurface Cleanup:	

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Response Alternative No. 6:
Expected minimum MEC depth (from the 'Planned Remedial or Removal Actions' Worksheet): ft
Not enough information has been entered in the 'Planned Remedial or Removal Actions' Worksheet. Please complete the table before returning to this section.

Maximum Intrusive Depth ft

Not enough information has been entered to calculate this input factor.

	Score
Baseline Conditions:	
Surface Cleanup:	
Subsurface Cleanup:	

Migration Potential Input Factor Categories

Is there any physical or historical evidence that indicates it is possible for natural physical forces in the area (e.g., frost heave, erosion) to expose subsurface MEC items, or move surface or subsurface MEC items? Yes

If "yes", describe the nature of natural forces. Indicate key areas of potential migration (e.g., overland water flow) on a map as appropriate (attach a map to the bottom of this sheet, or as a separate worksheet).

Steep terrain present and flash flooding potential.

The following table is used to determine scores associated with the migration potential:

	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Possible	30	30	10
Unlikely	10	10	10

Based on the question above, migration potential is 'Possible.'

	Score
Baseline Conditions:	**30**
Surface Cleanup:	**30**
Subsurface Cleanup:	**10**

Reference(s) for above information:

Select Ref(s)

MEC Classification Input Factor Categories

Cased munitions information has been inputed into the 'Munitions, Bulk Explosive Info' Worksheet; therefore, bulk explosives do not comprise all MECs for this MRS.

The 'Amount of MEC' category is 'Maneuver Areas'. It is assumed that the MEC items in this MRS are DMM.

Has a technical assessment shown that MEC in the OB/OD Area is DMM?

Are any of the munitions listed in the 'Munitions, Bulk Explosive Info' Worksheet: Yes

- Submunitions
- Rifle-propelled 40mm projectiles (often called 40mm grenades)
- Munitions with white phosphorus filler
- High explosive anti-tank (HEAT) rounds
- Hand grenades
- Fuzes
- Mortars

At least one item listed in the 'Munitions, Bulk Explosive Info' Worksheet was identified as 'fuzed'.

The following table is used to determine scores associated with MEC classification categories:

Fuzed DMM Special Case	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
UXO Special Case	180	180	180
UXO	110	110	110
Fuzed DMM Special Case	105	105	105
Fuzed DMM	55	55	55
Unfuzed DMM	45	45	45
Bulk Explosives	45	45	45

Based on your answers above, the MEC classification is 'Fuzed DMM Special Case'.

	Score
Baseline Conditions:	**105**
Surface Cleanup:	**105**
Subsurface Cleanup:	**105**

MEC Size Input Factor Categories

The following table is used to determine scores associated with MEC Size:

	Description	Baseline Conditions	Surface Cleanup	Subsurface Cleanup
Small	Any munitions (from the 'Munitions, Bulk Explosive Info' Worksheet) weigh less than 90 lbs; small enough for a receptor to be able to move and initiate a detonation	40	40	40

Large	All munitions weigh more than 90 lbs; too large to move without equipment	0	0	0

Based on the definitions above and the types of munitions at the site (see 'Munitions, Bulk Explosive Info' Worksheet), the MEC Size Input Factor is: Small

	Score
Baseline Conditions:	**40**
Surface Cleanup:	**40**
Subsurface Cleanup:	**40**

Scoring Summary

Site ID:	H09HI035402R02-2	a. Scoring Summary for Current Use Activities	
Date:	9/16/2011	Response Action Cleanup:	No Response Action
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Limited Accessibility	15
IV. Potential Contact Hours		10,000 to 99,999 receptor-hrs/yr	40
V. Amount of MEC		Maneuver Areas	115
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	240
VII. Migration Potential		Possible	30
VIII. MEC Classification		Fuzed DMM Special Case	105
IX. MEC Size		Small	40
		Total Score	685
		Hazard Level Category	3

Site ID:	H09HI035402R02-2	b. Scoring Summary for Future Use Activities	
Date:	9/16/2011	Response Action Cleanup:	No Response Action
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors			
III. Site Accessibility			
IV. Potential Contact Hours			
V. Amount of MEC		Maneuver Areas	115
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			
VII. Migration Potential		Possible	30
VIII. MEC Classification		Fuzed DMM Special Case	105
IX. MEC Size		Small	40
		Total Score	390
		Hazard Level Category	4

Site ID:	H09HI035402R02-2	c. Scoring Summary for Response Alternative 1: Subsurface Clearance (Baseline Condition)	
Date:	9/16/2011	Response Action Cleanup:	cleanup of MECs located both on the surface and subsurface
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Limited Accessibility	15
IV. Potential Contact Hours		10,000 to 99,999 receptor-hrs/yr	10
V. Amount of MEC		Maneuver Areas	5
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	95
VII. Migration Potential		Possible	10
VIII. MEC Classification		Fuzed DMM Special Case	105
IX. MEC Size		Small	40
		Total Score	380
		Hazard Level Category	4

Site ID:	H09HI035402R02-2	d. Scoring Summary for Response Alternative 2: Subsurface Clearance with LUCs	
Date:	9/16/2011	Response Action Cleanup:	cleanup of MECs located both on the surface and subsurface
Input Factor		**Input Factor Category**	**Score**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	100
II. Location of Additional Human Receptors		Outside of the ESQD arc	0
III. Site Accessibility		Very Limited Accessibility	5
IV. Potential Contact Hours		10,000 to 99,999 receptor-hrs/yr	10
V. Amount of MEC		Maneuver Areas	5
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth		Baseline Condition: MEC located surface and subsurface. After Cleanup: Intrusive depth overlaps with subsurface MEC.	95
VII. Migration Potential		Possible	10
VIII. MEC Classification		Fuzed DMM Special Case	105
IX. MEC Size		Small	40
		Total Score	**370**
		Hazard Level Category	**4**

Site ID:	H09HI035402R02-2	e. Scoring Summary for Response Alternative 3:	
Date:	9/16/2011	Response Action Cleanup:	
Input Factor		**Input Factor Category**	**Score**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	
II. Location of Additional Human Receptors		Outside of the ESQD arc	
III. Site Accessibility			
IV. Potential Contact Hours			
V. Amount of MEC		Maneuver Areas	
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			
VII. Migration Potential		Possible	
VIII. MEC Classification		Fuzed DMM Special Case	
IX. MEC Size		Small	
		Total Score	
		Hazard Level Category	

Site ID:	H09HI035402R02-2	f. Scoring Summary for Response Alternative 4:	
Date:	9/16/2011	Response Action Cleanup:	
Input Factor		**Input Factor Category**	**Score**
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	
II. Location of Additional Human Receptors		Outside of the ESQD arc	
III. Site Accessibility			
IV. Potential Contact Hours			
V. Amount of MEC		Maneuver Areas	
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			
VII. Migration Potential		Possible	
VIII. MEC Classification		Fuzed DMM Special Case	
IX. MEC Size		Small	
		Total Score	
		Hazard Level Category	

Site ID:	H09HI035402R02-2	g. Scoring Summary for Response Alternative 5:	
Date:	9/16/2011	Response Action Cleanup:	
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	
II. Location of Additional Human Receptors		Outside of the ESQD arc	
III. Site Accessibility			
IV. Potential Contact Hours			
V. Amount of MEC		Maneuver Areas	
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			
VII. Migration Potential		Possible	
VIII. MEC Classification		Fuzed DMM Special Case	
IX. MEC Size		Small	
		Total Score	
		Hazard Level Category	

Site ID:	H09HI035402R02-2	h. Scoring Summary for Response Alternative 6:	
Date:	9/16/2011	Response Action Cleanup:	
Input Factor		Input Factor Category	Score
I. Energetic Material Type		High Explosive and Low Explosive Filler in Fragmenting Rounds	
II. Location of Additional Human Receptors		Outside of the ESQD arc	
III. Site Accessibility			
IV. Potential Contact Hours			
V. Amount of MEC		Maneuver Areas	
VI. Minimum MEC Depth Relative to Maximum Intrusive Depth			
VII. Migration Potential		Possible	
VIII. MEC Classification		Fuzed DMM Special Case	
IX. MEC Size		Small	
		Total Score	
		Hazard Level Category	

MEC HA Hazard Level Determination		
Site ID: H09HI035402R02-2		
Date: 9/16/2011		
	Hazard Level Category	Score
a. Current Use Activities	3	685
b. Future Use Activities	4	390
c. Response Alternative 1: Subsurface Clearance (Baseline Condition)	4	380
d. Response Alternative 2: Subsurface Clearance with LUCs	4	370
e. Response Alternative 3:		
f. Response Alternative 4:		
g. Response Alternative 5:		
h. Response Alternative 6:		

Characteristics of the MRS	
Is critical infrastructure located within the MRS or within the ESQD arc?	No
Are cultural resources located within the MRS or within the ESQD arc?	Yes
Are significant ecological resources located within the MRS or within the ESQD arc?	No

APPENDIX E
SITE PHOTOGRAPHS

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<table>
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Remedial Investigation/Feasibility Study</th></tr>
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6-6-11 #1</td><td rowspan="4"></td></tr>
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<tr><td>PHOTO BY:
SUXOS</td></tr>
<tr><td>DESCRIPTION:
Site overview</td></tr>
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Remedial Investigation/Feasibility Study</th></tr>
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5-25-11 #2</td><td rowspan="4"></td></tr>
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Above</td></tr>
<tr><td>PHOTO BY:
SUXOS</td></tr>
<tr><td>DESCRIPTION:
First Aid/CPR Training.</td></tr>
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Waikane Valley FUDS **Remedial Investigation/Feasibility Study**	
DATE: 6-30-11#3	
DIRECTION: E to W	
PHOTO BY: Team Leader	
DESCRIPTION: Transect brush cutting	

Waikane Valley FUDS **Remedial Investigation/Feasibility Study**	
DATE: 7-8-11 #4	
DIRECTION: E to W	
PHOTO BY: Team Leader	
DESCRIPTION: Transect brush cutting in Southeastern Region MRS	

<table>
<tr><th colspan="2">Waikane Valley FUDS
Remedial Investigation/Feasibility Study</th></tr>
<tr><td>DATE:
6-22-11 #5</td><td rowspan="4"></td></tr>
<tr><td>DIRECTION:
E to W</td></tr>
<tr><td>PHOTO BY:
Team Leader</td></tr>
<tr><td>DESCRIPTION:
Transect lane with hub stakes.</td></tr>
</table>

<table>
<tr><th colspan="2">Waikane Valley FUDS
Remedial Investigation/Feasibility Study</th></tr>
<tr><td>DATE:
6-13-11 #6</td><td rowspan="4"></td></tr>
<tr><td>DIRECTION:
E to W</td></tr>
<tr><td>PHOTO BY:
Team Leader</td></tr>
<tr><td>DESCRIPTION:
Analog-and-dig along a transect. Documenting intrusive investigation using Trimble GeoXH.</td></tr>
</table>

Waikane Valley FUDS
Remedial Investigation/Feasibility Study

DATE: 6-13-11 #7	
DIRECTION: SE to NW	
PHOTO BY: Team Leader	
DESCRIPTION: UXO Technicians during MEC investigation.	

Waikane Valley FUDS
Remedial Investigation/Feasibility Study

DATE: 6-15-11 #10	
DIRECTION: Above	
PHOTO BY: Team Leader	
DESCRIPTION: Representative small arms.	

<table>
<tr><td colspan="2">Waikane Valley FUDS
Remedial Investigation/Feasibility Study</td></tr>
<tr><td>DATE:
6-15-11 #11</td><td rowspan="4"></td></tr>
<tr><td>DIRECTION:
W to E</td></tr>
<tr><td>PHOTO BY:
UXOSO/QC</td></tr>
<tr><td>DESCRIPTION:
Abandoned vehicle in Southeastern Region MRS.</td></tr>
</table>

<table>
<tr><td colspan="2">Waikane Valley FUDS
Remedial Investigation/Feasibility Study</td></tr>
<tr><td>DATE:
6-17-11 #12</td><td rowspan="4">
</td></tr>
<tr><td>DIRECTION:
NW to SE</td></tr>
<tr><td>PHOTO BY:
UXOSO/QC</td></tr>
<tr><td>DESCRIPTION:
Fence line separating FUDS and Marine Corps parcel.</td></tr>
</table>

<table>
<tr><td colspan="2">Waikane Valley FUDS
Remedial Investigation/Feasibility Study</td></tr>
<tr><td>DATE:
6-15-11 #13</td><td rowspan="4"></td></tr>
<tr><td>DIRECTION:

Unknown</td></tr>
<tr><td>PHOTO BY:

SUXOS</td></tr>
<tr><td>DESCRIPTION:
Warning sign on fence leading to Marine Corps parcel.</td></tr>
</table>

<table>
<tr><td colspan="2">Waikane Valley FUDS
Remedial Investigation/Feasibility Study</td></tr>
<tr><td>DATE:
7-8-11 #14</td><td rowspan="4"></td></tr>
<tr><td>DIRECTION:

South</td></tr>
<tr><td>PHOTO BY:

UXOSO/QC</td></tr>
<tr><td>DESCRIPTION:
Area of interest along Waikane Stream.</td></tr>
</table>

Waikane Valley FUDS **Remedial Investigation/Feasibility Study**	
DATE: 7-18-11 #15	
DIRECTION: Above	
PHOTO BY: Team Leader	
DESCRIPTION: Munitions debris: AP-trip flare found in Southeastern Region MRS.	

Waikane Valley FUDS **Remedial Investigation/Feasibility Study**	
DATE: 7-18-11 #16	
DIRECTION: SE to NW	
PHOTO BY: Team Leader	
DESCRIPTION: Munitions debris: 60mm Mortar, Training M96 found in Southeastern Region MRS.	

Waikane Valley FUDS
Remedial Investigation/Feasibility Study

DATE:
7-26-11 #17

DIRECTION:

Above

PHOTO BY:

Team Leader

DESCRIPTION:
Representative munitions debris items.

Waikane Valley FUDS
Remedial Investigation/Feasibility Study

DATE:
7-28-11 #18

DIRECTION:

Above

PHOTO BY:

Team Leader

DESCRIPTION:
Representative non-MD items.

<table>
<tr><td colspan="2">Waikane Valley FUDS
Remedial Investigation/Feasibility Study</td></tr>
<tr><td>DATE:
8-1-11 #19</td><td rowspan="4"></td></tr>
<tr><td>DIRECTION:
South</td></tr>
<tr><td>PHOTO BY:
SUXOS</td></tr>
<tr><td>DESCRIPTION:
Waikane Stream MEC intrusive investigation.</td></tr>
</table>

<table>
<tr><td colspan="2">Waikane Valley FUDS
Remedial Investigation/Feasibility Study</td></tr>
<tr><td>DATE:
8-2-11 #20</td><td rowspan="4"></td></tr>
<tr><td>DIRECTION:
S to N</td></tr>
<tr><td>PHOTO BY:
SUXOS</td></tr>
<tr><td>DESCRIPTION:
Waikane Stream MEC intrusive investigation.</td></tr>
</table>

Waikane Valley FUDS
Remedial Investigation/Feasibility Study

DATE:
7-8-11 #21

DIRECTION:

S to N

PHOTO BY:

Team Leader

DESCRIPTION:
Representative of trash located along Waikane Stream.

Waikane Valley FUDS
Remedial Investigation/Feasibility Study

DATE:
5-3-11 #22

DIRECTION:

SE to NW

PHOTO BY:

UXOSO

DESCRIPTION:
Munitions debris: 3.5-inch rocket shrouds found along Waikane Stream.

Waikane Valley FUDS
Remedial Investigation/Feasibility Study

DATE: 7-8-11 #22	
DIRECTION: Above	
PHOTO BY: SUXOS	
DESCRIPTION: Hau thicket along Unnamed Stream.	

Waikane Valley FUDS
Remedial Investigation/Feasibility Study

DATE: 5-3-11 #23	
DIRECTION: NE to SW	
PHOTO BY: UXOSO	
DESCRIPTION: AOC#2 Location from Removal Action. MC sample location WTA-SE-ZIS-007	

APPENDIX F

DOCUMENTATION OF DISPOSITION OF MUNITIONS POTENTIALLY PRESENTING AN EXPLOSIVE HAZARD, MUNITIONS DEBRIS, AND WASTES

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Bonetti Explosives, LLC

October 5, 2011

Invoice # 3013

Mr. George Mackanin
American EOD Services, Inc.
P.O. Box 878
1206 East Park Avenue
Anaconda, Montana 59711-0878

Re: Munitions debris from Zapata (Hawaii).

Mr. Mackanin,

This letter is to verify that Bonetti Explosives, LLC has received and released Zapata, Inc. of legal liability of (1) Drum weighing a total of 74lbs. The material arrived on October 3, 2011 in good condition. The drum had a sealed lid. The lid had security tags on it numbered (0042811) and (004212). It was noted that there was an additional security tag listed on the form 1348 (0042810) however this tag was not present. The security of the drum did not appear to be compromised. The material was inspected and found to be MDAS as documented on the form 1348 that was supplied. After removing the packaging material it was found that there was 59 lbs of material that required demil operations.

This material was stored in Corridor "C" until October 5, 2011 when it was smelted and recycled properly. This is your final letter regarding this material.

Thank you for your Business,

Matt Barnett

(979) 739 5597

P.O. Box 116, Columbus TX, 78934
www.Bonettiexplosives.com

(979) 739-5597
Bonetti4@yahoo.com

ZAPATA
TRUST • INTEGRITY • QUALITY

September 6, 2011

Matt Barnett
1618 Smith Rau Road
Columbus, Texas 78934

Subject: Final Disposition of Ordnance Related Scrap from The Former Waikane Training Area, Oahu, Hawaii.

Dear Mr. Barnett,

Zapata Incorporated is, at no additional cost to the Government, delivering to you ordnance related scrap that was recovered at the Former Waikane Training Area in Oahu, Hawaii. Your signature below indicates that you have received the scrap after it has been inspected for energetic materials. You further agree with the provided documentation that the scrap contains no explosive hazards when received and that the scrap will not be sold, traded or otherwise be given to another party until the contents have been shredded or smelted and are only identifiable by their basic content.

We request that you send Zapata Inc. notification in writing, and supporting documentation that the scrap has been shredded and/or smelted and is only identifiable by their basic content.

Your assistance is greatly appreciated.

Dwayne French
SUXOS

Acknowledgement: ______________________
Matt Barnett

DOC IDENT (1-3)	RI FROM (4-6)	M & S (7)	U/I (23-24)	QUANTITY (25-29)	SER (45)	SUPPLEMENTARY ADDRESS (46-50)	SIG (51)	FUND (52-53)	DISTRIBUTION (54-56)	PROJECT (57-59)	PRI (60-61)	RDD EEA QLT DE (62-64)	ADV (65-66)
1			LB	65						Oahu			

1. TOTAL PRICE	2. SHIP FROM	SHIP TO
UNIT PRICE / DOLLARS CTS	146 Hekili St Ste 204 Kailua, Hi 96734	1618 Smith Rau Rd Columbus Tx 78934
$0.00	$0.00	4. MARK FOR: Matt Barnett

5. DOCDATE	6. NMFC	7. FRT RATE	8. TYPE CARG0	9. PS
			MDAS	

10. QTY. REC'D	11. UP	12. UNIT WEIGHT	13. UNIT CUBE	14. UFC	15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE
Class 70

17. ITEM NOMENCLATURE
See Line 27 Additional Data

18. TYCONT	19. NO CONT	20. TOTAL WEIGHT	21. TOTAL CUBE
Drum	1		

22. RECEIVED BY	23. DATE RECEIVED

24. DOCUMENT NUMBER & SUFFIX (30-44)

Security Seal Number
0042810, 0042811, 0042812

25. NATIONAL STOCK NUMBER & ADD (8-22)

26

27. ADDITIONAL DATA

Ordnance fragments and practice ordnance items.

"This certifies and verifies that the material listed has been 100 percent inspected and to the best of our knowledge and belief, are inert and /or free of explosives or related materials"

[signature] 6 Sep 11
Dwayne French — DATE
Senior UXO Supervisor
Zapata Inc.
(404)840-3209

[signature] 6 Sept 11
Mike Mullins — DATE
Safety Representative
USACE, Honolulu, Hawaii
(808)438-0468

DD FORM 1348-1A, JUL 91 ISSUE RELEASE/RECEIPT DOCUMENT S/N 0102-LF-016-4100

APPENDIX G
BASELINE RISK ASSESSMENT/RISK CALCULATION DATA SHEETS

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TABLE G-1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SURFACE SOIL
Former Waikane Training Area
Oahu, Hawaii

Scenario Timeframe:	Current/Future
Medium:	Surface Soil
Exposure Medium:	Surface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)		Maximum Concentration (Qualifier)		Units	Location of Maximum Concentration (1)	Detection Frequency	Concentration Used for Screening	2x Background Value (2)	Screening Toxicity Value (n/c) (3)		Potential ARAR/TBC Value (3)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
Inorganics (Metals)																	
Surface	7440-50-8	Copper	31		362		mg/kg	WTA-SE-ZIS-016 (WTA282)	72/72	362	201	630	n	230	EALs	Y	Max >SL
Soil	7439-92-1	Lead	2.4		325		mg/kg	WTA-SE-ZIS-003 (WTA242)	72/72	325	13	400	n	200	EALs	Y	Max >SL
Explosives																	
	99-35-4	1,3,5-Trinitrobenzene	39	U	40	U	ug/kg	--	0/72	--	--	370,000	n	5,400	EALs	N	ND
	99-65-0	1,3-Dinitrobenzene	39	U	40	U	ug/kg	--	0/72	--	--	1,200	n	130	EALs	N	ND
	118-96-7	2,4,6-Trinitrotoluene	39	U	40	U	ug/kg	--	0/72	--	--	6,100	c**	680	EALs	N	ND
	121-14-2	2,4-Dinitrotoluene	39	U	40	U	ug/kg	--	0/72	--	--	24,000	c*	2,700	EALs	N	ND
	606-20-2	2,6-Dinitrotoluene	61	U	63	U	ug/kg	--	0/72	--	--	12,000	n	2,300	EALs	N	ND
	35572-78-2	2-Amino-4.6-dinitrotoluene	47	U	99	U	ug/kg	--	0/72	--	--	24,000	n	250	EALs	N	ND
	88-72-2	2-Nitrotoluene	39	U	40	U	ug/kg	--	0/72	--	--	140,000	c*	3	EALs	N	ND
	99-08-1	3-Nitrotoluene	40	U	41	U	ug/kg	--	0/72	--	--	250,000	n	6,700	EALs	N	ND
	19406-51-0	4-Amino-2,6-dinitrotoluene	39	U	99	U	ug/kg	--	0/72	--	--	24,000	n	250	EALs	N	ND
	99-99-0	4-Nitrotoluene	40	U	41	U	ug/kg	--	0/72	--	--	30,000	c**	220	EALs	N	ND
	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	40	U	41	U	ug/kg	--	0/72	--	--	4,400	c*	20	EALs	N	ND
	479-45-8	Methyl-2,4,6-trinitrophenylnitroamine (Tetryl)	44	U	45	U	ug/kg	--	0/72	--	--	49,000	n	49,000	EALs	N	ND
	98-95-3	Nitrobenzene	39	U	40	U	ug/kg	--	0/72	--	--	6,200	c*	110	EALs	N	ND
	2691-41-0	Octahydro-tetranitro-1,3,5,7-tetrazocine (HMX)	40	U	41	U	ug/kg	--	0/72	--	--	610,000	n	100,000	EALs	N	ND
	55-63-0	Nitroglycerine	250	IJ	466	IJ	ug/kg	WTA-SE-ZIS-007 (WTA256)	1/72	466	--	1,200	n	79	EALs	Y	Max >SL
	78-11-5	Pentaerythritol tetranitrate (PETN)	430	U	440	U	ug/kg	--	0/72	--	--	120,000	c**	15	EALs	N	ND

(1) The data set evaluated includes surface soil samples: WTA134, WTA135, WTA136, WTA137, WTA138, WTA139, WTA140, WTA141, WTA142, WTA143, WTA144, WTA145, WTA146, WTA147, WTA148, WTA154, WTA154B, WTA155, WTA155B, WTA156, WTA156B, WTA160, WTA160B, WTA161, WTA161B, WTA162, WTA162B, WTA175, WTA176, WTA177, WTA197, WTA198, WTA199, WTA202, WTA203, WTA204, WTA242, WTA243, WTA244, WTA245, WTA246, WTA247, WTA248, WTA249, WTA250, WTA251, WTA252, WTA253, WTA254, WTA255, WTA256, WTA257, WTA258, WTA259, WTA260, WTA261, WTA262, WTA263, WTA264, WTA265, WTA266, WTA267, WTA268, WTA269, WTA270, WTA271, WTA273, WTA274, WTA275, WTA276, WTA277, WTA278, WTA279, WTA280, WTA281, WTA282, WTA283, and WTA284.

(2) Background consists of samples WTA86, WTA87, WTA88, WTA89, WTA90, WTA91, WTA92, WTA93, WTA94, WTA95, WTA96, WTA97, WTA98, WTA99, WTA100, WTA105, WTA106, WTA107, WTA108, WTA109, WTA110, WTA123, WTA124, and WTA125, which were nearest the Southeastern region where the contamination was highest.

(3) Screened against EPA Regional Screening Levels (RSLs) for Residential Soil, June 2011 and Hawaii Environmental Action Levels (EALs) August 2009, whichever is lower. The EALs and RSLs are based on incidental ingestion, inhalation of dusts, and dermal absorption.

Max < SL = Maximum Concentration is less than the RSL and EAL

Max > SL = Maximum Concentration is more than the RSL and EAL

ND = The compound was not detected in any of the samples included in the data set.

Definitions :

NA = Not Available

ND = Not Detected

n = Screening Toxcity Value is based on noncancer effects

c = Screening Toxicity Value is based on cancer effects

* = where noncancer screening level is less than 100 times the cancer screening level

** = where noncancer screening level is less than 10 times the cancer screening level

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

EALs - Hawaii Environmental Action Levels

J = Estimated Concentration

I = The reported value is between the laboratory detection limit and quantitation limit and is an estimate.

TABLE G-2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SURFACE SOIL
Former Waikane Training Area
Oahu, Hawaii

Scenario Timeframe:	Current/Future
Medium:	Subsurface Soil
Exposure Medium:	Subsurface Soil

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)		Maximum Concentration (Qualifier)		Units	Location of Maximum Concentration (1)	Detection Frequency	Concentration Used for Screening	2x Background Value (2)	Screening Toxicity Value (n/c) (3)		Potential ARAR/TBC Value (3)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
Inorganics (Metals)																	
Surface	7440-50-8	Copper	37		170		mg/kg	WTA-SE-ZSB-027 (WTA237)	48/48	170	166	630	n	230	EALs	N	Max < SL
Soil	**7439-92-1**	**Lead**	**0.73**		**1,830**		**mg/kg**	**WTA-SE-ZSB-016 (WTA221)**	**48/48**	**1,830**	**12**	**400**	**n**	**200**	**EALs**	**Y**	**Max > SL**
Explosives																	
	99-35-4	1,3,5-Trinitrobenzene	59	U	79	U	ug/kg	--	0/48	--	--	370,000	n	5,400	EALs	N	ND
	99-65-0	1,3-Dinitrobenzene	59	U	79	U	ug/kg	--	0/48	--	--	1,200	n	130	EALs	N	ND
	118-96-7	2,4,6-Trinitrotoluene	213		213		ug/kg	WTA-SE-ZSB-026 (WTA234)	1/48	213	--	6,100	c**	680	EALs	N	Max < SL
	121-14-2	2,4-Dinitrotoluene	71	U	96	U	ug/kg	--	0/48	--	--	24,000	c*	2,700	EALs	N	ND
	606-20-2	2,6-Dinitrotoluene	64	U	93	U	ug/kg	--	0/48	--	--	12,000	n	2,300	EALs	N	ND
	35572-78-2	2-Amino-4,6-dinitrotoluene	316		953		ug/kg	WTA-SE-ZSB-026 (WTA234)	3/48	953	--	24,000	n	250	EALs	Y	Max >SL
	88-72-2	2-Nitrotoluene	59	U	79	U	ug/kg	--	0/48	--	--	140,000	c*	3	EALs	N	ND
	99-08-1	3-Nitrotoluene	59	U	79	U	ug/kg	--	0/48	--	--	250,000	n	6,700	EALs	N	ND
	19406-51-0	4-Amino-2,6-dinitrotoluene	183		617		ug/kg	WTA-SE-ZSB-026 (WTA234)	3/48	617	--	24,000	n	250	EALs	Y	Max >SL
	99-99-0	4-Nitrotoluene	75	U	100	U	ug/kg	--	0/48	--	--	30,000	c**	220	EALs	N	ND
	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	59	U	79	U	ug/kg	--	0/48	--	--	4,400	c*	20	EALs	N	ND
	479-45-8	Methyl-2,4,6-trinitrophenylnitroamine (Tetryl)	59	U	79	U	ug/kg	--	0/48	--	--	49,000	n	49,000	EALs	N	ND
	98-95-3	Nitrobenzene	68	U	92	U	ug/kg	--	0/48	--	--	6,200	c*	110	EALs	N	ND
	2691-41-0	Octahydro-tetranitro-1,3,5,7-tetrazocine (HMX)	59	U	79	U	ug/kg	--	0/48	--	--	610,000	n	100,000	EALs	N	ND
	55-63-0	Nitroglycerine	1,380		2,450		ug/kg	WTA-SE-ZSB-028 (WTA241)	2/48	2,450	--	1,200	n	79	EALs	Y	Max >SL
	78-11-5	Pentaerythritol tetranitrate (PETN)	370	U	490	U	ug/kg	--	0/48	--	--	120,000	c**	15	EALs	N	ND

(1) The data set evaluated includes subsurface soil samples: WTA149, WTA150, WTA157, WTA173, WTA174, WTA183, WTA184, WTA186, WTA187, WTA188, WTA189, WTA190, WTA191, WTA196, WTA200, WTA201, WTA206, WTA207, WTA208, WTA209, WTA210, WTA211, WTA212, WTA214, WTA215, WTA216, WTA217, WTA218, WTA219, WTA220, WTA221, WTA222, WTA223, WTA224, WTA225, WTA226, WTA227, WTA228, WTA229, WTA230, WTA233, WTA234, WTA236, WTA237, WTA238, WTA239, WTA241, and WTA285.

(2) Background consists of samples WTA70/71, WTA72/73, WTA74/75, WTA76/77, WTA78/79, WTA82/83, WTA84/85, WTA101/102, WTA103/104, WTA115, WTA119, WTA120, and WTA122, which were nearest the Southeastern region where the contamination was highest.

(3) Screened against EPA Regional Screening Levels (RSLs) for Residential Soil, June 2011 and Hawaii Environmental Action Levels (EALs) August 2009, whichever is lower. The EALs and RSLs are based on incidental ingestion, inhalation of dusts, and dermal absorption.

(4) Rationale for Selection or Deletion

Max < SL = Maximum Concentration is less than the RSL and EAL

Max > SL = Maximum Concentration is more than the RSL and EAL

ND = The compound was not detected in any of the samples included in the data set.

Definitions :

NA = Not Available
ND = Not Detected
n = Screening Toxcity Value is based on noncancer effects
c = Screening Toxicity Value is based on cancer effects
* = where noncancer screening level is less than 100 times the cancer screening level
** = where noncancer screening level is less than 10 times the cancer screening level
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
EALs - Hawaii Environmental Action Levels
J = Estimated Concentration

TABLE G-3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SEDIMENT
Former Waikane Training Area
Oahu, Hawaii

Scenario Timeframe:	Current/Future
Medium:	Sediment
Exposure Medium:	Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)		Maximum Concentration (Qualifier)		Units	Location of Maximum Concentration	Detection Frequency	Concentration Used for Screening	2x Background Value	Screening Toxicity Value (n/c) (1)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (2)
Inorganics (Metals)																	
Sediment	7440-50-8	Copper	63.4		189		mg/kg	WTA-WM-ZSD-011 (WTA182)	24/24	189	-	630	n	230	EALs	N	Max < SL
	7439-92-1	Lead	0.87		10.1		mg/kg	WTA-WM-ZSD-009 (WTA180)	24/24	10.1	-	400	n	200	EALs	N	Max < SL
Explosives																	
Sediment	99-35-4	1,3,5-Trinitrobenzene	56	U	78	U	ug/kg	--	0/24	--	--	370,000	n	5,400	EALs	N	ND
	99-65-0	1,3-Dinitrobenzene	56	U	78	U	ug/kg	--	0/24	--	--	1,200	n	130	EALs	N	ND
	118-96-7	2,4,6-Trinitrotoluene	140	U	200	U	ug/kg	--	0/24	--	--	6,100	c**	680	EALs	N	ND
	121-14-2	2,4-Dinitrotoluene	68	U	96	U	ug/kg	--	0/24	--	--	24,000	c*	2,700	EALs	N	ND
	606-20-2	2,6-Dinitrotoluene	61	U	86	U	ug/kg	--	0/24	--	--	12,000	n	2,300	EALs	N	ND
	35572-78-2	2-Amino-4.6-dinitrotoluene	140	U	200	U	ug/kg	--	0/24	--	--	24,000	n	250	EALs	N	ND
	88-72-2	2-Nitrotoluene	56	U	78	U	ug/kg	--	0/24	--	--	140,000	c*	3	EALs	N	ND
	99-08-1	3-Nitrotoluene	56	U	78	U	ug/kg	--	0/24	--	--	250,000	n	6,700	EALs	N	ND
	19406-51-0	4-Amino-2,6-dinitrotoluene	140	U	200	U	ug/kg	--	0/24	--	--	24,000	n	250	EALs	N	ND
	99-99-0	4-Nitrotoluene	71	U	99	U	ug/kg	--	0/24	--	--	30,000	c**	220	EALs	N	ND
	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	56	U	78	U	ug/kg	--	0/24	--	--	4,400	c*	20	EALs	N	ND
	479-45-8	Methyl-2,4,6-trinitrophenylnitroamine (Tetryl)	58	U	97	U	ug/kg	--	0/24	--	--	49,000	n	49,000	EALs	N	ND
	98-95-3	Nitrobenzene	65	U	91	U	ug/kg	--	0/24	--	--	6,200	c*	110	EALs	N	ND
	2691-41-0	Octahydro-tetranitro-1,3,5,7-tetrazocine (HMX)	56	U	78	U	ug/kg	--	0/24	--	--	610,000	n	100,000	EALs	N	ND
	55-63-0	Nitroglycerine	1,400	U	2,000	U	µg/kg	--	0/24	--	--	1,200	n	79	EALs	N	ND
	78-11-5	Pentaerythritol tetranitrate (PETN)	350	U	490	U	µg/kg	--	0/24	--	--	120,000	c**	15	EALs	N	ND

(1) The data set evaluated included sediment samples: WTA130, WTA131, WTA132, WTA133, WTA151, WTA152, WTA153, WTA158, WTA159, WTA165, WTA166, WTA168, WTA169, WTA170, WTA171, WTA172, WTA178, WTA179, WTA180, WTA181, WTA182, WTA192, WTA193, and WTA195.

(3) Screened against EPA Regional Screening Levels (RSLs) for Residential Soil, June 2011 and Hawaii Environmental Action Levels (EALs) August 2009, whichever is lower. The EALs and RSLs are based on incidental ingestion, inhalation of dusts, and dermal absorption.

(2) Rationale for Selection or Deletion

Max < SL = Maximum Concentration is less than the Screening Level

Max > SL = Maximum Concentration is more than the Screening Level

ND = The compound was not detected in any of the samples included in the data set.

Definitions :

NA = Not Available

ND = Not Detected

n = Screening Toxcity Value is based on noncancer effects

c = Screening Toxicity Value is based on cancer effects

* = where noncancer screening level is less than 100times the cancer screening level

** = where noncancer screening level is less than 10 times the cancer screening level

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

EALs = Hawaii Environmental Action Levels

Table G-4
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY IN SURFACE SOIL
Former Waikane Training Area
Oahu, Hawaii

Scenario Timeframe:	Current/Future
Medium:	Surface Soil
Exposure Medium:	Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Distribution	Maximum Concentration (Qualifier)	Exposure Point Concentrations			
						Value	Units	Statistic	Rationale
Surface Soil	Copper	mg/kg	76.0	88.6	362	88.6	mg/kg	95%UCL	Student's t
	Lead	mg/kg	31.6	65.4	325	65.4	mg/kg	95%UCL	Chebyshev UCL
	Nitroglycerine	mg/kg	0.466	NA	0.466 I J	0.466	mg/kg	max	Only one detection

Statistics: Maximum Detected Value (Max) or 95% UCL (Pro UCL Version 4.0, April 2007).

UCL - Upper Confidence Limit
mg/kg - Milligrams per kilogram
J = Estimated Concentration
I = The reported value is between the laboratory detection limit and quantitation limit and is an estimate.

Table G-5. Ecological Screening Levels for Former Waikane Training Area

Analyte	*ESV Soil mg/kg*	*Source*	*ESV Sediment mg/kg*	*Source*
Metals				
Copper	230	A	152	B
Lead	200	A	35.8	F
Explosives				
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	5.8	C	102	E
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	43	C	126	E
2,4,6-Trinitrotoluene (TNT)	8	C	0.1	E
1,3,5-Trinitrobenzene	0.38	C	1	E
1,3-Dinitrobenzene	0.66	D	0.009	D
2,4-Dinitrotoluene	1.28	D	0.014	D
2,6-Dinitrotoluene	0.3	C	0.5	E
2-Amino-4,6-dinitrotoluene	5.3	C	0.3	E
2-Nitrotoluene	4.1	C	NA	--
3-Nitrotoluene	5.3	C	NA	--
4-Amino-2,6-dinitrotoluene	NA	--	NA	--
4-Nitrotoluene	9.4	C	4.06	F
Nitrobenzene	40	A	0.51	F
Nitroglycerin	150	C	NA	--
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	2	C	0.5	E
Pentaerythritol Tetranitrate (PETN)	21,000	C	NA	--

NA - Not Available

A - State of Hawaii Environmental Screening Levels (HDOH, 2008)
B - Twice local background (ambient)
C - Los Alamos National Laboratory ECORISK Database (LANL, 2005)
D - EPA Region 5 Ecological Quality Levels (EPA, 2005)
E - Lotufo, et al. (2009)
F - EPA Region 3 Freshwater or Sediment Screening Benchmarks (EPA, 2008)

TABLE G-6
ECOLOGICAL SCREENING FOR PRELIMINARY CHEMICALS OF POTENTIAL CONCERN IN SOIL
Former Waikane Training Area
Oahu, Hawaii

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)		Maximum Concentration (Qualifier)		Units	Location of Maximum Concentration (1)	Detection Frequency	Concentration Used for Screening	2x Background Value (2)	Ecological Screening Value (3)	Hazard Quotient	Frequency Exceeding ESV	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
Inorganics (Metals)																
Surface	**7440-50-8**	**Copper**	**31**		**362**		**mg/kg**	**WTA-SE-ZIS-016 (WTA282)**	**72/72**	**362**	**198**	**230**	**1.6**	**1/72**	**Y**	**Max > SV**
Soil	**7439-92-1**	**Lead**	**2.4**		**325**		**mg/kg**	**WTA-SE-ZIS-003 (WTA242)**	**72/72**	**325**	**14.4**	**200**	**1.6**	**2/72**	**Y**	**Max > SV**
Explosives																
Surface	99-35-4	1,3,5-Trinitrobenzene	0.039	U	0.04	U	mg/kg	--	0/72	--	--	0.38	--	0/72	N	ND
Soil	99-65-0	1,3-Dinitrobenzene	0.039	U	0.04	U	mg/kg	--	0/72	--	--	0.66	--	0/72	N	ND
	118-96-7	2,4,6-Trinitrotoluene	0.039	U	0.04	U	mg/kg	--	0/72	--	--	8.0	--	0/72	N	ND
	121-14-2	2,4-Dinitrotoluene	0.039	U	0.04	U	mg/kg	--	0/72	--	--	1.28	--	0/72	N	ND
	606-20-2	2,6-Dinitrotoluene	0.061	U	0.063	U	mg/kg	--	0/72	--	--	0.3	--	0/72	N	ND
	35572-78-2	2-Amino-4.6-dinitrotoluene	0.047	U	0.099	U	mg/kg	--	0/72	--	--	5.3	--	0/72	N	ND
	88-72-2	2-Nitrotoluene	0.039	U	0.04	U	mg/kg	--	0/72	--	--	4.1	--	0/72	N	ND
	99-08-1	3-Nitrotoluene	0.040	U	0.041	U	mg/kg	--	0/72	--	--	5.3	--	0/72	N	ND
	19406-51-0	4-Amino-2,6-dinitrotoluene	0.039	U	0.099	U	mg/kg	--	0/72	--	--	NA	--	0/72	N	ND
	99-99-0	4-Nitrotoluene	0.040	U	0.041	U	mg/kg	--	0/72	--	--	9.4	--	0/72	N	ND
	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.040	U	0.041	U	mg/kg	--	0/72	--	--	5.8	--	0/72	N	ND
	479-45-8	Methyl-2,4,6-trinitrophenylnitroamine (Tetryl)	0.044	U	0.045	U	mg/kg	--	0/72	--	--	2.0	--	0/72	N	ND
	98-95-3	Nitrobenzene	0.039	U	0.04	U	mg/kg	--	0/72	--	--	40	--	0/72	N	ND
	2691-41-0	Octahydro-tetranitro-1,3,5,7-tetrazocine (HMX)	0.040	U	0.041	U	mg/kg	--	0/72	--	--	43	--	0/72	N	ND
	55-63-0	Nitroglycerine	0.466	IJ	0.466	IJ	ug/kg	WTA-SE-ZIS-007 (WTA256)	1/72	0.466	--	150	0.003	0/72	N	Max < SV
	78-11-5	Pentaerythritol tetranitrate (PETN)	0.430	U	0.44	U	mg/kg	--	0/72	--	--	21,000	--	0/72	N	ND

(1) The data set evaluated includes surface soil samples: WTA134, WTA135, WTA136, WTA137, WTA138, WTA139, WTA140, WTA141, WTA142, WTA143, WTA144, WTA145, WTA146, WTA147, WTA148, WTA154, WTA154B, WTA155, WTA155B, WTA156, WTA156B, WTA160, WTA160B, WTA161, WTA161B, WTA162, WTA162B, WTA175, WTA176, WTA177, WTA197, WTA198, WTA199, WTA202, WTA203, WTA204, WTA242, WTA243, WTA244, WTA245, WTA246, WTA247, WTA248, WTA249, WTA250, WTA251, WTA252, WTA253, WTA254, WTA255, WTA256, WTA257, WTA258, WTA259, WTA260, WTA261, WTA262, WTA263, WTA264, WTA265, WTA266, WTA267, WTA268, WTA269, WTA270, WTA271, WTA273, WTA274, WTA275, WTA276, WTA277, WTA278, WTA279, WTA280, WTA281, WTA282, WTA283, and WTA284.

(2) Background consists of samples WTA86, WTA87, WTA88, WTA89, WTA90, WTA91, WTA92, WTA93, WTA94, WTA95, WTA96, WTA97, WTA98, WTA99, WTA100, WTA105, WTA106, WTA107, WTA108, WTA109, WTA110, WTA123, WTA124, and WTA125, which were nearest the Southeastern region where the contamination was highest.

Definitions :

NA = Not Available
ND = Not Detected
COPC = Chemical of Potential Concern

TABLE G-7
ECOLOGICAL SCREENING FOR PRELIMINARY CHEMICALS OF POTENTIAL CONCERN IN SOIL
Former Waikane Training Area
Oahu, Hawaii

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)		Maximum Concentration (Qualifier)		Units	Location of Maximum Concentration (1)	Detection Frequency	Concentration Used for Screening	2x Background Value (2)	Ecological Screening Value (ESV) (3)	Hazard Quotient	Frequency Exceeding ESV	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
Inorganics (Metals)																
Surface	7440-50-8	Copper	37.4		196		mg/kg	WTA-SE-ZSB-027 (WTA237)	48/48	196	158	230	0.9	0/48	N	Max > SV
Soil	**7439-92-1**	**Lead**	**0.73**		**1,830**		**mg/kg**	**WTA-SE-ZSB-016 (WTA221)**	**48/48**	**1,830**	**17.2**	**200**	**9.2**	**2/48**	**Y**	**Max > SV**
Explosives																
Surface	99-35-4	1,3,5-Trinitrobenzene	0.059	U	0.079	U	mg/kg	--	0/48	--	--	0.4	--	0/48	N	ND
Soil	99-65-0	1,3-Dinitrobenzene	0.059	U	0.079	U	mg/kg	--	0/48	--	--	0.66	--	0/48	N	ND
	118-96-7	2,4,6-Trinitrotoluene	0.213		0.213		mg/kg	WTA-SE-ZSB-026 (WTA234)	1/48	0.213	--	8.0	0.03	0/48	N	Max < SV
	121-14-2	2,4-Dinitrotoluene	0.071	U	0.096	U	mg/kg	--	0/48	--	--	1.28	--	0/48	N	ND
	606-20-2	2,6-Dinitrotoluene	0.064	U	0.093	U	mg/kg	--	0/48	--	--	0.3	--	0/48	N	ND
	35572-78-2	2-Amino-4.6-dinitrotoluene	0.316		0.953		mg/kg	WTA-SE-ZSB-026 (WTA234)	3/48	0.953	--	5.3	0.2	0/48	N	Max < SV
	88-72-2	2-Nitrotoluene	0.059	U	0.079	U	mg/kg	--	0/48	--	--	4.1	--	0/48	N	ND
	99-08-1	3-Nitrotoluene	0.059	U	0.079	U	mg/kg	--	0/48	--	--	5.3	--	0/48	N	ND
	19406-51-0	4-Amino-2,6-dinitrotoluene	0.183		0.617		mg/kg	WTA-SE-ZSB-026 (WTA234)	3/48	0.617	--	NA	NA	0/48	N	NSV
	99-99-0	4-Nitrotoluene	0.075	U	0.1	U	mg/kg	--	0/48	--	--	9.4	--	0/48	N	ND
	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.059	U	0.079	U	mg/kg	--	0/48	--	--	5.8	--	0/48	N	ND
	479-45-8	Methyl-2,4,6-trinitrophenylnitroamine (Tetryl)	0.059	U	0.079	U	mg/kg	--	0/48	--	--	2.0	--	0/48	N	ND
	98-95-3	Nitrobenzene	0.068	U	0.092	U	mg/kg	--	0/48	--	--	40	--	0/48	N	ND
	2691-41-0	Octahydro-tetranitro-1,3,5,7-tetrazocine (HMX)	0.059	U	0.079	U	mg/kg	--	0/48	--	--	43	--	0/48	N	ND
	55-63-0	Nitroglycerine	1.38		2.45		mg/kg	WTA-SE-ZSB-028 (WTA241)	2/48	2.45	--	150	0.02	0/48	N	Max < SV
	78-11-5	Pentaerythritol tetranitrate (PETN)	0.37	U	0.49	U	mg/kg	--	0/48	--	--	21,000	--	0/48	N	ND

(1) The data set evaluated includes subsurface soil samples: WTA149, WTA150, WTA157, WTA173, WTA174, WTA183, WTA184, WTA186, WTA187, WTA188, WTA189, WTA190, WTA191, WTA196, WTA200, WTA201, WTA206, WTA207, WTA208, WTA209, WTA210, WTA211, WTA212, WTA214, WTA215, WTA216, WTA217, WTA218, WTA219, WTA220, WTA221, WTA222, WTA223, WTA224, WTA225, WTA226, WTA227, WTA228, WTA229, WTA230, WTA233, WTA234, WTA236, WTA237, WTA238, WTA239, WTA241, and WTA285.

(2) Background consists of samples WTA70/71, WTA72/73, WTA74/75, WTA76/77, WTA78/79, WTA82/83, WTA84/85, WTA101/102, WTA103/104, WTA115, WTA119, WTA120, and WTA122, which were nearest the Southeastern region where the contamination was highest.

(3) See Table 2-1.

Definitions :

NA = Not Available
ND = Not Detected
COPC = Chemical of Potential Concern
U = Analyte was analyzed for but not detected.
J = Reported concentration is estimated

TABLE G-8
ECOLOGICAL SCREENING FOR PRELIMINARY CHEMICALS OF POTENTIAL CONCERN IN SEDIMENT
Former Waikane Training Area
Oahu, Hawaii

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)		Maximum Concentration (Qualifier)		Units	Location of Maximum Concentration	Detection Frequency	Concentration Used for Screening	Background Value	Ecological Screening Value (1)	Hazard Quotient	Frequency Exceeding ESV	COPC Flag (Y/N)	Rationale for Selection or Deletion (2)
Inorganics (Metals)																
Sediment	**7440-50-8**	**Copper**	**63.4**		**189**		**mg/kg**	**WTA-WM-ZSD-011 (WTA182)**	**24/24**	**189**	**152**	**152**	**1.2**	**3/24**	**Y**	**Max > SV**
	7439-92-1	Lead	0.87		10.1		mg/kg	WTA-WM-ZSD-009 (WTA180)	24/24	10.1	15.5	35.8	0.3	0/24	N	Max < SV
Explosives																
Sediment	99-35-4	1,3,5-Trinitrobenzene	0.056	U	0.078	U	mg/kg	--	0/24	--	--	1.0	--	0/24	N	ND
	99-65-0	1,3-Dinitrobenzene	0.056	U	0.078	U	mg/kg	--	0/24	--	--	0.009	--	0/24	N	ND
	118-96-7	2,4,6-Trinitrotoluene	0.14	U	0.2	U	mg/kg	--	0/24	--	--	0.100	--	0/24	N	ND
	121-14-2	2,4-Dinitrotoluene	0.068	U	0.096	U	mg/kg	--	0/24	--	--	0.0416	--	0/24	N	ND
	606-20-2	2,6-Dinitrotoluene	0.061	U	0.086	U	mg/kg	--	0/24	--	--	0.5	--	0/24	N	ND
	35572-78-2	2-Amino-4.6-dinitrotoluene	0.14	U	0.2	U	mg/kg	--	0/24	--	--	0.3	--	0/24	N	ND
	88-72-2	2-Nitrotoluene	0.056	U	0.078	U	mg/kg	--	0/24	--	--	NA	--	0/24	N	ND
	99-08-1	3-Nitrotoluene	0.056	U	0.078	U	mg/kg	--	0/24	--	--	NA	--	0/24	N	ND
	19406-51-0	4-Amino-2,6-dinitrotoluene	0.14	U	0.2	U	mg/kg	--	0/24	--	--	NA	--	0/24	N	ND
	99-99-0	4-Nitrotoluene	0.071	U	0.099	U	mg/kg	--	0/24	--	--	4.06	--	0/24	N	ND
	121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.056	U	0.078	U	mg/kg	--	0/24	--	--	102	--	0/24	N	ND
	479-45-8	Methyl-2,4,6-trinitrophenylnitroamine (Tetryl)	0.058	U	0.097	U	mg/kg	--	0/24	--	--	0.5	--	0/24	N	ND
	98-95-3	Nitrobenzene	0.065	U	0.091	U	mg/kg	--	0/24	--	--	0.145	--	0/24	N	ND
	2691-41-0	Octahydro-tetranitro-1,3,5,7-tetrazocine (HMX)	0.056	U	0.078	U	mg/kg	--	0/24	--	--	126	--	0/24	N	ND
	55-63-0	Nitroglycerine	1.4	U	2	U	mg/kg	--	0/24	--	--	NA	--	0/24	N	ND
	78-11-5	Pentaerythritol tetranitrate (PETN)	0.35	U	0.49	U	mg/kg	--	0/24	--	--	NA	--	0/24	N	ND

(1) The data set evaluated included sediment samples: WTA130, WTA131, WTA132, WTA133, WTA151, WTA152, WTA153, WTA158, WTA159, WTA165, WTA166, WTA168, WTA169, WTA170, WTA171, WTA172, WTA178, WTA179, WTA180, WTA181, WTA182, WTA192, WTA193, and WTA195.

(1) See Table 2-1.

(2) Rationale for Selection or Deletion

Max < SL = Maximum Concentration is less than the Screening Level

Max > SL = Maximum Concentration is more than the Screening Level

Definitions :

NA = Not Available

ND = Not Detected

COPC = Chemical of Potential Concern

U = Analyte was analyzed for but not detected.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Copper

General Statistics

Number of Valid Observations	48	Number of Distinct Observations	47
Raw Statistics		**Log-transformed Statistics**	
Minimum	31	Minimum of Log Data	3.434
Maximum	362	Maximum of Log Data	5.892
Mean	76.02	Mean of log Data	4.204
Median	63.25	SD of log Data	0.46
SD	52.07		
Coefficient of Variation	0.685		
Skewness	3.894		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.633	Shapiro Wilk Test Statistic	0.931
Shapiro Wilk Critical Value	0.947	Shapiro Wilk Critical Value	0.947
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	88.63	95% H-UCL	84.29
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	96.61
95% Adjusted-CLT UCL (Chen-1995)	92.89	97.5% Chebyshev (MVUE) UCL	106.3
95% Modified-t UCL (Johnson-1978)	89.33	99% Chebyshev (MVUE) UCL	125.3
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	3.858	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	19.7		
MLE of Mean	76.02		
MLE of Standard Deviation	38.7		
nu star	370.4		
Approximate Chi Square Value (.05)	326.8	**Nonparametric Statistics**	
Adjusted Level of Significance	0.045	95% CLT UCL	88.38
Adjusted Chi Square Value	325.5	95% Jackknife UCL	88.63
		95% Standard Bootstrap UCL	88.44
Anderson-Darling Test Statistic	1.683	95% Bootstrap-t UCL	98.18
Anderson-Darling 5% Critical Value	0.753	95% Hall's Bootstrap UCL	147
Kolmogorov-Smirnov Test Statistic	0.166	95% Percentile Bootstrap UCL	88.87
Kolmogorov-Smirnov 5% Critical Value	0.128	95% BCA Bootstrap UCL	94.18
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	108.8
		97.5% Chebyshev(Mean, Sd) UCL	122.9
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	150.8
95% Approximate Gamma UCL	86.16		

95% Adjusted Gamma UCL	86.49		
Potential UCL to Use		Use 95% Student's-t UCL	88.63
		or 95% Modified-t UCL	89.33

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead

General Statistics

Number of Valid Observations	48	Number of Distinct Observations	46
Raw Statistics		**Log-transformed Statistics**	
Minimum	6	Minimum of Log Data	1.792
Maximum	325	Maximum of Log Data	5.784
Mean	31.62	Mean of log Data	2.999
Median	15.95	SD of log Data	0.757
SD	53.69		
Coefficient of Variation	1.698		
Skewness	4.467		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.415	Shapiro Wilk Test Statistic	0.821
Shapiro Wilk Critical Value	0.947	Shapiro Wilk Critical Value	0.947
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	44.62	95% H-UCL	33.64
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	40.5
95% Adjusted-CLT UCL (Chen-1995)	49.7	97.5% Chebyshev (MVUE) UCL	46.56
95% Modified-t UCL (Johnson-1978)	45.45	99% Chebyshev (MVUE) UCL	58.44
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.176	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	26.89		
MLE of Mean	31.62		
MLE of Standard Deviation	29.16		
nu star	112.9		
Approximate Chi Square Value (.05)	89.36	**Nonparametric Statistics**	
Adjusted Level of Significance	0.045	95% CLT UCL	44.36
Adjusted Chi Square Value	88.71	95% Jackknife UCL	44.62
		95% Standard Bootstrap UCL	44.37
Anderson-Darling Test Statistic	5.552	95% Bootstrap-t UCL	69.8
Anderson-Darling 5% Critical Value	0.773	95% Hall's Bootstrap UCL	94.44
Kolmogorov-Smirnov Test Statistic	0.255	95% Percentile Bootstrap UCL	45.6
Kolmogorov-Smirnov 5% Critical Value	0.131	95% BCA Bootstrap UCL	51.15
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	65.39
		97.5% Chebyshev(Mean, Sd) UCL	80.01

Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	108.7
95% Approximate Gamma UCL	39.94		
95% Adjusted Gamma UCL	40.23		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	65.39

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

NG

General Statistics

Number of Valid Data	48	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	47
		Percent Non-Detects	97.92%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BT

The data set for variable NG was not processed!

LEAD MODEL FOR WINDOWS Version 1.1

==

Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research

==

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(µg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.200
1-2	0.500
2-3	0.520
3-4	0.530
4-5	0.550
5-6	0.580
6-7	0.590

Drinking Water Concentration: 4.000 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 32.120 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (µg Pb/g)	House Dust (µg Pb/g)
.5-1	31.600	32.120
1-2	31.600	32.120
2-3	31.600	32.120
3-4	31.600	32.120
4-5	31.600	32.120
5-6	31.600	32.120
6-7	31.600	32.120

****** Alternate Intake ******

Age	Alternate (µg Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 1.000 µg Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
.5-1	0.021	1.101	0.000	0.390
1-2	0.034	0.953	0.000	0.973
2-3	0.062	1.039	0.000	1.015
3-4	0.067	0.999	0.000	1.038
4-5	0.067	0.959	0.000	1.082
5-6	0.093	1.010	0.000	1.143
6-7	0.093	1.095	0.000	1.164

Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	0.792	2.304	1.3
1-2	1.256	3.217	1.4
2-3	1.260	3.376	1.3
3-4	1.265	3.369	1.2
4-5	0.941	3.049	1.1
5-6	0.849	3.095	1.0
6-7	0.802	3.155	0.9

LEAD MODEL FOR WINDOWS Version 1.1

==
Model Version: 1.1 Build11
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research
==

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(µg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.200
1-2	0.500
2-3	0.520
3-4	0.530
4-5	0.550
5-6	0.580
6-7	0.590

Drinking Water Concentration: 4.000 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 79.300 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (µg Pb/g)	House Dust (µg Pb/g)
.5-1	99.000	79.300
1-2	99.000	79.300
2-3	99.000	79.300
3-4	99.000	79.300
4-5	99.000	79.300
5-6	99.000	79.300
6-7	99.000	79.300

****** Alternate Intake ******

Age	Alternate (µg Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 1.000 µg Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
.5-1	0.021	1.084	0.000	0.384
1-2	0.034	0.936	0.000	0.955
2-3	0.062	1.023	0.000	0.999
3-4	0.067	0.985	0.000	1.024
4-5	0.067	0.951	0.000	1.073
5-6	0.093	1.003	0.000	1.135
6-7	0.093	1.088	0.000	1.157

Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	2.158	3.647	2.0
1-2	3.409	5.334	2.2
2-3	3.429	5.513	2.1
3-4	3.449	5.526	1.9
4-5	2.579	4.670	1.6
5-6	2.330	4.561	1.4
6-7	2.204	4.543	1.3

APPENDIX H
FIELD WORK DOCUMENTATION

(*INCLUDED ELECTRONICALLY ONLY ON ENCLOSED CD/DVD*)

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APPENDIX I
PERFORMANCE WORK STATEMENT (PWS)

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Performance Work Statement
Remedial Investigation / Feasibility Study
~~And Optional Removal Action~~
at Waikane Training Area
Island of Oahu, Hawaii
Property Number H09HI0354
12 May 2009
Revision: 2
Revision Date: 12 July 2010

Revision 2 – Summary of changes for revision 1 released 30 June 2009 (Changes are in bold and italic type.)
Par 3.4.1 – Amended to indicate that slope of up to 30 degrees maybe investigated rather than 33% slope.
Tasks 9a, 13, 14 and 15 struck through due to not being awarded.

The following revisions have been made to the Draft PWS dated 12 May 2009(in italics):
Par 3.1 - Presentation materials and advantage package have been clarified.
Par 3.4 - Delineation of areas with greater than 33% slope on a map has been added. Archeological/Biological monitoring will be provided by the government.
Par 3.5 – Data incorporation requirements have been clarified.
Par 3.11 - Administrative Record required for each MRS.
Par 3.12 - Sampling requirements were increased.
Par 3.14.1 - Restriction on slope and delineation of areas with greater than 33% slope on a map has been added.
Par 3.16 - Added increase in amount of insurance required.
Par 4.5 – Added 'Hardcopies shall be printed on both sides of the paper whenever possible.'
Par 4.6 – POH PM replaced.
Appendix A – Price for increased insurance requirements added.

1.0 OBJECTIVE: There are two objectives for this task order. The primary objective of this task order is to obtain acceptance of a Decision Document meeting the requirements of ER 200-3-1 and CX Interim Guidance 06-04. Work to be accomplished includes the conduct of a Remedial Investigation (RI), Feasibility Study (FS). The secondary optional objective is to perform a removal of material presenting a potential explosive hazard (MPPEH) in designated areas as described in the Non-Time Critical Action Removal Action Memorandum for Waikane Training Area. This includes all necessary activities required to accomplish both objectives. The secondary objective will be awarded at the discretion of the Contracting Officer.

2.0 BACKGROUND: Work required under this Performance Work Statement (PWS) falls under the Formerly Used Defense Sites (FUDS) Military Munitions Response Program (MMRP). Munitions and Explosives of Concern (MEC) are a safety hazard and may constitute an imminent and substantial endangerment to site personnel. Applicable provisions of Chapter 29 of the Code of Federal Regulations (CFR) 1910.120 apply. The Contractor shall perform all work in a manner consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104 and the National Contingency Plan (NCP), Sections 300.120(d) and 300.400(e). All activities involving work in areas potentially containing MEC hazards shall be conducted in full compliance with United States Army Corps of Engineers (USACE), United States Army Engineering and Support Center Huntsville (USAESCH), Department of the Army (DA), Active Installation, and Department of Defense (DOD) safety regulations.

2.1 Location: The Waikane Training Area, Island of Oahu, Hawaii consists of approximately 933 acres located on the coastal plain adjacent to Kaneoha Bay and on the slopes of the Koolau Mountain Range.

2.2 History: In 1942, the Department of the Army entered into a lease agreement with Lincoln L. McCandless heirs and the Waiahole Water Company, Ltd. This lease established the right to use approximately 1,132 acres in Waikane Valley for advanced offensive warfare training due to the valley's geographical location and terrain. Authorization for the Army to use Waikane Valley continued until July 1953, when the Marine Corps was substituted as lessee. Waikane Valley was formerly used as a training and artillery impact area from 1942 to 1976. Of the 1,132 acres, only 933 are considered eligible under DERP-FUDS. The Marine Corps property, consisting of 199 acres formerly known as the Kamaka parcel, does not fall under FUDS and was not investigated under this PWS

2.3 Previous Investigations: An Engineering Evaluation and Cost Analysis was performed in 2006 and a Site Investigation was performed in 2008.

3.0 SPECIFIC TASKS: Methods to be used to achieve task order objectives at the specified level of performance shall be determined by the Contractor. The Contractor will be evaluated periodically during each of the following tasks to ensure compliance with the PWS and to document that quality objectives, delivery schedule, and the overall completion date are being met. This evaluation will be performed according to a Quality Assurance Surveillance Plan (QASP). A programmatic QASP modified for the specific task order requirements will be provided by the government. The QASP will be updated upon acceptance of the Contractor's Quality Control Plan (QCP). Failure to adequately complete any service or submittal to at least a satisfactory level of quality or timeliness may result in a repeat of the work, or a poor performance evaluation, or both. Performance metrics are provided in Section 6.0. Minimum requirements for Contractor performance and QC are provided in Section 7.0.

3.1 Task 1, Technical Project Planning (TPP): This is a Firm Fixed Price/Unit Price task. The objective of this task is for the Contractor to implement the TPP process IAW EM 200-1-2, and Interim Guidance Document 01-02. Disputes between the Project Delivery Team (PDT) and the regulators regarding the adequacy of DQO will be resolved by the USACE Project Manager. The Contractor shall anticipate 3 meetings to be conducted on Oahu. Meetings shall be for 1 day each plus travel. The Contractor shall plan for meetings to occur as follows: first meeting, pre-Work Plan with resulting TPP Memorandum; second meeting, to finalize Work Plan; third meeting, verify all data gaps have been filled and finalize Remedial Investigation Report The Contractor shall also provide a unit price per TPP meeting in the event more meetings are necessary. The Contractor shall organize and coordinate all meetings. The Contractor shall identify and involve all stakeholders, upon approval by the Government, to be included in the TPP process. The Contractor shall be responsible for the logistics of these meetings to include but not limited to, providing a facilitator, obtaining meeting location, sending invitation letters (after government review and acceptance***), and presentation materials. The Contractor shall provide presentation materials as an advanced package for government review and comment prior to the first TPP meeting.*** The Contractor shall prepare, submit for review and gain acceptance of a TPP memorandum containing the DQO's and other results of the TPP meetings, including a conceptual site model (CSM). The conceptual site model will be compatible with current GIS standards.

3.2 Task 2, RI/FS Work Plan (WP): This is a Firm Fixed Price task. The objective of this task is the Contractor to prepare, submit and gain acceptance of a WP that is a detailed and comprehensive plan covering <u>all</u> aspects of the site characterization in accordance with data item description (DID) MR-001 and EM 1110-1-4009. An Explosives Safety Submission (ESS) shall be submitted for acceptance in accordance with DID MR-060 as a stand alone document inserted into the WP after acceptance. The ESS shall cover requirements for both the RI/FS and the Removal Action.

3.3 Task 3, GeoSpatial Data: This is a Firm Fixed Price/Unit Price task. The objective of this task is for the Contractor to utilize GIS in the development of the Conceptual Site Model (CSM). The Government will provide the existing GIS database. The existing GIS will be used to build upon and managed IAW DID MR-005-07.01. If the existing GIS database does not meet the requirements of the DID then the Contractor shall revise the database to meet the DID. A pre and post-project response action geospatial data analysis shall be performed using a GIS. All available existing data that is applicable to the project shall be consolidated into the GeoDatabase and analyzed to relay pertinent information to the PDT. The analysis of data from the GIS shall support all conclusions of the CSM. The information attained through the pre-RI analysis shall be documented in the work plan. The information attained in the post-RI and FS analysis shall be documented in the RI and FS reports. The pre-RI analysis shall encompass social, environmental and/or economic entities that will be or may be impacted by response-action activities. The post-RI and FS analysis shall detail entities impacted by RI/FS activities and impacts of future response action activities (if applicable). The pre and post-RI and FS analysis may detail the fieldwork strategies, areas of concern, survey requirements, environmental concerns, milestones and/or other factors that affect product delivery and future action planning. Entities that may be affected by response actions include but are not limited to: landowners, homeowners, rental tenants, schools, utilities, roads, businesses, recreational areas, air traffic, water bodies and/or industries. The GeoDatabase shall be a living repository that is refined throughout the life of the project. The Contractor shall incorporate layers that overlay on maps of the site that identify physical features, and MPPEH/MD and Range-Related Debris found during the investigation. Examples include: streets, anomalies, MEC positively identified, identifiable MD, sampling location, cultural resources, environmental, biological, and socio-economic variables. Archeological site location(s) will not be released to the public without written permission from USACE. The Contractor shall perform civil surveys IAW EM 1110-1-4009 and DID MR-005-07.01. The Contractor shall obtain property GIS data for all landowners with in the project boundaries. The Contractor shall maintain property ownership data in the GIS, track and assist in obtaining property Right-of-Entry.

3.3.1 Task 3a, Optional GeoSpatial Data for Removal Action: The GeoSpatial Data requirements for the Removal Action shall be covered under this task and shall be IAW 1110-1-4009 and DID MR-005-07.01 and relevant requirements under paragraph 3.3. The Contractor shall assist in obtaining property Right-of-Entry.

3.4 Task 4, RI/FS Field Activities: This task is a Firm Fixed Price/Unit Price task.

3.4.1 The objective of this task is for the Contractor to perform all necessary field activities to meet the primary objective of this task order and the DQOs established for this project. The Contractor shall, per agreed upon requirements during TPP, characterize the nature and extent of MEC contamination at the required munitions response sites (MRS) for the purpose of developing and evaluating effective remedial alternatives. This task shall include all field activities necessary to execute this task except MC sampling. MC sampling requirements are covered under the Environmental Sampling & Analysis task. The Contractor shall perform 13.5 acres of transects and 1.5 acres of grids. Investigation areas shall be distributed in the following manner:
- Southeastern Region: 7 acres
- Southern Impact Region: 4 acres
- Western Region: 2 acres
- Mountainous Region: 2 acres

A slope of up to 30 degrees maybe investigated dependent upon determination of safety in the field. All DGM shall be IAW DID MR-005-05.01. For this task order 1 acre of transects equals 14,520 lf (2.75 miles) of transects 3 feet wide. One acres worth of grids equals seventy (70) 25' x 25' grids. A pricing schedule is provided in Appendix A for unit price which will be used for price increase or decrease based on the final level of effort determined during TPP. The Government is responsible for the cost of evacuations. The Contractor is responsible for coordinating, planning and verifying evacuations. *Due to the high degree of importance placed on Archeological and Biological issue in Hawaii, the government will provide Archeological monitoring and potentially biological monitoring during field work. Working closely with Honolulu District Archeologists and Biologists in development of the work plans should limit any delays in field work.*

3.4.2 MEC Disposal: The Contractor shall be responsible for the destruction of all MEC encountered during project activities.

3.4.3 Backfilling Excavations/Erosion Controls: All access/excavation/detonation holes shall be backfilled by the Contractor. The Contractor shall restore such areas to their prior condition. The Contractor shall implement Best Management Practices to mitigate potential for erosion.

3.4.4 MEC Accountability: The Contractor shall maintain a detailed accounting of all MEC items/components encountered. This accounting shall include the amounts of MEC, nomenclature and condition, location and depth of MEC, and disposition. The accounting system shall also account for all demolition materials utilized to detonate MEC on site. The Contractor shall take digital photographs of identifiable MEC found during the investigation.

3.4.5 Disposal/Disposition of MPPEH: All MPPEH and munitions debris shall be handled in accordance with Chapter 14, EM 1110-1-4009 and Errata Sheet No. 2.

3.5 Task 5, Remedial Investigation (RI) Report: This task is a Firm Fixed Price task. The objective of this task is for the Contractor to prepare, submit and gain acceptance of a RI report in accordance with EM CX Interim Guidance 06-04. The Contractor also shall incorporate all *RI data*, available data and data from previous reports, including the removal action, into this RI. The Contractor shall prepare, as an appendix to this report, a determination of the Munitions Response Site (MRS) priority for **each** MRS covered under this task order using the Munitions Response Site Prioritization Protocol (MRSPP) worksheets.

3.6 Task 6, Feasibility Study (FS) Report: This task is a Firm Fixed Price task. The objective of this task is for the Contractor to prepare, submit and gain acceptance of a FS report in accordance with EM CX Interim Guidance 06-04.

3.7 Task 7, Proposed Plan: This task is a Firm Fixed Price task. The objective of this task is for the Contractor to prepare, submit and gain acceptance of a Proposed Plan IAW ER 200-3-1 FUDS Program Policy and MM CX Interim Guidance 06-04. After government review, the draft version of the Proposed Plan will be subject to a minimum 30-day public review.

3.8 Task 8, Decision Document: This task is a Firm Fixed Price task. The objective of this task is for the Contractor to prepare, submit and gain acceptance of a Decision Document for **each** MRS in accordance with ER 200-3-1 FUDS Program Policy and MM CX Interim Guidance 06-04 and Appendix B. Appendix B provides new formatting requirements for the Decision Document and supersedes MM CX Interim Guidance 06-04 for formatting of Decision Documents.

3.9 Task 9, Community Relations Support: This task is a Firm Fixed Price/Unit Price task. The objective of this task is for the Contractor to successfully complete public meetings and support the Honolulu District (CEPOH) with community relations. The Contractor shall attend and participate in 2 public meetings. These meetings are different and in addition to TPP meetings. These meetings will be held in the Waikane Valley area. The support shall include, but is not limited to: preparation and delivery of briefings, graphics, maps, posters, and support of question and answer sessions. The Contractor shall also obtain the meeting site, perform public notification and prepare any correspondence necessary to meet the objectives of this task. The USACE shall approve all correspondence, public notices and other materiel being presented to the public before use. These actions are independent of the field activities that involve interaction with the community. The meeting for the Proposed Plan shall be covered under this task. Transcripts of the public meeting for the Proposed Plan shall be prepared and submitted with the Final Proposed Plan. The Contractor shall provide all necessary support for 6 public meetings to include preparation of briefings, graphics, maps, posters, public notification and prepare any correspondence necessary to support meetings but not to attend the meetings. The Contractor shall provide a unit price per meeting for possible additional meetings. The Contractor shall also develop and maintain a project website for viewing by the public and PDT members. The Contractor shall maintain this website for the 18 month period of performance. The Contractor shall provide a monthly unit price to maintain the site.

3.91. Task 9a, Optional Community Relations Support for Removal Action: The Contractor shall attend and participate in a public meeting for the Removal Action. The performance of this subtask shall be accomplished in the manner described in paragraph 3.9.

3.10 Task 10, Public Involvement Plan (PIP): This task is a Firm Fixed Price task.
The objective of this task is for the Contractor to review, update, submit and gain acceptance of the PIP in accordance with EP 1110-3-8.

3.11 Task 11, Administrative Record: This task is a Firm Fixed Price task. The objective of this task is for the Contractor to maintain *an* Administrative Record for *each MRS* ~~***on-going project***~~ in accordance with the guidance given in EP 1110-3-8, Chapter 4 (Establishing and Maintaining Administrative Records) and Standard Operating Procedure for Formerly Used Defense Sites (FUDS) Records Management, Revision 5, dated January 2008. This task requires close coordination with the CEPOH and USAESCH to secure all required documents to support the Administrative Record. The existing Administrative Record is located at the Kaneohe Public Library, 45-829

Kamehameha Highway, Kaneohe, Hawaii and the U.S. Army Corps of Engineers, Honolulu District. The Contractor shall provide all final documents in the Administrative Record on CD/DVD to CEPOH and USAESCH**.** These files shall be suitable for placement on the PIRS web site. The Contractor shall submit 2 copies each to CEPOH and USAESCH.

3.12 Task 12, Environmental Sampling & Analysis: This task is a Firm Fixed Price/Unit Price task.

3.12.1 The objective of this task is for the Contractor to determine the presence of and the nature and extent of, the munitions constituents (MC) that are detected above the applicable regulatory criteria and to perform an ecological and human health risk assessment in accordance with the EPA Risk Assessment Guidance (RAGS) and USACE EM 200-1-4, Volumes I and II. Existing site data shall be reviewed and evaluated. Sampling shall be conducted to support the MC baseline risk assessment. The Contractor shall prepare and submit for acceptance a single sampling and analysis plan (SAP) that shall include a field sampling plan and a quality assurance project plan in accordance with DID MR-005-10.01 and UFP QAPP that describes their phased approach and addresses contaminants of interest and sample media (soil/groundwater/sediment/surface water). The price of the SAP shall be firm fixed price and shall be covered under the Work Plan Task. The Contractor shall propose the analytical methodology, media and analytical parameters including QC and QA requirements it will use to execute this Task order. The Contractor shall provide an independent laboratory to analyze QA samples separate from the Contractor's primary laboratory. Data from the QA laboratory will be sent directly to the government. For the proposal the Contractor shall perform ~~***12***~~ *24* multi-increment (MI) decision unit samples for surface soil~~***, two of these samples to be collected***~~ in triplicate. These samples shall be collected in accordance with the most recent version of the Hawaii Department of Health *Technical Guidance Manual for the Implementation of the Hawai'i State Contingency Plan*. For background the Contractor shall perform ~~***two***~~ *12* MI decision unit samples for surface soil *in triplicate*. The Contractor shall perform ~~***five***~~ *20* discrete surface water and sediment samples, ~~***one***~~ *two* pair of samples to be collected in duplicate. The Contractor shall perform ~~***9***~~ *forty* discrete subsurface soil samples (12 inch depth), ~~***one***~~ *four* samples to be collected in duplicate. For background the Contractor shall perform ~~***ten***~~ *fifteen* discrete surface water and sediment and subsurface soil samples. The Contractor shall perform pre and post-detonation composite samples based on the CRREL 7-sample wheel approach (as described in ERDC SR96-15). Additionally, a price spreadsheet is provided in Appendix A for unit price required for this task order and will be used to increase or decrease the scope of the Task Order based on the final level of effort determined during TPP.

3.12.2 The SAP and the data deliverables shall be performed and submitted in accordance with DID MR-005-10.01 and acceptance be gained from the Government. The Contractor shall also provide a discussion on data evaluation and fate and transport analysis. The potential for fate and transport shall address all transport pathways, and it should also address future degradation products resulting from biodegradation, photolysis, and chemical reactions.

3.12.3 Any deviations from the accepted SAP shall be documented in the Daily Quality Control Reports (DQCR). Any deviations that may affect Data Quality Objectives (DQO's) shall be conveyed to USAESCH personnel [project manager (PM), project engineer (PE), project chemist, etc.] immediately.

~~***3.13 Task 13, Optional Removal Action Work Plan Addendum: This is a Firm Fixed Price task. This is a Firm Fixed Price task. The objective of this task is the Contractor to prepare, submit and gain acceptance of additional require removal action discussion into the RIFS WP that is a detailed and comprehensive plan covering all aspects of the removal action work effort in accordance with (IAW) data item description (DID) MR-005-01 and EM 1110-1-4009.***~~

~~***3.14 Task 14, Optional Removal Action Field Activities: This task is a Firm Fixed Price/Unit Price task.***~~
~~***3.14.1 The objective of this task is for the Contractor to perform all necessary field activities to meet the secondary objective of this task order. The Contractor shall removal MPPEH to depth of detection on 41.1 acres to depth of detection as described in the NTCRA Action Memorandum dated May 2009. Additionally, a price spreadsheet is provided in Appendix A for unit price required for this task order and will be used to increase or decrease the scope of the Task Order as necessary. Removal Action shall not occur on slopes 33% or greater. The Contractor shall clearly delineate areas on a map where the slope is 33% or greater. MEC Disposal, Backfilling Excavations, MEC Accountability and Disposal/Disposition of MPPEH shall be handled in the same***~~

~~manner as required in paragraph 3.4, Task 4. The Government is responsible for the cost of evacuation. The Contractor is responsible for coordinating and verifying evacuations, as necessary.~~

~~3.15 Task 15, Optional Site Specific Final Report: This is a Firm Fixed Price task. The objective of this effort is for the Contractor to submit for acceptance a Site Specific Final Report (SSFR) IAW DID MR-030, to include MEC, MPPEH, and identifiable MD discussed in the report to include photographs and maps and locations.~~

3.16 Task 16, Additional Insurance Requirements: This is a firm Fixed Price Task. The objective of this task is to meet additional insurance requirements of the government negotiated Right-of-Entry with Honolulu City and County. The Contractor shall procure and maintain, during the life of this Task Order and any extensions thereof, comprehensive general liability insurance covering bodily injury and property damage with limits not less than $1,000,000 combined single limit per occurrence and including the following extensions: (1) contractual liability to cover liability assumed under this Task Order; and (2) products and completed operations coverage; and all insurance that may be required under the laws, ordinances or rules or regulations of any governmental authority. All required policies of insurance shall name Honolulu City and County, its elected and appointed officials, employees and agents as additional insured and provide that the policy will not be canceled, terminated, lapsed, or materially changed without thirty (30) days' prior written notice to the Honolulu City and County.

4.0 SUBMITTALS AND CORRESPONDENCE:

4.1 Computer Files: All final text and spreadsheet files generated by the Contractor under this task order shall be furnished to the Contract Officer in MS Office Suite 2003 compatible format. Other computer files shall be in accordance with the DIDs. All computer files shall be submitted on CD or DVD.

4.2 PDF Deliverables: In addition to the paper and digital copies of submittals, all versions of any and all reports and/or plans shall be submitted in their entirety (including appendices), uncompressed, on CD or DVD in Adobe Portable Document Format (PDF) format along with a linked table of contents, linked tables, linked photographs, linked graphs and linked figures, all of which shall be suitable for viewing on the Internet. In the case of large reports, the appendices can be provided as one .pdf file separate from the narrative .pdf file. PDF files shall be produced from source documents wherever possible.

4. 3 Identification of Responsible Personnel: Each submittal shall identify the specific members and title of the Contractor's and subcontractor staff that had significant input into the report's preparation or review. All submittals shall be signed by a registered Professional-In-Charge.

4.4 Public Affairs: The Contractor shall not publicly disclose any data generated or reviewed under this contract. The Contractor shall refer all requests for information concerning site conditions to the CEPOH PAO with a copy furnished to the USAESCH Project Manager. Reports and data generated under this contract are the property of the DoD and distribution to any other source by the Contractor, unless authorized by the Contracting Officer, is prohibited.

4.5 Submittals: The Contractor shall furnish copies of the plans, maps, and reports as identified in Table 4-1 to each addressee listed below in the quantities indicated in the Submittal Guidance table, Table 4-2. The Contractor shall submit 1 copy on CD with each hard copy of all submittals (WPs, Reports, Plans, etc) in accordance with paragraphs computer files and PDF Deliverables. *Hardcopies shall be printed on both sides of the paper whenever possible.*

4.6 Addressees:

US Army Engineering & Support Center, Huntsville
Attn: CEHNC-OE-DC (Becky Terry)
PO Box 1600
Huntsville, AL 35807-4301
4820 University Square
Huntsville, AL 35816-1822

Commander
U.S. Army of Corps of Engineers. Honolulu District
Attn: CEPOH-PP-E (~~***Milton Yoshimoto***~~ ***Frank Ono***)
Programs and Project Management Division
Environmental Branch
Building 230
Fort Shafter, Hawaii 96858-5440

Note: Addresses shall be verified by the Contractor.

4.7 Submittals and Due Dates.

Table 4-1 List of Deliverables

Submittals	**Due Dates (Calendar days)**
~~***AAPP***~~	~~***14 days prior to site visit***~~
Explosives Siting Plan	Separate MACOM approval before intentional physical contact with MEC on site
Proposed schedule	7 days after kick-off conference call
GIS on CD/DVD	3 weeks after NTP
Advanced TPP package & CSM	14 days before 1st TPP
Draft TPP Memorandum	14 Days after completion of the first TPP meeting
Final TPP Memorandum	14 days after comments
Draft Public Involvement Plan	TBD
Final Public Involvement Plan	14 days after receipt of comments
Draft Work Plan	21 days after DQOs are determined (TPP)
Draft Final Work Plan	14 days after receipt of comments
Final Work Plan	14 days after receipt of comments
Draft Work Plan Addendum (Optional)	TBD
Final Work Plan Addendum (Optional)	TBD
Draft RI Report w/ GIS on CD/DVD	60 days after completion of fieldwork
Draft Final RI Report	14 days after receipt of comments
Final RI Report	14 days after on board Review
Draft FS Report	TBD
Draft Final FS Report	14 days after receipt of comments
Final FS Report	14 days after on board Review
Draft Proposed Plan	14 days after receipt of acceptance of the FS Report
Final Proposed Plan	7 days after receipt of comments
PP Meeting Transcripts	with final Proposed Plan
Responsive Summary	with Decision Document Submittals
Draft Decision Document	14 days after acceptance of Proposed Plan
Draft Final Decision Document	7 days after receipt of comments
Final Decision Document	7 days after receipt of comments
Draft Site Specific Final Report (Optional)	TBD
Draft Final Site Specific Final Report (Optional)	TBD
Final Site Specific Final Report (Optional)	TBD
Final Administrative Record (On CD/DVD)	Upon completion of the Record
Daily QC Report for Environmental Sampling	Daily during Environmental Sampling Activities
Analytical Data Submittal for QA Evaluation	30 days after completion of fieldwork
Electronic Laboratory Data Submittal	45 days after completion of fieldwork
Final GIS Files on CD	End of Project

4.8 Submittal Quantities

Provide the number of submittals shown in Table 4-2 to the addressees given in Section 4.6.

Table 4-2 Submittal Guidance

	Draft TPP/Plans /Reports/Documents	Draft Final/Final TPP /Plans /Reports/Documents	Others
USAESCH	6	6	TBD
CEPOH	4	4	TBD
Others	0	3	TBD

4.9 Review Comments: Various reviewers will have the opportunity to review submittals made by the Contractor under this contract. The Contractor shall review all comments received through the Project Delivery Team/Contracting Officer and evaluate their appropriateness based upon their merit and the requirements of the PWS. The Contractor shall issue to the Project Manager a formal, annotated response to each. The Contractor shall not non-concur with a comment without discussing with the PM and/or comment maker. Where comments refer to a specific paragraph of a document and the paragraph number has changed since the comment was made, the Contractor shall note the new paragraph number in the annotated response to the comment.

4.10 Schedule: A final schedule shall be submitted a minimum of 30 days before commencing field work in a format compatible with Microsoft Project. A PDF version shall also be submitted. This is an electronic submittal only. The Contractor shall update the schedule in accordance with DID MR-085 Project Status Report.

4.11 Telephone Conversations/Correspondence Records/Meeting Minutes: The Contractor shall keep a record of each phone conversation, written correspondence concerning this Task Order and meeting minutes in accordance with DID MR-055 and DID MR-045. A copy of these records shall be attached to the Project Status Report.

4.12 Project Status Reports: The Contractor shall prepare and submit Project Status Reports in accordance with DID MR-085 and include any other items required in the PWS.

4.13 Period of Performance: The Completion Date for this Task Order is ~~***18 months after award***~~ *January 31, 2011***.**

4.14 Milestone Payments for firm fixed price tasks: Milestones will be considered met or completed when the required QC documentation has been submitted, QA completed and the submittal and/or product is accepted. Any payment vouchers submitted that do not coincide with the final accepted milestones or do not have the appropriate QC documentation will be rejected. All payments will be made utilizing an agreed upon Payment Milestone Schedule. The Contractor shall provide suggested milestones for payment.

5.0 REFERENCES:

5.1 Refer to "Basic Contract."

5.2 Data Item Descriptions: are available at the following: http://www.hnd.usace.army.mil/oew/didsindex.aspx. DIDs MR-005-05, MR-005-05A, MR-005-07 and MR-005-10 have been revised. The new DIDs are MR-005-05.01, MR-005-07.01 and MR-005-10.01. MR-005-05A is no longer used.

5.3 Documentation
5.3.1 Final Engineering Evaluation/Cost Analysis (EE/CA) Report, Former Waikane Valley Training Area, Island of Oahu, Hawaii, Prepared for: US Army Engineering and Support Center, Huntsville, Geographical District: Honolulu, by: Zapata Incorporated, November 2008

5.3.2 Draft Site Investigation Report, Pali Training Camp, Heeia Combat Training Area, and Waikane Training Area, Oahu, Hawaii, Project No. H00HI027201, H09HI011901, And H09HI035401, Prepared For: United States Army Engineer District, Honolulu, Prepared By: Wil Chee - Planning, Inc., Dated MARCH 2009

5.3.3 Inventory Project Report (INPR) for Property No. H09HI0354, Waikane Training Area, Waikane, Oahu, Hawaii. Dated 27 February 2009

5.4 Other Data: GeoSpatial data from the EE/CA.

6.0 PERFORMANCE METRICS:

6.1 Performance Metrics for Performance Assessment Record (PAR)

	Exceptional	**Very Good**	**Satisfactory**	**Marginal**	**Unsatisfactory**
PAR Category: Quality of Product or Service					
Performance indicator: Document reviews					
<u>*Draft*</u> Plans, Reports, and documents [Plans, documents and reports are considered draft until accepted as final by the Government]	All contract-milestone documents accepted as submitted	No substantive comments (i.e. limited to grammar, spelling, terminology) to any of the documents or subplans, but a few exceptions were noted and corrected by change pages	One or more documents or subplans required revisions to be resubmitted for approval prior to proceeding. However, no document or subplan required more than one backcheck, all original comments were resolved satisfactorily.	One or more documents or subplans required revisions to be resubmitted for approval prior to proceeding. Two backchecks were required on one or more documents or subplans before original comments were resolved satisfactorily.	One or more documents or subplans did not comply with contract requirements, or one or more documents or subplans required more than two backchecks before original comments were resolved satisfactorily, or one or more documents or subplans were rejected.
Performance indicator: Project Execution					
Process Compliance	Zero Corrective Action Requests (CAR)	1-5 CARs for non-critical violations to WP requirements	6-8 CARS for non-critical violations and/or 1 CAR for critical violation	8-10 CARS for non-critical violations and/or 2-4 CARS for critical violations	>10 CARS for non-critical violations and/or >4 CARS for critical violations, or any unresolved CARS
Project Execution	Zero letters of reprimand, grievances, or formal complaints AND one or more unsolicited letters of commendation		Zero letters of reprimand, grievances, or formal complaints	One letter of reprimand, grievance or formal complaint that was resolved through negotiation	More than one letter of reprimand, grievance or formal complaint that were resolved through negotiation
Task Completion			All final data		Final data and

	Exceptional	Very Good	Satisfactory	Marginal	Unsatisfactory
			and QC documentation submitted and accepted		QC documentation submitted but not accepted
PAR Category: Schedule					
Performance indicator: Timely completion of tasks					
Final Plans and Reports, project milestones, T.O. invoices	All document submittals and task order milestones and invoices complete and accepted by T.O date, project closed out/final invoice approved ahead of schedule	Project closed out/final invoice accepted ahead of schedule	Project closed out/final invoice accepted on T.O. date	Project closed out/final invoice accepted within 30 calendar days after T.O. date.	Project closed out/final invoice accepted more than 30 calendar days after T.O. date.
Project status reports accurate			Yes		No
Performance indicator: Impacts to schedule					
Impacts caused by Contractor or other causes identified, in writing to HNC CO/ PM, in a timely manner to apply acceptable corrective actions.			Yes		No
PAR Category: Cost Control (Not Applicable for Firm Fixed Price)					
Performance indicator: No unauthorized cost overruns					
Unauthorized cost overruns			No		Yes
Total Project Costs	Total contract invoices less than 98% of T.O. authorized amount	Total contract invoices greater than 98% but less than 99.99%of T.O. authorized amount	Total contract invoices between 99.99% and 100% of T.O. authorized amount	Total contract invoices greater than 100% but less than 105% of T.O. authorized amount	Total contract invoices greater than or equal to 105% of T.O. authorized amount
Performance indicator: Monthly cost report					
Monthly cost reports accurate			Yes		No
Performance indicator: Impacts to cost					
Impacts caused by Contractor or other causes identified, in writing to HNC			Yes		No

	Exceptional	Very Good	Satisfactory	Marginal	Unsatisfactory
CO/PM, in a timely manner to apply acceptable corrective actions.					
PAR Category: Business Relations					
Performance indicator: Met contractual obligations					
Corrective Actions taken were timely and effective (Refer to CARs issued to Contractor)			Yes		No
Performance indicator: Professional and Ethical Conduct					
Meetings and correspondences with Public, project delivery team and other stakeholders	Zero letters of reprimand, grievances, or formal complaints AND one or more unsolicited letters of commendation		Zero letters of reprimand, grievances, or formal complaints	One letter of reprimand, grievance or formal complaint that was resolved through negotiation	More than one letter of reprimand, grievance or formal complaint that were resolved through negotiation OR removal of one or more project personnel as a results of a letter of reprimand, grievance or formal complaint.
Performance indicator: Customer has overall satisfaction with work performed					
Customer survey results for rating period	4.0-5.0	3.0-3.9	2.0-2.9	1.0-1.9	<1.0
Performance indicator: Personnel responsive and cooperative					
Key personnel responsive, and cooperative	Always		Most Times		Almost Never
PAR Category: Management of Key Personnel and Resources					
Performance indicator: Personnel knowledgeable and effective in their areas of responsibility					
Personnel assigned to tasks	All personnel proposed by Contractor were assigned to project, some personnel were substituted by higher qualified individuals.		All personnel proposed by Contractor were assigned to project, some personnel were substituted by equally qualified individuals.	All personnel proposed by Contractor were assigned to project, some personnel were substituted by equally qualified individuals, Letter of reprimand	All personnel proposed by Contractor were assigned to project, some personnel were substituted by lesser qualified individuals or HNC requested, in writing,

	Exceptional	Very Good	Satisfactory	Marginal	Unsatisfactory
				received for personnel conduct from HNC.	removal of assigned personnel for poor performance.
Performance indicator: Personnel able to manage resources efficiently					
Instances when resource management had negative impact on project execution	0	1-2	3-4	5-6	>6
PAR Category: Safety					
Performance indicator: Accidents and Violations					
*No Class A Accidents, Contractor at fault	0 No class A accidents IAW AR 385-40	No class A accidents IAW AR 385-40	<1 non-explosive related Class D, accidents, or <2 non-explosive Class C accidents IAW AR 385-40.	<2 non-explosive related Class C accidents, or 1 non-explosive Class B accident, IAW AR 385-40	1 Any Class A accident IAW AR-385-40, or Any explosive related accident.
*Major safety violations	0 accidents/injuries No safety violations	0 accidents/injuries No safety violations	0 accidents/injuries 1 non-explosive related safety violation.	2 non-explosive safety violations.	>1 any violation of procedures for handling, storage, transportation, or use of explosives IAW the WP, and all Federal, State and local laws/ordinances.
*Minor safety violations	No safety violations	1 safety violation	2 safety violations.	3 safety violations	>3 safety violations

Classes of Accidents:

- **Class A:** Fatality or permanent total disability (Government Civilian, Military Personnel, and/or Contractor), or >$1,000,000 property damage.

- **Class B:** Permanent partial disability or impatient hospitalization of 3 or more persons (Government Civilian, Military Personnel, and/or Contractor), $200,000< $1,000,000 property damage.

- **Class C:** Lost Workday (Contractor) or Lost Time (Government Civilians), $20,000< $200,000 property damage.

- **Class D:** $2000 < $20,000 property damage.

* From Section C of Solicitation Number W912DY-04-R-0003, Amendment 0001 (may be included but are not limited to these).

The following guidelines are provided for issuing ratings that are subjective in nature, these ratings will be supported by the weight of evidence documented during the government's surveillance efforts:

Exceptional: Performance *meets* contractual requirements and *exceeds many* to the Government's benefit. The contractual performance of the element or sub-element being assessed was accomplished with *few minor problems* for which corrective actions taken by the Contractor were *highly effective*.

Very Good: Performance *meets* contractual requirements and *exceeds some* to the Government's benefit. The contractual performance of the element or sub-element being assessed was accomplished with *some minor problems* for which corrective actions taken by the Contractor were *effective*.

Satisfactory: Performance *meets* contractual requirements. The contractual performance of the element or sub-element contains *some minor problems* for which corrective actions taken by the Contractor *appear or were satisfactory*.

Marginal: Performance *does not meet all* contractual requirements. The contractual performance of the element or sub-element being assessed reflects a *serious problem* for which the Contractor has *not yet identified corrective actions*. The Contractor's proposed actions appear only *marginally effective or were not fully implemented*.

Unsatisfactory: Performance *does not meet most* contractual requirements and *recovery is not likely* in a timely manner. The contractual performance of the element or sub-element contains *serious problems* for which the Contractor's corrective actions *appear or were ineffective*

7.0 CONTRACTOR MINIMUM PERFORMANCE AND QC REQUIREMENTS: The Contractor shall include in their QC plan specific tests that are itemized below. The values listed in the various requirements listed in Tables 7-1 through 7-4 below may be adjusted upon request, provided the Contractor supplies supporting documentation and rationales for Government concurrence. Table 7-5 provides acceptance sampling parameters. All reported QC results from these tests will be reviewed as part of government QA. In the event a requirement is not met and the Contractor submits the data to the Government, the Contractor shall provide rationales for accepting them. All such rationales will be reviewed as part of government QA. If the rationales are either insufficient or technically unfeasible, or are attempts to justify non-conformances that should be corrected to meet project needs, the Government will issue a Corrective Action Request to the Contractor and the submittal(s) will be rejected. Some performance standards are default values and may be changed by the PDT to suit project needs, potentially as a result of TPP decisions. These requirements are marked with an asterisk (*). These QC requirements supersede the required QC entries in the DID MR-005-05.01 Access Database. The database template shall be used; however, the required fields will change based on these tables. Included in the assumptions for these requirements is that the data will be used to develop 'costs to complete' and that grids will be fully investigated.

Table 7-1 Performance Requirements for RI/FS using DGM Methods [1]

Requirement	**Applicability (Specific to Collection Method/Use)**	**Performance Standard**	**Frequency**	**Consequence of Failure[2]**
Static Repeatability (instrument functionality)[3]	All	Response (mean static spike minus mean static background) +-10% of GPO/original value on all channels	Min 1 daily	Day's data fails unless seed item is mapped that day with repeatable anomaly characteristics (see Dynamic Detection Repeatability)
Along Line Measurement Spacing	All	98% <=25cm along line[4]	By dataset	Dataset submittal fails
Speed	Transects without seeds[5]	95% within max project design speed or demonstrated speed	By dataset	Dataset submittal fails unless new max speed successfully demonstrated at GPO.
Coverage(*)	Grids	>90% coverage at project design line spacing.[6]	By dataset or grid[7]	Submittal fails unless gaps filled, additional data collected, or government refund for missing acreage.
Dynamic Detection Repeatability	Grids	Test item anomaly characteristics (peak response and size) repeatable with allowable variation +/- 25%.[8]	1 test item per grid or dataset. [7]	Submittal fails
	Transects	(a) #anomalies on repeat segment w/in +- 20% or +-8 of original or within range of adjacent sections (b) Test item (in test strip or on transect) anomaly characteristics (peak response and size) repeatable with allowable variation +/- 25%. Or Fit coefficient[10] over test strip is acceptable.	(a) repeat 2% per lot[9] or (b) repeat test strip once per system per lot or daily; or 2 test items per system per lot	(a) Lot submittal fails or (b) Lot (or day's data) fails
Dynamic Positioning Repeatability	Grid coverage	Position offset of Test item target <=35cm + 1/2 line spacing[11] (<=50cm + 1/2 line spacing for fiducially positioned data).	1 test item per grid or dataset [7] (same item as Dynamic Detection Repeatability)	submittal fails

Requirement	Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure[2]
	Transects with reacquisition/digging	(a) Demonstrate reacquisition by reproducing randomly chosen anomaly signals (reac amplitude >= original & offset <= 1m) [12] or (b) Test item anomaly characteristics (peak response and size) repeatable with allowable variation +/- 25% and position offset <=1m.	(a) 2 targets per system per lot or (b) 2 test items per system per lot (can be same as detection repeatability test items)	Lot submittal fails
Target Selection	All	All dig list targets are selected according to project design	By grid or dataset[7]	submittal fails
Anomaly Resolution(*)[13]	Verification checking by DGM re-mapping[14] Or Verification checking with original instrument of anomaly footprint after excavation [15]	If MEC[16]: 70% confidence <10% unresolved anomalies[17] If no MEC: 90% confidence <5% unresolved anomalies Accept on zero.	Rate varies depending on lot size. [18] See Acceptance Sampling Table.	Lot submittal fails
Geodetic Equipment Functionality(*)	All	Position offset of known/temporary control point within expected range as described in the approved work plan. [19]	Daily	Redo affected work or re-process affected data
Geodetic Internal Consistency	Grids with line/fiducial positioning	Grid corners are internally consistent within 30cm on any leg or diagonal.	Per Grid	Redo affected work (corner placement & data collection, or data processing)
Geodetic Accuracy	Points used for RTK or RTS base stations	Project network must be tied to HARN, CORS, OPUS or other recognized network[20]. Project control points that are used more than once must be repeatable to within 5cm	For points used more than once, repeat occupation[21] of each point used, either monthly (for frequently used points) or before re-use (if used infrequently[22]).	Re-set points not located at original locations or resurvey point following approved work plan.
Geodetic Repeatability(*)	Grid centroids or corners/transect points	Measured locations are reoccupied within	1 per lot	Lot submittal fails

Requirement	Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure[2]
	without anomaly reacquisition	10m. [23]		

[1] These are the critical requirements for RI DGM methods. Contractors shall use additional methods/frequencies that they deem beneficial and as required in their SOPs.
[2] All failures also require a Root Cause Analysis.
[3] Item should be placed on a jig that ensures consistent geometry between the sensor and item to ensure repeatability, response not to exceed 500 units, or optionally use the Geonics calibration coil. Duration of data collection needed TBD by the Contractor. Must compare to original to ensure instrument is consistent throughout the project. .It is recognized that this QC requirement may be redundant and could contradict results from seeding QC, however, in the event of seed failure, information from this test may aid in determining cause of failure, i.e. instrument or processing.
[4] 25cm based on institutional knowledge and common instrument physical dimensions. Assumes speed used achieves detection. This requirement can be relaxed if supporting documentation is provided to the Government for concurrence.
[5] Needed because increase in speed can reduce SNR and increase # false hits (alternatively this test can be supplanted by repeatable anomaly characteristics of seed items within the dataset).
[6] Recommended default line spacing is 0.6m for items of interest the size of 40mm grenades and smaller, else 0.8m
[7] The terms “grid” and “dataset” refer here to logical groupings of data or data collection event. Logical groupings of data are contiguous areas mapped by the same instrument and in the same relative time-frame. These can be grids, acres, or some other unit of area. A data collection event is similar to logical groupings of data but refers to data collected over a contiguous time frame, such as “morning”, “afternoon”, “battery life”, or some other measure of contiguous time. It is recognized that physical marking of corners on the ground is not always beneficial to the government. Additionally, size and shape of the grid is not specified.
[8] A standard test item shall be placed within the survey area (i.e. a small pipe or flat plate with a small area response. Item can be placed flush with the surface or buried at a standard depth and standard orientation). This test does not demonstrate the detection capabilities of the MEC of interest. The standard response to this test item must be defined prior to the start of production field activities. Response repeatability to this standard test item in the mapping data will indicate data quality is consistent and sufficient for detection of the MEC items of interest.
[9] Fit Coefficient means how well the repeated data matches the original data. Method of calculation and acceptance criteria can be proposed by the Contractor, and could be based on the UX-Process repeatability gx value.
[10] Contractor shall propose the lot size and criteria for designation (i.e. woods vs. open)
[11] For 0.8m line spacing, this would be a 0.75m allowable error radius (or 0.9 for fiducial).
[12] Does not necessarily mean the peak response or actual item location (i.e. for transect data the response could still be ramping up off-line). This could also be demonstrated through blind seed items.
[13] Resolved is defined as 1) there is no geophysical signal remaining at the flagged/selected location, or 2) a signal remains but it is too low or too small to be associated with UXO/DMM, or 3) a signal remains but is associated with surface material which when moved results in low, or no signal at the interpreted location, or 4) a signal remains and a complete rationale for its presence exists.
[14] Mapping shall cover the required number of anomaly locations. This is used in-lieu of checking individual anomalies for those instances where it is quicker to re-map sections of land rather than return to individual anomalies. Only the data at the anomaly locations is reviewed for resolution.
[15] This may require leaving flags at excavated locations until QC is complete. It is up to the Contractor to indicate which holes knowingly have metal left in them where the PDT has agreed such is acceptable. It is the Contractor’s responsibility to not put hot material back in the hole before QC is complete. As part of this requirement location accuracy must also be demonstrated (i.e. cleared location is within dynamic positioning error radius as described above). Contractor SOPs that incorporate post-excavation inspections using digital geophysical instruments can

be used to meet the excavation verification need of this requirement provided appropriate QC protocols are in place to monitor and document the SOPs are followed. Acceptance sampling or alternative QC protocols to monitor and document the reacquisition SOP would be required to demonstrate the correct locations are excavated.

[16] If MEC (or intact or partial training or practice rounds) are not detected in a lot then the information from that lot may be used to support certain decisions where the confidence in the results must be greater than that for grids where MEC are detected.

[17] This is a statistical test number. It does not imply there are 10% bad units. It tests there are fewer than 10% bad units, including zero bad units. Values for confidence levels will be determined by the PDT and are dependent on the information needed. Stopping rules will take precedence over this standard (i.e. for high MEC density, decision could be made to stop because the team has enough data for characterization)

[18] For example, if lot size is 500 anomalies, to achieve a 90% confidence that there are less than 5% unresolved anomalies, 43 anomalies must be re-checked. If any one of the 43 is unresolved, then the confidence level has not been met, the lot submittal fails and all anomalies in that lot must be re-checked (i.e. accept on zero). The Contractor shall propose the lot size for government concurrence (i.e. The Contractor determines the amount of risk they are willing to take. The larger the lot, the less sampling needs to be done, but the larger the risk of increased costs/rework if failure occurs.) For anomaly resolution, in order to use statistics/confidence levels, it is based on number of anomalies, not grids.

[19] Most high-accuracy systems should demonstrate repeatability between 5cm and 10cm. Typical accuracies achievable for some high-accuracy systems are: 2cm to sub-centimeter for RTK DGPS and RTS units depending on manufacturer and site conditions. Less accurate systems should demonstrate repeatability within manufacturer published ranges. Typical accuracies for less accurate systems are 5m to sub-meter for WAAS or satellite correction service DGPS units depending on manufacturer, correction service and site conditions, and 30m to 1m for USCG beacon corrected units depending on manufacturer.

[20] The plan for tying the project network to a common reference network must be described in the approved work plan. If monumentation is part of the plan, specific monumentation procedures and data quality objectives will also need to be specified and installation of monumentation or network control points shall follow all guidance and accuracies specified in EC 1110-1-73 – "Standards and Specifications for Surveys, Maps, Engineering Drawings, and Related Spatial Data Products".

[21] Repeat occupation means demonstrate the control points being used can be recovered and reoccupied and that they have not moved more than the requirement specification. This can be accomplished using the same methodology used to initially tie the local network to a HARN, CORS, OPUS, or other recognized network, or it can be accomplished by other means that achieve this requirement.

[22] An example of frequently used control points would be points used as RTK DGPS base stations. Infrequently used points could be those used during RTS operations where the control point was used during mapping and then again at some later time for reacquisition and QC statistical sampling. Infrequently used points could also include grid corners they are used for line and fiducial positioning and then subsequently re-used for reacquisition or QC statistical sampling.

[23] The exact location of a single transect/grid is not critical when the information is used only for characterization by interpolating over large areas (e.g. transect spacings are larger than geodetic accuracies). The acceptable accuracy may be tightened by the PDT if more exact positioning is needed (e.g. trying to characterize extents of small MRS's). If specific anomalies/locations must be recovered this metric must be revised to meet project needs and will likely have the same accuracy needs as the Geodetic Accuracy requirement.

Table 7-2 QC Requirements for RI/FS using Analog Methods[1]

Requirement	Limited Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure[2]
Repeatability (instrument functionality)	All	All items in test strip detected (trains ear daily to items of interest)[3]	Min 1 daily[4]	Remedial training and additional remedial measures as described in the approved work plan if due to operator error, or replacement of faulty equipment.[5]
Dynamic Repeatability	Transects used only for density estimates	Repeat a segment of transect & show #Counts repeated w/in the greater of +-20% or +-8, or w/in range of adjacent segments.	2nd party repeat of 2% per lot	Redo lot
	Transects with digging	Repeat a segment of transect & show extra flags/digs not greater than the greater of 20% or 8 flags/digs, or w/in range of adjacent segments.	2nd party repeat of 2% per lot	Redo lot
Coverage(*)	Grids	Blind coverage seeds and blind detection seeds recovered[6]: 75% if MEC 90% if no MEC[7]	Variable rate at 2, 3 or 4 times # operators, per lot.	Redo lot.
Detection & Recovery (*)	No DGM QC remapping	Blind detection seeds recovered: 80% if MEC 100% if no MEC	Per operator per lot: variable 1-2 large/deep and 1-3 small/ shallow[8]	Redo lot
	With DGM QC remapping	If MEC[9]: 70% confidence <10% unresolved anomalies[10] If no MEC: 90% confidence <5% unresolved anomalies Accept on zero. [11]	Rate varies depending on lot size. [Table showing acreage rates per lot size for varying confidence levels will be provided][12]	Redo lot
Anomaly Resolution(*)[13]	Verification checking of excavated locations (analog or digital instrument)	2nd party checks open holes to determine: If MEC: 70% confidence <10% anomalies unresolved[14] If no MEC: 90%	Rate varies depending on lot size. See Acceptance Sampling Table.[15]	Redo lot

Requirement	Limited Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure[2]
		confidence <5% anomalies unresolved		
	Verification checking by DGM remapping[16]	Same as Detection & Recovery	Rate varies depending on lot size. See Acceptance Sampling Table.	Redo lot
Geodetic Equipment Functionality (*)	All	Position offset of known/temporary control point within expected range as described in the approved work plan.[17]	Daily	Redo affected work
Geodetic Accuracy	Points used for RTK or RTS base stations	Project network must be tied to HARN, CORS, OPUS or other recognized network[18]. Project control points that are used more than once must be repeatable to within 5cm	For points used more than once, repeat occupation[19] of each point used, either monthly (for frequently used points) or before re-use (if used infrequently[20]).	Re-set points not located at original locations or resurvey point following approved work plan.
Geodetic Repeatability (*)	Grid corners/transect points without anomaly reacquisition	Measured locations are reoccupied within 10m.[21]	1 per lot	Redo affected work

[1] These are the critical requirements for RI analog methods. Contractors shall use additional methods/frequencies that they deem beneficial and as required in their SOPs.
[2] All failures also require a Root Cause Analysis.
[3] The requirement is that each operator demonstrates positive detection on a daily basis of the smallest and largest expected MEC of interest when it is placed at both its best and worst orientations and buried between 95% and 100% of their respective maximum consistent detection depth. Maximum consistent detection depth is defined as producing any above background response on a minimum of the first three time gates of the EM61MK2 optimized for site conditions and having a $0.9m^2$ size or more as calculated using the Geosoft Oasis Montaj UCEAnalyseTarget.gx or equivalent routine.
[4] Random blind reconfiguration of test strip is also required (i.e. moving/adding items) at a frequency determined by the Contractor and approved in the work plan, to address the potential for simply memorizing seed locations.
[5] Some examples of additional remedial measures are: removal of operator from mapping for one day, retesting on new blind strip meeting the same requirements for seed items (could move location of items in same area), 100% QC re-inspection of initial lanes by that operator, etc.
[6] Coverage seeds are small pieces of metal that will produce relatively large amplitude anomalies over small areas, such as small nails or ball bearings. Known location accuracy of placement is not critical. See endnote #8 for description of blind detection seeds.

[7] If MEC (or intact or partial training or practice rounds) are not detected in a grid/lot then the information from that grid/lot may be used to support certain decisions where the confidence in the results must be greater than that for grids where MEC are detected.
[8] Detection and recovery must be consistently demonstrated for the hard to detect items; therefore, the largest expected MEC and the smallest expected MEC shall be placed between 95% and 100% of their respective maximum consistent detection depth
[9] If MEC (or intact or partial training or practice rounds) are not detected in a lot then the information from that lot may be used to support certain decisions where the confidence in the results must be greater than that for grids where MEC are detected.
[10] This is a statistical test number. It does not imply there are 10% bad units. It tests there are fewer than 10% bad units, including zero bad units. Values for confidence levels will be determined by the PDT and are dependent on the information needed. Stopping rules will take precedence over this standard (i.e. for high MEC density, decision could be made to stop because the team has enough data for characterization)
[11] Unresolved anomaly for 'Detection & Recovery Testing' means a significant signal remains without a complete rationale for its presence. Default values for such a 'significant signal' are peak amplitude on sum channel >=30mv & anomaly width >=1.2m or anomaly size >=0.9m^2. This value may change but must be agreed upon by the PDT up front.
[12] The statistical calculations for this test are in progress. This is different from sampling of excavated holes, in that a portion of the acreage is re-mapped, and the amount re-mapped must be statistically valid to show, to some confidence level, that anomalies did not go undetected.
[13] This requires leaving flags at excavated locations until QC is complete. If shovel called to a flag during QC then the failure has already occurred—it is not important that something large or small comes out of the hole. Assumption here is "mapping coverage" is addressed through other means. It is up to the Contractor to indicate which holes knowingly have metal left in them where the PDT has agreed such is acceptable. It is the Contractor's responsibility to not put hot material back in the hole before QC is complete.
[14] Resolved is defined as 1) there is no geophysical signal remaining at the flagged/selected location, or 2) a signal remains but it is too low or too small to be associated with UXO/DMM, or 3) a signal remains but is associated with surface material which when moved results in low, or no signal at the interpreted location, or 4) a signal remains and a complete rationale for its presence exists.
[15] For example, if lot size is 500, to achieve a 90% confidence that there are less than 5% unresolved anomalies, 43 anomalies must be re-checked. If any one of the 43 is unresolved, then the confidence level has not been met , the lot submittal fails and all anomalies in that lot must be re-checked (i.e. accept on zero). The Contractor shall propose the lot size for government concurrence (i.e. The Contractor determines the amount of risk they are willing to take. The larger the lot, the less sampling needs to be done, but the larger the risk of increased costs/rework if failure occurs.) For anomaly resolution, in order to use statistics/confidence levels, it is based on number of anomalies, not grids.
[16] Mapping shall cover the required number of anomaly locations. This is used in-lieu of checking individual anomalies for those instances where it is quicker to re-map sections of land rather than return to individual anomalies. Only the data at the anomaly locations is reviewed for resolution.
[17] Most high-accuracy systems should demonstrate repeatability between 5cm and 10cm. Typical accuracies achievable for some high-accuracy systems are: 2cm to sub-centimeter for RTK DGPS and RTS units depending on manufacturer and site conditions. Less accurate systems should demonstrate repeatability within manufacturer published ranges. Typical accuracies for less accurate systems are 5m to sub-meter for WAAS or satellite correction service DGPS units depending on manufacturer, correction service and site conditions, and 30m to 1m for USCG beacon corrected units depending on manufacturer.
[18] The plan for tying the project network to a common reference network must be described in the approved work plan. If monumentation is part of the plan, specific monumentation procedures and data quality objectives will also need to be specified and installation of monumentation or network control points shall follow all guidance and accuracies specified in EC 1110-1-73 – "Standards and Specifications for Surveys, Maps, Engineering Drawings, and Related Spatial Data Products".
[19] Repeat occupation means demonstrate the control points being used can be recovered and reoccupied and that they have not moved more than the requirement specification. This can be accomplished using the same methodology used to initially tie the local network to a HARN, CORS, OPUS, or other recognized network, or it can be accomplished by other means that achieve this requirement.

[20] An example of frequently used control points would be points used as RTK DGPS base stations. Infrequently used points could be those used during RTS operations where the control point was used during mapping and then again at some later time for reacquisition and QC statistical sampling. Infrequently used points could also include grid corners they are used for line and fiducial positioning and then subsequently re-used for reacquisition or QC statistical sampling.

[21] The exact location of a single transect/grid is not critical when the information is used only for characterization by interpolating over large areas (e.g. transect spacings are larger than geodetic accuracies). The acceptable accuracy may be tightened by the PDT if more exact positioning is needed (e.g. trying to characterize extents of small MRS's). If specific locations must be recovered this metric must be revised to meet project needs and will likely have the same accuracy needs as the Geodetic Accuracy requirement, which is 30cm.

Table 7-3 Performance Requirements for RA using DGM Methods [1]

Requirement	Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure[2]
Static Repeatability (instrument functionality)[3]	All	Response (mean static spike minus mean static background) +-10% of GPO/original value on all channels	Min 1 daily	Day's data fails unless seed item is mapped that day with repeatable anomaly characteristics (see Dynamic Detection Repeatability)
Along Line Measurement Spacing	All	98% <=25cm along line[4]	By dataset	Dataset submittal fails
Coverage(*)	Data using electronic positioning equipment	>95% coverage at project design line spacing.[5]	By grid or dataset[6]	submittal fails
	Data using fiducial positioning	All blind coverage seeds detected at their emplacement location within the dynamic positioning repeatability metric[7] Or Lay down guidance ropes & perform random inspection	Variable rate at 2, 3 or 4 per system per grid or dataset. [6] Or All have ropes, visual observation minimum once per day	submittal fails
Dynamic Detection Repeatability	All	Test item anomaly characteristics (peak response and size) repeatable within allowable variation +/- 25%.[8]	1 test item per grid or dataset[6]	submittal fails
Dynamic Positioning Repeatability	Data using electronic positioning equipment	Position offset of Test item target <=35cm + 1/2 line spacing.[9]	1 test item per grid or dataset [6] (same item as Dynamic Detection Repeatability)	submittal fails
	Data using fiducial positioning	Position offset of Test item target <=50cm + 1/2 line spacing.	1 test item per grid or dataset [6] (same item as Dynamic Detection Repeatability)	submittal fails
Target Selection	All	All dig list targets are selected according to project design	By grid or dataset[6]	submittal fails
Anomaly Resolution(*)[10]	Verification checking by DGM re-mapping[11]	90% confidence <1% unresolved anomalies[13] Accept on zero.	Rate varies depending on lot size. [14] See Acceptance	Lot submittal fails

Requirement	Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure[2]
	Or Verification checking with original instrument of anomaly footprint after excavation [12]		Sampling Table.	
Geodetic Equipment Functionality(*)	All	Position offset of known/temporary control point within expected range as described in the approved work plan. [15]	Daily	Redo affected work or re-process affected data
Geodetic Internal Consistency	Grids with line/fiducial positioning	Grid corners are internally consistent within 30cm on any leg or diagonal.	Per Grid	Redo affected work (corner placement & data collection, or data processing)
Geodetic Accuracy	Points used for RTK or TS base stations	Project network must be tied to HARN, CORS, OPUS or other recognized network[16]. Project control points that are used more than once must be repeatable to within 5cm	For points used more than once, repeat occupation[17] of each point used, either monthly (for frequently used points) or before re-use (if used infrequently[18]).	Re-set points not located at original locations or resurvey point following approved work plan.

[1] These are the critical requirements for RA DGM methods. Contractors shall use additional methods/frequencies that they deem beneficial and as required in their SOPs.
[2] All failures also require a Root Cause Analysis.
[3] Item should be placed on a jig that ensures consistent geometry between the sensor and item to ensure repeatability, response not to exceed 500 units, or optionally use the Geonics calibration coil. Duration of data collection needed TBD by the Contractor. Must compare to original to ensure instrument is consistent throughout the project. .It is recognized that this QC requirement may be redundant and could contradict results from seeding QC, however, in the event of seed failure, information from this test may aid in determining cause of failure, i.e. instrument or processing.
[4] 25cm based on institutional knowledge and common instrument physical dimensions. Assumes speed used achieves detection. This requirement can be relaxed if supporting documentation is provided to the Government for concurrence.
[5] Recommended default line spacing is 0.6m for items of interest the size of 40mm grenades and smaller, else 0.8m.
[6] The terms “grid” and “dataset” refer here to logical groupings of data or data collection event. Logical groupings of data are contiguous areas mapped by the same instrument and in the same relative time-frame. These can be grids, acres, or some other unit of area. A data collection event is similar to logical groupings of data but refers to data collected over a contiguous time frame, such as “morning”, “afternoon”, “battery life”, or some other measure of contiguous time. It is recognized that physical marking of corners on the ground is not always beneficial to the government. Additionally, size and shape of the grid is not specified.

[7] Coverage seeds are small pieces of metal that will produce relatively large amplitude anomalies over small areas, such as small nails or ball bearings. They shall be placed beneath the ground surface so as not to be visible to the operator.
[8] A standard test item shall be placed within the survey area (i.e. a small pipe or flat plate with a small area response. Item can be placed flush with the surface or buried at a standard depth and standard orientation). This test does not demonstrate the detection capabilities of the MEC of interest. The standard response to this test item must be defined prior to the start of production field activities. Response repeatability to this standard test item in the mapping data will indicate data quality is consistent and sufficient for detection of the MEC items of interest.
[9] For 0.8m line spacing, this would be a 0.75m allowable error radius.
[10] Resolved is defined as 1) there is no geophysical signal remaining at the interpreted location, or 2) a signal remains but it is too low or too small to be associated with UXO/DMM, or 3) a signal remains but is associated with surface material which when moved results in low, or no signal at the interpreted location, or 4) a signal remains and a complete rationale for its presence exists.
[11] Mapping shall cover the required number of anomaly locations. This is used in-lieu of checking individual anomalies for those instances where it is quicker to re-map sections of land rather than return to individual anomalies. Only the data at the anomaly locations is reviewed for resolution.
[12] This may require leaving flags at excavated locations until QC is complete. It is up to the Contractor to indicate which holes knowingly have metal left in them where the PDT has agreed such is acceptable. It is the Contractor's responsibility to not put hot material back in the hole before QC is complete. As part of this requirement location accuracy must also be demonstrated (i.e. cleared location is within dynamic positioning error radius as described above). Contractor SOPs that incorporate post-excavation inspections using digital geophysical instruments can be used to meet the excavation verification need of this requirement provided appropriate QC protocols are in place to monitor and document the SOPs are followed. Acceptance sampling or alternative QC protocols to monitor and document the reacquisition SOP would be required to demonstrate the correct locations are excavated.
[13] This is a statistical test number. It does not imply there are 1% bad units. It tests there are fewer than 1% bad units, including zero bad units. Values for confidence levels will be determined by the PDT and are dependent on the information needed.
[14] For example, if lot size is 500 anomalies, to achieve a 90% confidence that there are less than 5% unresolved anomalies, 44 anomalies must be re-checked. If any one of the 44 is unresolved, then the confidence level has not been met, the lot submittal fails and all anomalies in that lot must be re-checked or some other action or actions performed. The Contractor shall propose the lot size for government concurrence (i.e. The Contractor determines the amount of risk they are willing to take. The larger the lot, the less sampling needs to be done, but the larger the risk of increased costs/rework if failure occurs.) For anomaly resolution, in order to use statistics/confidence levels, numbers of anomalies is used and not numbers of grids.
[15] Most high-accuracy systems should demonstrate repeatability between 5cm and 10cm. Typical accuracies achievable for some high-accuracy systems are: 2cm to sub-centimeter for RTK DGPS and RTS units depending on manufacturer and site conditions. Less accurate systems should demonstrate repeatability within manufacturer published ranges. Typical accuracies for less accurate systems are 5m to sub-meter for WAAS or satellite correction service DGPS units depending on manufacturer, correction service and site conditions, and 30m to 1m for USCG beacon corrected units depending on manufacturer.
[16] The plan for tying the project network to a common reference network must be described in the approved work plan. If monumentation is part of the plan, specific monumentation procedures and data quality objectives will also need to be specified and installation of monumentation or network control points shall follow all guidance and accuracies specified in EC 1110-1-73 – "Standards and Specifications for Surveys, Maps, Engineering Drawings, and Related Spatial Data Products".
[17] Repeat occupation means demonstrate the control points being used can be recovered and reoccupied and that they have not moved more than the requirement specification. This can be accomplished using the same methodology used to initially tie the local network to a HARN, CORS, OPUS, or other recognized network, or it can be accomplished by other means that achieve this requirement.
[18] An example of frequently used control points would be points used as RTK DGPS base stations. Infrequently used points could be those used during RTS operations where the control point was used during mapping and then again at some later time for reacquisition and QC statistical sampling. Infrequently used points could also include

grid corners they are used for line and fiducial positioning and then subsequently re-used for reacquisition or QC statistical sampling.

Table 7-4 Performance Requirements for RA using Analog Methods[1]

Requirement	Limited Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure[2]
Repeatability (instrument functionality)	All	All items in test strip detected (trains ear daily to items of interest)[3]	Min 1 daily[4]	Remedial training and additional remedial measures as described in the approved work plan if due to operator error, or replacement of faulty equipment.[5]
Coverage(*)	All	All blind coverage seeds and blind detection seeds recovered[6]	Variable rate at 2, 3 or 4 times # operators, per lot.	Redo lot.
Detection & Recovery (*)	No DGM QC remapping	All blind detection seeds recovered	Per operator per lot: variable 1-2 large/deep and 1-3 small/ shallow[7]	Redo lot
	With DGM QC remapping	90% confidence <1% unresolved anomalies. Accept on zero.[8]	Rate varies depending on lot size. [Table showing acreage rates per lot size for varying confidence levels will be provided][9]	Redo lot
Anomaly Resolution(*)[10]	Verification checking of excavated locations (analog or digital instrument)	2nd party checks open holes to determine: 90% confidence <1%[11] unresolved anomalies.[12] Accept on zero.	Rate varies depending on lot size. See Acceptance Sampling Table.[13]	Redo lot
	Verification checking by DGM remapping[14]	Same as Detection & Recovery	Rate varies depending on lot size. See Acceptance Sampling Table.	Redo lot
Geodetic Equipment Functionality(*)	All	Position offset of known/temporary control point within expected range as described in the approved work plan.[15]	Daily	Redo affected work
Geodetic Accuracy	Points used for RTK or RTS base stations	Project network must be tied to HARN, CORS, OPUS or other recognized network[16]. Project control points that are used more than once must be repeatable to within 5cm	For points used more than once, repeat occupation[17] of each point used, either monthly (for frequently used points) or before re-use (if used infrequently[18]).	Re-set points not located at original locations or resurvey point following approved work plan.

[1] These are the critical requirements for RA analog methods. Contractors shall use additional methods/frequencies that they deem beneficial and as required in their SOPs.
[2] All failures also require a Root Cause Analysis.
[3] The requirement is that each operator demonstrates positive detection on a daily basis of the smallest and largest expected MEC of interest when it is placed at both its best and worst orientations and buried between 95% and 100% of their respective maximum consistent detection depth. Maximum consistent detection depth is defined as producing any above background response on a minimum of the first three time gates of the EM61MK2 optimized for site conditions and having a 0.9m^2 size or more as calculated using the Geosoft Oasis Montaj UCEAnalyseTarget.NET or equivalent routine.
[4] Random blind reconfiguration of test strip is also required (i.e. moving/adding items) at a frequency determined by the Contractor and approved in the work plan, to address the potential for simply memorizing seed locations.
[5] Some examples of additional remedial measures are: removal of operator from mapping for one day, retesting on new blind strip meeting the same requirements for seed items (could move location of items in same area), 100% QC re-inspection of initial lanes by that operator, etc.
[6] Coverage seeds are small pieces of metal that will produce relatively large amplitude anomalies over small areas, such as small nails or ball bearings. Known location accuracy of placement is not critical. See endnote #5 for description of blind detection seeds.
[7] Detection and recovery must be consistently demonstrated for the hard to detect items; therefore, the largest expected MEC and the smallest expected MEC shall be placed between 95% and 100% of their respective maximum consistent detection depth
[8] Unresolved anomaly for ‘Detection & Recovery Testing’ means a significant signal remains without a complete rationale for its presence. Default values for such a ‘significant signal’ are peak amplitude on sum channel >=30mv & anomaly width >=1.2m or anomaly size >=0.9m^2. This value may change but must be agreed upon by the PDT up front.
[9] The statistical calculations for this test are in progress. This is different from sampling of excavated holes, in that a portion of the acreage is re-mapped, and the amount re-mapped must be statistically valid to show, to some confidence level, that anomalies did not go undetected.
[10] This requires leaving flags at excavated locations until QC is complete. If shovel called to a flag during QC then the failure has already occurred—it is not important that something large or small comes out of the hole. Assumption here is “mapping coverage” is addressed through other means. It is up to the Contractor to indicate which holes knowingly have metal left in them where the PDT has agreed such is acceptable. It is the Contractor’s responsibility to not put hot material back in the hole before QC is complete.
[11] This is a statistical test number. It does not imply there are 1% bad units. It tests there are fewer than 1% bad units, including zero bad units. Values for confidence levels will be determined by the PDT and are dependent on the information needed.
[12] Resolved is defined as 1) there is no geophysical signal remaining at the flagged/selected location, or 2) a signal remains but it is too low or too small to be associated with UXO/DMM, or 3) a signal remains but is associated with surface material which when moved results in low, or no signal at the interpreted location, or 4) a signal remains and a complete rationale for its presence exists.
[13] For example, if lot size is 500 anomalies, to achieve a 90% confidence that there are less than 5% unresolved anomalies, 44 anomalies must be re-checked. If any one of the 44 is unresolved, then the confidence level has not been met, the lot submittal fails and all anomalies in that lot must be re-checked (i.e. accept on zero). The Contractor shall propose the lot size for government concurrence (i.e. The Contractor determines the amount of risk they are willing to take. The larger the lot, the less sampling needs to be done, but the larger the risk of increased costs/rework if failure occurs.) For anomaly resolution, in order to use statistics/confidence levels, it is based on number of anomalies, not grids.
[14] Mapping shall cover the required number of anomaly locations. This is used in-lieu of checking individual anomalies for those instances where it is quicker to re-map sections of land rather than return to individual anomalies. Only the data at the anomaly locations is reviewed for resolution.
[15] Most high-accuracy systems should demonstrate repeatability between 5cm and 10cm. Typical accuracies achievable for some high-accuracy systems are: 2cm to sub-centimeter for RTK DGPS and RTS units depending on manufacturer and site conditions. Less accurate systems should demonstrate repeatability within manufacturer published ranges. Typical accuracies for less accurate systems are 5m to sub-meter for WAAS or satellite correction service DGPS units depending on manufacturer, correction service and site conditions, and 30m to 1m for USCG beacon corrected units depending on manufacturer.
[16] The plan for tying the project network to a common reference network must be described in the approved work plan. If monumentation is part of the plan, specific monumentation procedures and data quality objectives will also need to be

specified and installation of monumentation or network control points shall follow all guidance and accuracies specified in EC 1110-1-73 – “Standards and Specifications for Surveys, Maps, Engineering Drawings, and Related Spatial Data Products”.

[17] Repeat occupation means demonstrate the control points being used can be recovered and reoccupied and that they have not moved more than the requirement specification. This can be accomplished using the same methodology used to initially tie the local network to a HARN, CORS, OPUS, or other recognized network, or it can be accomplished by other means that achieve this requirement.

[18] An example of frequently used control points would be points used as RTK DGPS base stations. Infrequently used points could be those used during RTS operations where the control point was used during mapping and then again at some later time for reacquisition and QC statistical sampling. Infrequently used points could also include grid corners they are used for line and fiducial positioning and then subsequently re-used for reacquisition or QC statistical sampling.

Table 7-5 Acceptance Sampling Table for Anomaly Resolution

	Lot size = **50** anomalies	**100**	**200**	**500**	**1000**	**2000**	**5000**	**10,000**
70% confidence <**10%** unresolved[1]	11	11	12	12	12	12	12	12
80% confidence <**10%** unresolved	14	15	15	16	16	16	16	16
90% confidence <**10%** unresolved	18	20	21	22	22	22	22	22
95% confidence <**10%** unresolved	22	25	27	28	29	29	29	29
70% confidence <**5%** unresolved	17	21	23	23	24	24	24	24
80% confidence <**5%** unresolved	21	27	30	31	31	32	32	32
85% confidence <**5%** unresolved	23	31	34	36	37	37	37	37
90% confidence <**5%** unresolved[2]	27	37	41	43	44	45	45	45
95% confidence <**5%** unresolved	31	45	51	56	57	58	59	59
80% confidence <**1%** unresolved	40	80	111	138	144	154	158	159
85% confidence <**1%** unresolved	43	85	123	158	172	181	186	187
90% confidence <**1%** unresolved[3]	45	90	137	184	205	217	224	227
95% confidence <**1%** unresolved	48	95	155	225	258	277	290	294

* Gray boxes show number of dug locations to check post-excavation. All must be shown to be resolved to meet confidence values (accept on zero)

[1] Default for RIFS where MEC has been recovered.

[2] Default for RIFS where no MEC has been recovered.

[3] Default for Removal Action.

8.0 GENERAL CONDITIONS:

8.1 The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has assessed and satisfied itself as to the general and local conditions, which can affect the work or its price, including but not limited to:

- conditions bearing upon transportation, disposal, handling, and storage of materials, explosives, or scrap;

- the availability of labor, facilities, water, electric power, communications, and roads;

- uncertainties of weather, river stages, tides, or similar physical conditions at the site;

- the conformation and conditions of the ground, soil, geology, and vegetation (type, height, density), the distribution of each, and the seasonal effects on each;

- the character of equipment and facilities needed preliminary to and during work performance;

- Personal Protective Equipment (PPE) requirements including all effects on price or production due to the requirement to use PPE;

- exclusion zone requirements including all effects and prices of implementing and enforcing exclusion zones. The Contractor is responsible for evaluating, identifying the requirements of, and implementing/complying with all exclusion zones;

- responsibility for understanding and implementing the required safety and access control requirements and factoring them into its approach and price;

- the availability or price of qualified labor, material, and/or equipment;

- the availability or price of lodging for on-site personnel;

- the availability or location of explosives storage.

8.2 The Government has provided the Contractor with access to the site, which allowed the Contractor to become confident in its independent understanding of the site conditions. The Government strongly encourages prospective Contractors to use this time to perform the requisite site assessments necessary to ascertain the site conditions to a reasonable degree of accuracy The Contractor attests that the quantity and distribution of hot rocks, vegetation, terrain, soil condition, weather and other similar price drivers are reasonably ascertainable from the Contractor's research and assessment of the site in conjunction with the Contractor verified data provided by the Government. Contractors are strongly encouraged to perform this site assessment and use their experienced judgment and reasoned interpolation and extrapolation of all the available site information to assess the general and local conditions, which can affect the work or its price. Contractors who do not perform a site assessment assume the risks associated with the decision to forgo this important source of information about the site. The Contractor is expected to apply due diligence in the research and development of its proposal and to know or reasonably estimate the conditions to be encountered that will affect the price, quality, or schedule of the work included in this task order. The Government expects the Contractor to assess the risk and factor this risk into its proposal. The act of signing this task order signifies that the Contractor has been given ample opportunity to assess the conditions under which the work will be performed and the Contractor fully understands those conditions. The Contractor accepts full and sole responsibility for identifying and considering all factors that may affect the price to execute the work. The Contractor attests that it has been provided the opportunity to make an independent assessment of the site, has gathered the information necessary to fully understand the conditions it will encounter during execution of this task order, and has used any data provided by the Government at the its own risk.

8.3 Government acceptance of the proposed technical approach and/or price does not relieve the Contractor from full responsibility for the viability, productivity, and efficiency of the approach used to perform the work and for meeting the performance requirements of the PWS at the price proposed.

8.4 Use of the data provided, listed in Par 5.3, as the basis of estimate for an accurate price proposal requires an experienced understanding of how the data of this type is collected, analyzed, interpreted, and presented. The Contractor is responsible for interpreting the data provided in the context of the conditions under which the data was collected and analyzed. The Contractor is responsible for recognizing the limitations of the data provided for assessments of this type. The Contractor is strongly encouraged to use the pre-proposal site visit to field verify its interpretation of the data and assumptions made during preparation of the proposal. The Government expects that Contractors will promptly notify the Contracting Officer (KO) if they have not been given adequate opportunity to assess the site conditions.

8.5 The Contractor attests that it has had sufficient opportunity to assess the conditions of the work and has used its experienced judgment and reasoned interpolation and extrapolation of all the available site information to assess the general and local conditions, which can affect the work or its price. The Contractor attests that any exceptions to any of the conditions of this PWS were clearly marked in the proposal in bold type as “Exception to the RFP”. The Contractor certifies that its proposal is not qualified or contingent upon the site conditions.

Appendix A
Price Spreadsheet

Waikane Training Area						
				If priced per unit		
Task	*Task Name*	Task Pricing	Unit Price	Units	Number of Units	Total Price
1	Technical Project Planning	FFP		LS		
	Additional meeting	Unit Price		per meeting		
2	RI/FS Work Plan	FFP		LS		
3	GIS	FFP		LS		
3a	Optional GIS for Removal Action	FFP		LS		
4	RI/FS Field Activities	FFP		LS		
	Civil Survey	Unit Price		per acre		
	Vegetation Removal - Light	Unit Price		per acre		
	Vegetation Removal - Medium	Unit Price		per acre		
	Vegetation Removal - Heavy	Unit Price		per acre		
	Density Transect - Light Brush	Unit Price		per acre		
	Density Transect - - Medium Brush	Unit Price		per acre		
	Density Transect - - Heavy Brush	Unit Price		per acre		
	DGM Transect	Unit Price		per acre		
	DGM Grids	Unit Price		per acre		
	Analog Grids	Unit Price		per acre		
	Mob/Demob Geophysical Team	Unit Price		per mob/demob		
	Mob/Demob MEC Investigation Team	Unit Price		per mob/demob		
	Demolition Shot	Unit Price		per Demo Shot		
	Intrusive Investigation	Unit Price		per 50 anomalies		
5	Remedial Investigation Report	FFP		LS		
6	Feasibility Study Report	FFP		LS		
7	Proposed Plan	FFP		LS		
8	Decision Document	FFP		LS		
9	Community Relations Support	FFP		LS		
9a	Optional Community Relations Support for Removal Action	FFP		LS		
	Additional Meeting	Unit Price		per meeting		
	Additional meeting support w/o attendance	Unit Price		per meeting		
	Maintain Website	Unit Price		per month		
10	Public Involvement Plan	FFP		LS		
11	Administrative Record	FFP		LS		
12	Environmental Sampling & Analysis	FFP		LS		
	Sampling & analysis – Subsurface Soil	Unit Price		per 10 Samples		
	Subsurface soil in duplicate	Unit Price		per Sample		

Waikane Training Area						
				If priced per unit		
Task	***Task Name***	**Task Pricing**	**Unit Price**	**Units**	**Number of Units**	**Total Price**
	Sampling and analysis - Water	**Unit Price**		**per 10 Samples**		
	Water in duplicate	**Unit Price**		**per Sample**		
	Sampling and analysis - Sediment	**Unit Price**		**per 10 Samples**		
	Sediment in duplicate	**Unit Price**		**per Sample**		
	Multi-incremental Decision Unit	**Unit Price**		**per Unit**		
	MI DU in triplicate	**Unit Price**		**per Unit**		
	Pre & Post Detonation	**Unit Price**		**per Sample set**		
	Groundwater sampling	**Unit Price**		**per Sample**		
	Installation of monitoring well – Base Price	**Unit Price**		**per well**		
	Installation of monitoring well – Price per additional foot	**Unit Price**		**per Foot**		
	Subsurface Sampling, boring 0' - 10'	**Unit Price**		**per boring**		
	Subsurface Sampling, boring 10' - 15'	**Unit Price**		**per boring**		
	Subsurface Sampling, Hand Auger	**Unit Price**		**per sample**		
13	**Optional Removal Action Work Plan**	**FFP**		**LS**		
14	**Optional Removal Action Field Activities**	**FFP**		**LS**		
	Civil Survey	**Unit Price**		**per acre**		
	Vegetation Removal - Light	**Unit Price**		**per acre**		
	Vegetation Removal - Medium	**Unit Price**		**per acre**		
	Vegetation Removal - Heavy	**Unit Price**		**per acre**		
	DGM Grids	**Unit Price**		**per acre**		
	Analog Grids	**Unit Price**		**per acre**		
	Mob/Demob Geophysical Team	**Unit Price**		**per mob/demob**		
	Mob/Demob MEC Removal Team	**Unit Price**		**per mob/demob**		
	Demolition Shot	**Unit Price**		**per 5 Demo Shots**		
	MPPEH Removal	**Unit Price**		**per acre**		
15	**Optional Site Specific Final Report**	**FFP**		**LS**		
16	**Additional Insurance**	**FFP**		**LS**		
					TOTAL	

Appendix B

1. REQUIREMENTS AND PROCEDURES:

a. General requirements for the development and review of FUDS MMRP decision documents and action memoranda are documented in references 3a and 3b. This interim guidance provides specific requirements for MMRP.

b. Format and content of ALL MMRP decision documents and action memoranda, regardless of signature authority shall be in accordance with Section 2. Each document will contain:

(1) A title page,

(2) A table of contents,

(3) Page numbers on each page indicating page number and total number of pages in the document, e.g., "1 of 25".

(4) Header in the upper right-hand corner of each page including; document type ("Decision Document", "Time Critical Removal Actions (TCRA) Action Memorandum", or "Non-time Critical Removal Action (TCRA) Action Memorandum"), project name ("Sitka Naval Operating Base"), project location ("Sitka, Alaska"), and project number to include MRS number.

c. All decision documents or action memoranda, regardless of level of signature authority, will be accompanied by an Executive Summary that Headquarters (HQ), USACE will forward to ACSIM-ISE and DASA (ESOH). The Executive Summary shall be kept to a single page, whenever possible, and will include:

(1) Title, including project name and project number, date DD (or AM) was signed and by whom,

(2) Brief description of the Munitions Response Sites (MRS), covered by the decision,

(3) Brief description of selected response action and its relationship to other cleanup actions,

(4) Degree of risk reduction,

(5) Present worth cost of selected response action, and the contribution to the cost-to-complete of all remedies for the FUDS Property,

(6) Amounts and fiscal year(s) that funds are required for remedial/removal action design and construction,

(7) Duration of any remedial action-operation (RA-O), removal action construction (RmA-C) and/or Long Term Monitoring (LTM) actions,

(8) Land use controls (LUC) required and means of maintaining them,

(9) Other potential response actions considered, and

(10) Expected result of the action.

2.0 CONTENT

Remedial Action Decision Document
Table of Contents

Remedial Action Decision Document Outline

PART 1: THE DECLARATION

The Declaration functions as the abstract and formal authorizing signature page for the DD.

1. PROJECT NAME AND LOCATION.
2. STATEMENT OF BASIS AND PURPOSE.

   Certify the factual and legal basis for the Selected Remedy.

3. ASSESSMENT OF PROJECT MRS.

   Certify that the MRS poses a threat to public health, welfare, or the environment.

4. DESCRIPTION OF SELECTED REMEDY.

   a. Describe the major components of the Selected Remedy in a bullet fashion.

   b. Describe the scope and role of this MRS.

   c. Describe how this remedial action addresses principal threats and other contamination at the MRS (i.e., what is being treated, what is being contained, and what is the rationale for each).

5. STATUTORY DETERMINATIONS.

   a. Describe how the Selected Remedy satisfies the statutory requirements of CERCLA §121 and discuss the applicability of the 5-year review requirements.

6. DATA CERTIFICATION CHECKLIST.

   The Declaration should certify that the following information is included in the DD (or provide a brief explanation for why this information is not included):

   a. Munitions and Explosives of Concern (MEC) and munitions constituents (MC) and their respective concentrations.

   b. Baseline risk represented by the MEC/MCs.

   c. Cleanup levels established for MEC/MCs and the basis for these levels.

   d. How MEC and MC will be addressed.

   e. Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and DD.

   f. Potential land and groundwater use that will be available at the MRS as a result of the Selected Remedy.

   g. Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected.

   h. Key factor(s) that led to selecting the remedy (i.e., describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision).

7. AUTHORIZING SIGNATURE.

   The following general paragraph and signature block. (*Note: Signature block may not appear alone on a page – it must be on the same page with the preceding paragraph*):

   “This Decision Document presents the selected response action at [place]. The U.S. Army Corps of Engineers is the lead agency under the Defense Environmental Restoration Program (DERP) at the [FUDS property name]

Formerly Used Defense Site, and has developed this Decision Document consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document will be incorporated into the larger Administrative Record file for [FUDS property name], which is available for public view at [address]. This document, presenting a selected remedy with a present worth cost estimate of [$$], is approved by the undersigned, pursuant to Memorandum, DAIM-ZA, September 9, 2003, subject: Policies for Staffing and Approving Decision Documents (DDs), and to Engineer Regulation 200-3-1, Formerly Used Defense Sites (FUDS) Program Policy."

APPROVED:

(insert individual's signature block here) Date_________________________

For present worth cost estimate of $2M or less:
District Commander" Signature Block

For present worth cost estimate of more than $2M and less than or equal to $10M:
HQUSACE signature block for:
Chief, Department of Defense
Support Team
Directorate of Military Programs

For present worth cost estimate of more than $10M:
Signature block for ACSIM or DASA(ESOH) or both

PART 2: THE DECISION SUMMARY

The Decision Summary identifies the Selected Remedy, explains how the remedy fulfills statutory and regulatory requirements, and provides a substantive summary of the Administrative Record file that supports the remedy selection decision.

1. PROJECT NAME, LOCATION, AND BRIEF DESCRIPTION.
   a. Name and location.

   b. FUDS Project Number.

   c. Lead and support agencies (e.g., DoD, State, Tribes).

   d. Source of cleanup monies (e.g., ER-FUDS, ER-Army, ER-BRAC).

   e. Brief MRS description.

2. PROJECT HISTORY AND ENFORCEMENT ACTIVITIES.
   a. History of MRS activities that led to the current problems.

   b. History of federal, state, and local MRS investigations and removal and remedial actions conducted under CERCLA or other authorities.

   c. History of CERCLA enforcement activities at the MRS (e.g., results of PRP searches, issuances of special notices to PRPs).

3. COMMUNITY PARTICIPATION.

a. Describe how the public participation requirements in CERCLA and the NCP were met in the remedy selection process (e.g., community relations plans, fact sheets, public notices, public meetings, public Restoration Advisory Board).

b. Describe other community outreach and involvement efforts.

c. Describe efforts to solicit views on the reasonably anticipated future land uses and potential future land uses.

4. SCOPE AND ROLE OF RESPONSE ACTION.

a. The planned sequence of actions.

b. The scope of problems those actions will address.

c. The authorities under which each action will be/has been implemented (e.g., removal, remedial).

5. PROJECT MRS CHARACTERISTICS: (Include maps, a site plan, or other graphical presentations, as appropriate.)

a. Describe the conceptual site model (CSM) on which the risk assessment and response action are based.

b. Provide an overview of the MRS, including the following:

(1) Size of MRS (e.g., acres).

(2) Geographical and topographical information (e.g., surface waters, flood plains, wetlands).

(3) Surface and subsurface features (e.g., number and volume of tanks, lagoons, structures, and drums on-site).

(4) Areas of archaeological or historical importance.

c. Describe the sampling strategy (e.g., which media were investigated, what sampling approach was used, over what area, when was the sampling performed).

d. Describe known or suspected sources of contamination.

e. Describe types of contamination and the affected media, including the following:

(1) Types and characteristics of MEC/MCs (e.g., toxic, mobile, carcinogenic, non-carcinogenic).

(2) Quantity/volume of MEC/MC that needs to be addressed.

(3) Concentrations of MEC/MCs in each medium.

(4) RCRA hazardous wastes and affected media.

f. Describe location of contamination and known or potential routes of migration, including the following:

(1) Lateral and vertical extent of contamination.

(2) Current and potential future surface and subsurface routes of human or environmental exposure.

(3) Likelihood for migration of MEC/MCs from current location or to other media.

(4) Human and ecological populations that could be affected.

g. For MRSs with groundwater contamination, describe the following:

(1) Aquifer(s) affected or threatened by site contamination, types of geologic materials, approximate depths, whether aquifer is confined or unconfined.

(2) Groundwater flow directions within each aquifer and between aquifers and groundwater discharge locations (e.g., surface waters, wetlands, other aquifers).

(3) Interconnection between surface contamination (e.g., soils, sediments/surface water) and groundwater contamination.

(4) Confirmed or suspected presence and location of non-aqueous phase liquids.

(5) If groundwater models were used to define the fate and transport of MEC/MC, identify the model used and major model assumptions.

h. Note other site-specific factors that may affect response actions at the MRS.

6. CURRENT AND POTENTIAL FUTURE LAND AND WATER USES.

a. Land Uses.

(1) Current on-site land uses.

(2) Current adjacent/surrounding land uses.

(3) Reasonably Anticipated Future Land Uses and Basis for Future Use Assumptions (e.g., zoning maps, nearby development, 20-year development plans, dialogue with local land use planning officials and citizens, reuse assessment).

b. Groundwater and Surface Water Uses.

(1) Current groundwater and surface water uses.

(2) Potential beneficial groundwater and surface water uses (e.g. potential drinking water, irrigation) and basis for future use assumptions (e.g., Comprehensive State Groundwater Protection Plan, promulgated state classification guidelines).

(3) If beneficial use is potential drinking water source, identify the approximate time frame of projected future drinking water use (e.g., groundwater aquifer not currently used as a drinking water source but expected to be utilized in 30 to 50 years).

(4) Location of anticipated use in relation to location and anticipated migration of contamination.

7. SUMMARY OF PROJECT MRS RISKS.

a. Human Health Risks.

(1) Identify the concentrations of MEC/MC in each medium.

(2) Summarize the results of the exposure assessment.

(3) Summarize the results of the toxicity assessment for the MEC/MC.

(4) Summarize the risk characterization for both current and potential future land use scenarios and identify major assumptions and sources of uncertainty.

b. Ecological Risks.

(1) Identify the concentrations of MEC/MC in each medium.

(2) Summarize the results of the exposure assessment.

(3) Summarize the results of the ecological effects assessment.

(4) Summarize the results of the ecological risk characterization and identify major assumptions and sources of uncertainty.

c. Basis for Response Action.

(1) Clearly Present the Basis for Taking the Response Action at the Conclusion of this Section.

8. REMEDIAL ACTION OBJECTIVES.

a. Present a clear statement of the specific RAOs for the MRS (e.g., treatment of contaminated soils above health-based action levels, restoration of groundwater plume to drinking water levels, and containment of DNAPL source areas) and reference a list or table of the individual performance standards.

b. Discuss the basis and rationale for RAOs (e.g., current and reasonably anticipated future land use and potential beneficial groundwater use).

c. Explain how the RAOs address risks identified in the risk assessment (e.g., how will the risks driving the need for action be addressed by the response action?).

9. DESCRIPTION OF ALTERNATIVES: The objective of this section is to provide a brief understanding of the remedial alternatives developed for the MRS.

a. Remedy Components. Provide a bulleted list of the major components of each alternative, including but not limited to:

(1) Treatment technologies and the materials they will be used to address (e.g., principal threats).
(2) Containment components of remedy (e.g., engineering controls, cap, hydraulic barriers) and the materials they will be used to address (e.g., low concentration source materials, treatment residuals).

(3) Land use controls (and entity responsible for implementing and maintaining them).

(4) Operations and maintenance (O&M) activities required to maintain the integrity of the remedy (e.g., cap maintenance).

(5) Monitoring requirements.

b. Common Elements and Distinguishing Features of Each Alternative. Describe common elements and distinguishing features unique to each response option. Examples of these elements include:

(1) Key ARARs (or ARAR waivers) associated with each alternative (e.g., action- and/or location-specific groundwater treatment units, manifesting of hazardous waste, and regulating solid waste landfills).

(2) Long-term reliability of remedy (potential for remedy failure/replacement costs).

(3) Quantity of untreated MEC/MC to be disposed off-site or managed on-site in a containment system and degree of residual contamination remaining in such waste.

(4) Estimated time required for design and construction (i.e., implementation time frame).

(5) Estimated time to reach cleanup levels (i.e., time of operation, period of performance).

(6) Estimated capital, annual O&M, and total present worth costs, discount rate, and the number of years over which the remedy cost estimate is projected.

(7) Describe uses of presumptive remedies and/or innovative technologies.

c. Expected Outcomes of Each Alternative.

(1) Available land uses upon achieving performance standards. Note time frame to achieve performance standards (e.g., commercial or light industrial use available in 3 years when cleanup levels are achieved).

(2) Available groundwater uses upon achieving performance standards. Note time frame to achieve performance standards (e.g., restricted use for industrial purposes in technical impracticability [TI] waiver zone, drinking water use in non-TI zone upon achieving cleanup levels in 50 to 70 years).

(3) Other impacts or benefits associated with each alternative.

10. <u>COMPARATIVE ANALYSIS OF ALTERNATIVES.</u> Compare the relative performance of each alternative against the others with respect to the nine evaluation criteria (summarize in a table if appropriate).

11. <u>PRINICIPAL MEC/MC ISSUES</u>. Identify the MEC/MC issues at the MRS and discuss how the alternatives will address them.

Note: The *Statutory Determinations* section of the DD should explain whether or not the Selected Remedy satisfies the statutory preference for remedies employing treatment that reduces toxicity, mobility, or volume as a principal element. By indicating whether the principal threats will be addressed by the alternatives, this section of the *Decision Summary* should provide the basis for that statutory determination.

12. <u>SELECTED REMEDY</u>.

a. Summary of the Rationale for the Selected Remedy.

(1) Provide a concise discussion of the key factors for remedy selection.

b. Detailed Description of the Selected Remedy.

(1) Expand on the Description of the Selected Remedy from that which was provided in the Description of Alternatives section and provide a brief overview of the RAOs and performance standards.

c. Cost Estimate for the Selected Remedy.

(1) Present a detailed, activity-based breakdown of the estimated costs associated with implementing and maintaining the remedy (include estimated capital, annual O&M, and total present worth costs discount rate and the number of years over which the remedy cost estimate is projected).

d. Estimated Outcomes of Selected Remedy.

(1) Available land use(s) upon achieving cleanup levels. Note time frame to achieve available use (e.g., commercial or light industrial use available in 3 years when cleanup levels are achieved).

(2) Available groundwater use(s) upon achieving cleanup levels. Note time frame to achieve available use (e.g., restricted use for industrial purposes in TI waiver zone, drinking water use in non-TI zone upon achieving cleanup levels in 50 to 70 years).

(3) Final cleanup levels for each medium (i.e., contaminant-specific cleanup levels), basis for cleanup levels, and risk at cleanup levels (if appropriate).

(4) Anticipated socioeconomic and community revitalization impacts (e.g., increased property values, reduced water supply costs, jobs created, increased tax revenues due to redevelopment, environmental justice concerns addressed, enhanced human uses of ecological resources).

(5) Anticipated environmental and ecological benefits (e.g., restoration of sensitive ecosystems, protection of endangered species, protection of wildlife populations, wetlands restoration).

13. STATUTORY DETERMINATIONS.

a. Explain how the remedy satisfies the requirements of §121 of CERCLA to:

(1) Protect human health and the environment.

(2) Comply with ARARs, or justify a waiver.

(3) Be cost-effective.

(4) Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable (i.e., explain why the Selected Remedy represents the best option).

(5) Satisfy the preference for treatment as a principal element, or justify the selection of an alternative remedy.

b. Explain 5-year review requirements for the Selected Remedy.

14. DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN. If there are significant changes in the Selected Remedy from the Preferred Alternative:

a. Discuss the Preferred Alternative originally presented in the Proposed Plan.

b. Describe the significant changes in the Selected Remedy.

c. Explain the rationale for the changes and how they could have been reasonably anticipated based on information presented in the Proposed Plan or the Administrative Record file.

PART 3: THE RESPONSIVENESS SUMMARY

The Responsiveness Summary serves the dual purposes of: (1) presenting stakeholder concerns about the MRS and preferences regarding the remedial alternatives; and (2) explaining how those concerns were addressed and the preferences were factored into the remedy selection process. This discussion should cross-reference sections of the Decision Summary that demonstrate how issues raised by the community have been addressed.

1. STAKEHOLDER ISSUES AND LEAD AGENCY RESPONSES: Summarize and respond concisely to issues raised by stakeholders.

2. TECHNICAL AND LEGAL ISSUES: Expand on technical and legal issues, if necessary

APPENDIX J
UNIFORM FEDERAL POLICY FOR QUALITY ASSURANCE PLANS (UFP-QAPP)

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Final Quality Assurance Project Plan (QAPP)

Remedial Investigation - Feasibility Study (RI/FS)

Former Waikane Training Area
Project Number: H09HI0354

Contract: W912DY-04-D-0007
Task Order: 0025

Prepared for:

US Army Engineering and Support Center, Huntsville

and

US Army Corps of Engineers, Pacific District

by:

ZAPATA
TRUST · INTEGRITY · QUALITY

March 2011

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TABLE OF CONTENTS

QAPP Worksheet #1
(UFP-QAPP Section 2.1)
Title and Approval Page

Site Name/Project Name: Waikane Training Area RI/FS
Site Location: Oahu, Hawaii

Document Title: Remedial Investigation, Munitions Constituents, Sampling and Analysis Plan

Lead Organization: US Army Corps of Engineers, Pacific Division, Hawaii District (CEPOH)

Preparer's Name and Organizational Affiliation: Zapata Incorporated (ZAPATA)

Preparer's Address, Telephone Number, and E-mail Address: 6302 Fairview Road, Suite 600, Charlotte, North Carolina 28210, (704) 358-8240, zapata@zapatainc.com

Preparation Date (Day/Month/Year): 03/02/11

Investigative Organization's Project Manager/Date: ______________________________
Signature
Printed Name/Organization: David Wolf/Zapata Incorporated

Investigative Organization's Project QA Officer/Date: ____________________________
Signature
Printed Name/Organization: Suzy Cantor-McKinney/Zapata Incorporated

Lead Organization's Project Manager/Date: ____________________________________
Signature
Printed Name/Organization: Walter Nagai/CEPOH

Approval Signatures/Date: ____
Signature
Printed Name/Title: Becky Terry/USAESCH Project Manager

Approval Authority: United State Army Corps of Engineers

Other Approval Signatures/Date: ____
Signature
Printed Name/Title: Kim Meacham/USAESCH Technical Manager

Document Control Numbering System:____

QAPP Worksheet #2
(UFP-QAPP Section 2.2.4)
QAPP Identifying Information

Site Name/Project Name: Waikane Training Area RI/FS
Site Location: Oahu, Hawaii
Site Number/Code: H09HI0354
Operable Unit: Waikane Training Area
Contractor Name: Zapata Incorporated (ZAPATA)
Contractor Number: W912DY-04-D-0007

Title: Waikane RI/FS Draft QAPP
Revision Number: 0
Revision Date: 03/02/11
Page 3 of 63

Contract Title: Munitions Response Contract for Worldwide Sites
Work Assignment Number: 0025

1. Identify regulatory program: Defense Environmental Restoration Program in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Sections 104 and 121; Executive Order 12580; and the National Oil and Hazardous Substances Pollution contingency Plan (NCP).

2. Identify approval entity: US Army Engineering and Support Center, Huntsville

3. The QAPP is (select one): ☐Generic ☒Project Specific

4. List dates of scoping sessions that were held: In-Progress Draft RI/FS SAP (Worksheets#10, #11, #15, and #17) Technical Project Planning Meeting with State of Hawaii Department of Health (DOH), October 28, 2009

5. List dates and titles of QAPP documents written for previous site work, if applicable:

Title	Approval Date
None	

6. List organizational partners (stakeholders) and connection with lead organization:
US Army Corps of Engineers, Pacific Division, Hawaii District (CEPOH), Lead Organization;
US Army Engineering and Support Center, Huntsville (USAESCH), Center of Expertise
Hawaii Department of Health (HDOH), State Regulatory Agency;
Zapata Incorporated (ZAPATA), USAESCH Prime Contractor;
Wil Chee-Planning, Environmental Services, Subcontractor
Accutest, Laboratory Services Subcontractor;
TestAmerica, Laboratory Services Subcontractor;
HSW Engineering, Inc., Data Validation Subcontractor; and
Black & Veatch, Risk Assessment Subcontractor

7. List data users:
US Army Corps of Engineers, Pacific Division, Hawaii District (CEPOH), Lead Organization;
US Army Engineering and Support Center, Huntsville (USAESCH), Center of Expertise
Hawaii Department of Health (HDOH), State Regulatory Agency;
Zapata Incorporated (ZAPATA), USAESCH Prime Contractor;
Wil Chee-Planning, Environmental Services, Subcontractor
Black & Veatch, Risk Assessment Subcontractor

8. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusions below:
All QAPP elements are applicable to this project.

QAPP Worksheet #2
QAPP Identifying Information
(continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Related Documents
Project Management and Objectives		
2.1 Title and Approval Page	- Title and Approval Page	
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information	
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	- Distribution List - Project Personnel Sign-Off Sheet	
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications Table - Special Personnel Training Requirements Table	
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	- Project Planning Session Documentation (including Data Needs tables) - Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background - Site Maps (historical and present)	
2.6 Project Quality Objectives and Measurement Performance Criteria 2.6.1 Development of Project Quality Objectives Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific PQOs - Measurement Performance Criteria Table	

QAPP Worksheet #2
QAPP Identifying Information
(continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Related Documents
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table	
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	- Summary of Project Tasks - Reference Limits and Evaluation Table - Project Schedule/Timeline Table	
Measurement/Data Acquisition		
3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Collection Procedures 3.1.2.2 Sample Containers, Volume, and Preservation 3.1.2.3 Equipment/Sample Containers Cleaning and Decontamination Procedures 3.1.2.3 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures 3.1.2.4 Supply Inspection and Acceptance Procedures 3.1.2.6 Field Documentation Procedures	- Sampling Design and Rationale - Sample Location Map - Sampling Locations and Methods/SOP Requirements Table - Analytical Methods/SOP Requirements Table - Field Quality Control Sample Summary Table - Sampling SOPs - Project Sampling SOP References Table - Field Equipment Calibration, Maintenance, Testing, and Inspection Table	
3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures	- Analytical SOPs - Analytical SOP References Table - Analytical Instrument Calibration Table - Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	

QAPP Worksheet #2
QAPP Identifying Information
(continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Required Documents
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures 3.3.1 Sample Collection Documentation 3.3.2 Sample Handling and Tracking System 3.3.3 Sample Custody	- Sample Collection Documentation Handling, Tracking, and Custody SOPs - Sample Container Identification - Sample Handling Flow Diagram - Example Chain-of-Custody Form and Seal	
3.4 Quality Control Samples 3.4.1 Sampling Quality Control Samples 3.4.2 Analytical Quality Control Samples	- QC Samples Table - Screening/Confirmatory Analysis Decision Tree	
3.5 Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	- Project Documents and Records Table - Analytical Services Table - Data Management SOPs	
Assessment/Oversight		
4.1 Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses	- Assessments and Response Actions - Planned Project Assessments Table - Audit Checklists - Assessment Findings and Corrective Action Responses Table	
4.2 QA Management Reports	- QA Management Reports Table	
4.3 Final Project Report		

QAPP Worksheet #2
QAPP Identifying Information
(continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Related Documents
Data Review		
5.1 Overview		
5.2 Data Review Steps 5.2.1 Step I: Verification 5.2.2 Step II: Validation 5.2.2.1 Step IIa Validation Activities 5.2.2.2 Step IIb Validation Activities 5.2.3 Step III: Usability Assessment 5.2.3.1 Data Limitations and Actions from Usability Assessment 5.2.3.2 Activities	- Verification (Step I) Process Table - Validation (Steps IIa and IIb) Process Table - Validation (Steps IIa and IIb) Summary Table - Usability Assessment	
5.3 Streamlining Data Review 5.3.1 Data Review Steps To Be Streamlined 5.3.2 Criteria for Streamlining Data Review 5.3.3 Amounts and Types of Data Appropriate for Streamlining		

QAPP Worksheet #3
(UFP-QAPP Manual Section 2.3.1)

☐ Worksheet Not Applicable (State Reason)

Distribution List

QAPP Recipients	Title	Organization	Telephone Number	Fax Number	E-mail Address	Document Control Number
Walter Nagai (four copies)	Project Manager	CEPOH	(808) 438-0470	(808) 438-6930	Walter.T.Nagai@usace.army.mil	
Becky Terry (six copies)	Project Manager	USAESCH	(256) 895-1788	(256) 895-1378	rebecca.k.terry@usace.army.mil	
Derek Yasaka	Senior Environmental Scientist	Wil Chee-Planning & Environmental	(808) 596-4688	(808) 597-1851	dyasaka@wcphawaii.com	
Jim Eldridge	Risk Assessor	Black & Veatch	(206) 852-4168	(425) 487-2170	eldridgejc@bv.com	
Sue Bell	Primary Lab Project Manager	Accutest Labs	(813) 741-3338	(813) 741-9137	sueb@accutest.com	
Debra Henderer	QA Lab Project Manager	TestAmerica Labs	(303) 736-0138	(303) 431-7171	Debra.Henderer@testamericainc.com	
Cindy Lee Westergard	Data Validator	HSW Engineering	(813) 968-7722	(813) 962-2406	cwestergard@hsweng.com	

QAPP Worksheet #4 (UFP-QAPP Manual Section 2.3.2)

☐ Worksheet Not Applicable (State Reason)

Project Personnel Sign-Off Sheet

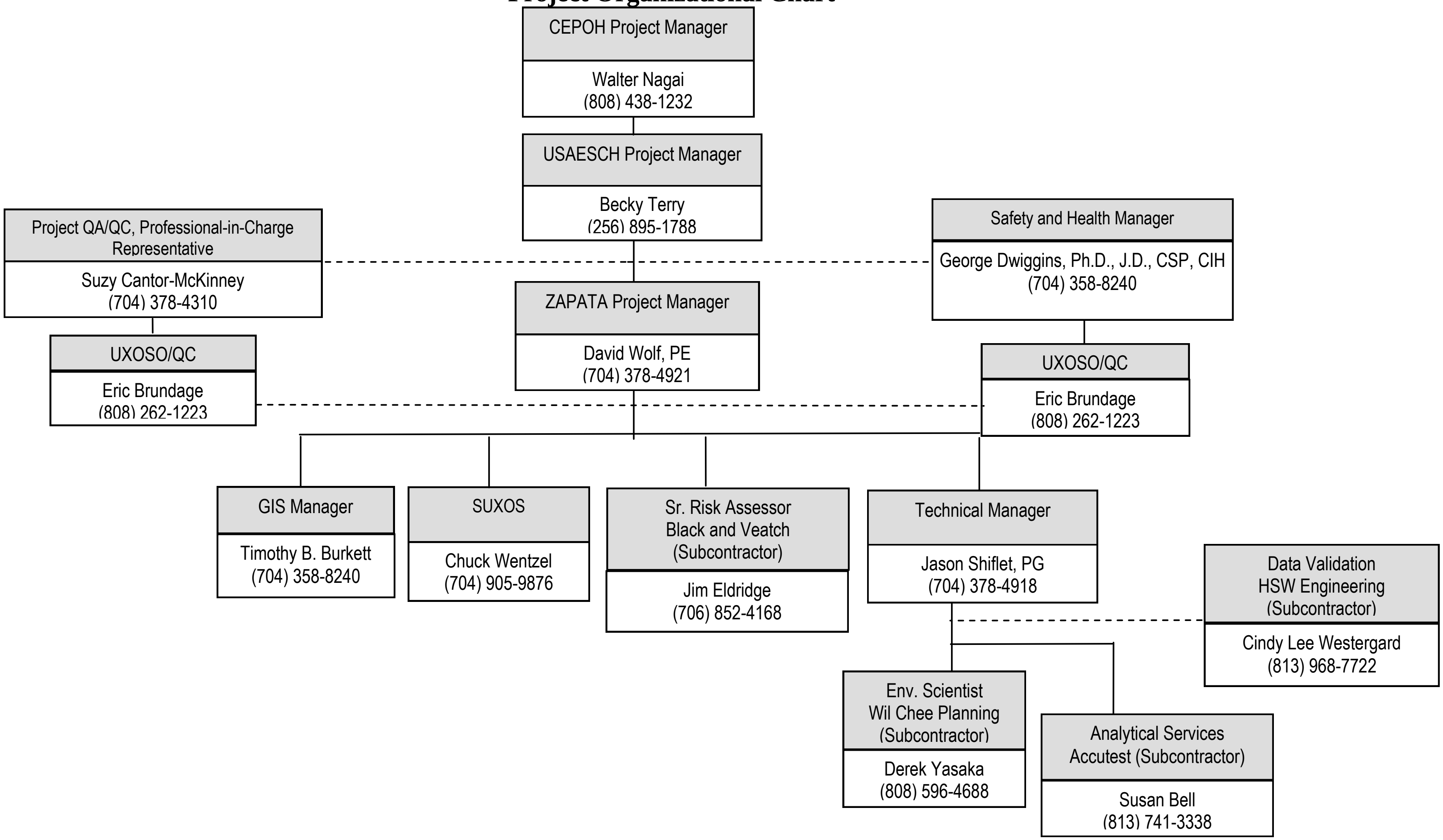
Organization: Zapata Incorporated Team

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Walter Nagai	Project Manager	(808) 438-1232		
Becky Terry	Project Manager	(256) 895-1788		
Michael Winningham	Program Manager	(704) 378-4935		
David Wolf, PE	Project Manager	(704) 378-4921		
Chuck Wentzel	Senior UXO Supervisor	(704) 378-4931		
Eric Brundage	UXO Safety/Quality Control Officer	(808) 262-1223		
Suzy Cantor-McKinney	Professional-in-Charge/Quality Manager	(704) 378-4910		
Timothy Burkett, GISP	GIS Manager	(704) 378-4932		
Derek Yasaka	Senior Environmental Scientist	(808) 596-4688		
Christin Shacat	Project Geologist	(808) 596-4688		
Jim Eldrdige	Risk Assessor	(206) 852-4168		
Sue Bell	Primary Lab Project Manager	(813) 741-3338		
Debra Henderer	QA Lab Project Manager	(303) 736-0138		
Cindy Lee Westergard	Data Validator	(813) 968-7722		

QAPP Worksheet #5
(UFP-QAPP Manual Section 2.4.1)

☐ Worksheet Not Applicable (State Reason)

Project Organizational Chart



QAPP Worksheet #6
(UFP-QAPP Manual Section 2.4.2)

☐ Worksheet Not Applicable (State Reason)

Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Overall Project Implementation	CEPOH Project Manager	Walter Nagai	(808) 438-1232	Primary point of contact for the USAESCH and responsible for all direct communications with the regulatory agencies and other stakeholders.
Approval of Amendments to the SAP	USAESCH Project Manager	Becky Terry	(256) 895-1788	Per Worksheet #1 herein, amendments to the SAP will be submitted for approval prior to implementation.
Modification of the QAPP	ZAPATA Project Manager	David Wolf	(704) 378-4921	Suggested modifications to the SAP will be evaluated by ZAPATA's Project Manager. If required, the SAP will be modified and submitted for approval.
Delays in Site Activities	ZAPATA SUXOS	Chuck Wentzel	(704) 378-4931	Delays in site activities will be reported to ZAPATA's Project Manager. ZAPATA's Project Manager will notify the USAESCH and CEPOH Project Managers.
Notification of delays or changes in field work, or issues affecting sample integrity	Field Manager and Project Geologist, Wil Chee - Planning, Inc.	Clayton Sugimoto, Christin Shacat	(808) 596-4688	Clayton Sugimoto and Christin Shacat act as the liaisons between the subcontractors and ZAPATA's Project Manager will be notified of delays, changes, or any other issue affecting field work or sampling within 24 hours.
Deviations from QAPP	ZAPATA Quality Officer	Suzy Cantor-McKinney	(704) 378-4910	Deviations from the SAP will be documented in writing. ZAPATA's Quality Officer will notify ZAPATA's Project Manager, who will in turn notify the USAESCH Project Manager.
Stop Work/Corrective Actions	All Site Personnel	Various	Various	For safety or quality related reasons, all site personnel have the authority to temporarily stop work until an issue can be resolved. ZAPATA personnel will notify the ZAPATA Project Manager, who will then notify the USAESCH Project Manager. ZAPATA PM will document, in writing, the work stoppage.
Data Collection and Data Quality Challenges	ZAPATA Quality Officer	Suzy Cantor-McKinney	(704) 378-4910	ZAPATA's Quality Officer will document the data collection and/or data quality challenges in writing and notify ZAPATA's Project Manager.

Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Analytical Data Results	Accutest Project Manager	Sue Bell	(407) 425-6700	Analytical data will be provided to HSW Engineering as ADR Stage 2a electronic data deliverables (SEDD 2a) for data validation. The analytical data also will be provided to HSW as EPA Level IV data packages, either in pdf or hard copy format.
Analytical Data Results	TestAmerica Project Manager	Debra Henderer	(303) 736-0134	Analytical data will be provided to the USAESCH Chemist as ADR Stage 2a electronic data deliverables (SEDD 2a) for evaluation/data validation. The analytical data also will be provided to USAESCH as EPA Level IV data packages, either in pdf or hard copy format.
Analytical Data Validation	HSW Project Manager	Cindy Lee Westergard	(813) 968-7722	Analytical data will be validated using ADR automated data review software, with reference to the pdf / hard copy reports as needed. Validated results will be provided to ZAPATA's Project Manager.
Analytical Data Validation/Evaluation	USAESCH Chemist	Michael D'Auben	(256) 895-1460	Analytical data may be validated/evaluated using ADR automated data review software, with reference to the pdf / hard copy reports as needed. Validated results and or QA summary may be provided to ZAPATA's Project Manager for inclusion in the final report.
Release of Analytical Data	CEPOH Project Manager	Walter Nagai	(808) 438-1232	Analytical data will be submitted in the RI report. Following USAESCH approval, the data will be provided to the public by releasing the RI report.

QAPP Worksheet #7
(UFP-QAPP Manual Section 2.4.3)

☐ Worksheet Not Applicable (State Reason)

Personnel Responsibilities Table

Name	Title	Organizational Affiliation	Responsibilities
Walter Nagai	Project Manager	CEPOH	Perform project management for the Department of Defense. Ensure project requirements are met. Oversee project b udget and schedule. Provide direction to ZAPATA. Communicate directly with regulatory agencies and stakeholders.
TBD	Contracting Officer	USAESCH	Provide contractual guidance for ZAPATA.
Becky Terry	Project Manager	USAESCH	Performs project management for USAESCH. Ensure project requirements are met. Oversee project schedule and budget. Provide direction to ZAPATA. Communicate directly with CEPOH.
Kim Meacham, PE	Technical Manager	USAESCH	Provide technical oversight for project requirements. Provide direction to ZAPATA. Monitoring ZAPATA's performance. Evaluate and approve project deliverables.
David Wolf, PE	Project Manager	ZAPATA	Perform project management for ZAPATA. Ensure project requirements are met. Oversee project budget and schedule. Provide direction to ZAPATA subcontractors. Communicate directly with the USAESCH.
Suzy Cantor-McKinney	Quality Manager	ZAPATA	Ensure all project deliverables meet project quality objectives as defined herein.
Derek Yasaka	Senior Environmental Scientist	Wil Chee-Planning and Environmental	Oversee all environmental site activities, including data collection and reporting.
Clayton Sugimoto	Field Manager	Wil Chee-Planning and Environmental	Directs and oversees field sampling efforts, maintains field logbook, identifies problems or non-conformance.
Christin Shacat	Project Geologist	Wil Chee-Planning and Environmental	Assist in SAP preparation. Perform onsite QC and assist in data analysis for RI/FS Report

Personnel Responsibilities Table

Name	Title	Organizational Affiliation	Responsibilities
			preparation.
Chuck Wentzel	Senior UXO Supervisor	ZAPATA	Oversee all munitions related activities. Oversee fieldwork activities.
Eric Brundage	UXO Safety Officer	ZAPATA	Oversee safety aspects of fieldwork activities. Conduct daily safety briefings. Complete daily safety reports. Communicate directly with ZAPATA Corporate Safety Officer and Project Manager.
Sue Bell	Primary Lab Project Manager	Accutest	Oversee chemical analytical services. Provide chemical analytical results to data validation subcontractor. Communicate directly with data validator and ZAPATA Project Manager.
Debra Henderer	QA Lab Project Manager	TestAmerica	Oversee chemical analytical services. Provide chemical analytical results to USAESCH for data validation. Communicate directly with USAESCH.
Cindy Lee Westergard	Data Validator	HSW Engineering, Inc.	Perform data validation services for analytical data. Generate the Quality Control Summary Report. Communicate directly with analytical laboratory and ZAPATA Project Manager.
Jim Eldridge	Risk Assessor	Black & Veatch	Oversee risk assessment tasks in support of ZAPATA. Communicate directly with ZAPATA Project Manager.

QAPP Worksheet #8
(UFP-QAPP Manual Section 2.4.4)

☐ Worksheet Not Applicable (State Reason)

Special Personnel Training Requirements Table

Project Function	Specialized Training – Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
Project Safety	Adult CPR	American Red Cross	Various	All Field Personnel and Project Manager	All Field Personnel and Project Manager	ZAPATA Human Resources files at corporate office. Copies maintained in the field during site activities.
Project Safety	Adult First Aid	American Red Cross	Various	All Field Personnel and Project Manager	All Field Personnel and Project Manager	See above
Project Safety	Certified Industrial Hygienist Certified Safety Professional	ABIH BCSP	1982 2008	George Dwiggins, Ph.D., CIH, CSP	Corporate Safety Officer	See above
Project Safety	Explosives and Ordnance Disposal	US Navy US Navy	1977 1980	Chuck Wentzel Eric Bundage	SUXOS UXO SO/QC	See above
Hazard Awareness	OSHA HAZWOPER 40-Hr. and 8-Hr.	Various	Various	All Field Personnel and Project Manager	All Field Personnel and Project Manager	See above
Hazard Awareness	OSHA HAZWOPER Supervisor Training	Various	Various	PM, SUXOS, UXO SO/QC	PM, SUXOS, UXO SO/QC	See above

QAPP Worksheet #9
(UFP-QAPP Manual Section 2.5.1)

☐ Worksheet Not Applicable (State Reason)

	NAME	Title	AFFILIATION	TEL. NO	E-MAIL	Role
1	Dan Nakamura	Program Manager	CEPOH	808-438-0467	dan.a.nakamura@usace.army.mil	Program Manager
2	Walter Nagai	Project Manager	CEPOH	808-438-0470	walter.t.nagai@usace.army.mil	Project Manager
3	Steven Mow	Project Manager	HDOH-HEER	808-586-4251	steven.mow@doh.hawaii.gov	Project Manager
4	Kim Meacham	Technical Manager	USAESCH	256-895-1667	Kim.K.Meacham@usace.army.mil	Technical Manager
5	Debra Edwards	Geophysicist	USAESCH	256-895-1628	Debra.L.Edwards@usace.army.mil	Geophysicist
6	Michael Winningham	Program Manager	Zapata	707-647-7707	MWinningham@zapatainc.com	Program Manager
7	Eric Brundage	General Manager, Pacific Division	Zapata	808-262-1223	ebrundage@zapatainc.com	UXO SO
8	David Wolf	Project Manager	Zapata	704-378-4921	dwolf@zapatainc.com	Project Manager
9	Michael Mullen	UXO SO	CEPOH	808-438-0860	Michael.K.Mullen@usace.army.mil	UXO SO
10	Hal Hammatt	Principal Archaeologist	Cultural Surveys Hawaii	808-262-9972	hhammatt@culturalsurveys.com	Archelogy Oversight
11	David Shideler	Supervising Archaeologist	Cultural Surveys Hawaii	808-262-9972	dshideler@culturalsurveys.com	Archelogy Oversight
12	Alex Hazlett	Archaeologist	Cultural Surveys Hawaii	808-262-9972	ahazlett@culturalsurveys.com	Archaeologist
13	Clayton Sugimoto	Environmental Scientist	Wil Chee - Planning, Inc.	808-596-4688	csugimoto@wcphawaii.com	Environmental Scientist
14	Becky Terry (via Conference Call)	Project Manager	USAESCH	(256) 895-1788	Rebecca.K.Terry@usace.army.mil	Project Manager
15	Jim Eldridge (via Conference Call)	Risk Assessor	Black & Veatch	(206) 852-4168	EldridgeJC@bv.com	Risk Assessor
16	Cindy Lee Westergard (via Conference Call)	Data Validator	HSW Engineering	813-968-7722	cwestergard@hsweng.com	Data Validator

Comments/Decisions: Please see TPP Memorandum, Appendix I to the Work Plan
Action Items: Please see TPP Memorandum, Appendix I to the Work Plan
Consensus Decisions: Please see TPP Memorandum, Appendix I to the Work Plan

QAPP Worksheet #10
(UFP-QAPP Manual Section 2.5.2)

☐ Worksheet Not Applicable (State Reason)

Problem Definition

The problem to be addressed by the project: The Waikane Training Area was used by the U.S. Army between 1942 and 1976 as a training and artillery impact area. In 1942, the Department of the Army entered into a lease agreement with Lincoln L. McCandless heirs and the Waiahole Water Company, Ltd. This lease established the right to use approximately 1,061 acres in Waikane Valley for advanced offensive warfare training due to the valley's geographical location and terrain. Authorization for the Army to use Waikane Valley continued until July 1953, when the Marine Corps was substituted as lessee. Of the 1,061 acres, only 874 are considered eligible under DERP-FUDS. The Marine Corps property, consisting of 187 acres formerly known as the Kamaka parcel, will not be investigated under this RI/FS. The most prevalent Munitions and Explosives of Concern (MEC) items found to date are 75mm projectiles and 60mm mortars. Other MEC/Munitions Debris (MD) found onsite includes 37mm projectiles, rifle grenades, 81mm mortars, 2.36-inch and 3.5-inch rockets, hand grenades, smoke grenades, flares, and projectile fragmentation. Abundant small arms have also been found. The objective of this project is to delineate the nature and extent of MEC and their associated Munitions Constituents (MC). This RI/FS will address three munitions response sites (MRS) within the Waikane Training Area. The MRSs were selected based on the EE/CA Report and Action Memorandum. The RI/FS process is intended to achieve close-out of these individual areas only. Expansion of one or more of the MRSs may be required to achieve site close-out. The three MRSs are: • Southeastern Region MRS (RMIS ID: H09HI035401R01-1) • Southeastern Region Expansion and Stream Characterization Area • Southern Impact Region MRS (RMIS ID: H09HI035402R02-2) • Western/Mountainous Region MRS (RMIS ID: H09HI035402R03-3)
The environmental questions being asked: The objective of the RI/FS is to determine the nature and extent of selected metals (copper and lead), explosives and perchlorate present at the designated MRS. To address this objective, ZAPATA will conduct multi-increment soil (MIS) sampling in accordance with HEER Interim Final Guidance on Incremental Soil Sampling dated June 2009. MIS will be conducted in 100-ft x 100-ft decision units (DUs) placed in areas thought to constitute former target locations and ranges, based on confirmation from historical photographic analysis, and from analysis of MEC characterization data. Samples will be collected from areas where there is evidence of MEC. A total of thirty-six DUs will be placed over the three MRSs. The MIS samples will be analyzed for explosives constituents (including PETN and nitroglycerine), selected metals (copper and lead). In addition to MIS sampling, discrete soil, sediment, and surface water samples will be collected from across the site and sampled for selected metals (copper and lead). Also, if existing groundwater wells are in use, groundwater may be sample and analyzed for perchlorate.

Observations from any site reconnaissance reports: Waikane Valley was formerly used as a training and artillery impact area from 1942 to 1976. Due to its geographic location and rugged terrain, Waikane Valley was utilized for advanced training in offensive warfare and air-to-ground practice bombing during World War II. Per its lease, the Marine Corps (USMC) was authorized continued use of Waikane Valley as a training area from 1953 to 1976. However, due to its potential as a fire hazard, no tracer ammunition or incendiary shells were to be used at any time on the leased premises, and all weapons in excess of .50-caliber were to be fired into the designated impact areas. Inventory Project Report (INPR) 1996 and Supplement 2004 The INPR was approved in 1996 and INPR Supplement in 2004. This document established the Waikane Training Area as a FUDS, established a site boundary, defined the past usage, and assigned Project No. H09HI0354. Based on the historic use of the site, the INPR recommended further action. 1976 and 1984 Surface Clearance Two EOD sweeps of artillery impact areas which occurred August 1976 and February to April 1984 recovered as much as 40,000 pounds of demilitarized practice ordnance as well as 37- and 75-mm high explosive (HE) rounds, 60-mm mortars, 2.36- and 3.5-inch high explosive anti-tank (HEAT) rockets, M28 HEAT grenades, and M9A1 anti-tank (AT) rifle grenades, which were summarily destroyed. The 1976 clearance focused on the FUDS property and the USMC property. The 1984 clearance primarily focused USMC property. 1990 Archeological Survey An archaeological survey was conducted south and west of the USMC property after the EOD sweeps revealed the continued presence of dud rounds as mortars and grenades. Three UXO items were identified in Southern Impact Region MRS. The Southern Impact Region MRS can be seen in Figure 1, Appendix B of the Work Plan. 2006 Engineering Evaluation/Cost Analysis An Engineering Evaluation / Cost Analysis (EE/CA) was conducted in 2006 within the 874-acre FUDS portion of Waikane Valley to evaluate MEC risks. During the EE/CA, 150 grids (100 ft by 100 ft) and nine miles of transects were investigated. Seven MEC items were recovered: two 81mm HE mortar rounds, three 60mm HE mortar rounds, and two 37mm HE projectiles. All of the MEC items were recovered in the southeastern portion of the FUDS site, which adjoins the southern boundary of the USMC property. There were 172 MD items found and abundant evidence of HE ordnance usage, as projectile fragmentation, fuze pieces, tail fins, base plates, and other munitions debris (MD) were located throughout the valley. Most of the area was also apparently used for foot maneuvering evident by the significant amount of small arms throughout the valley. USMC 2008 Site Inspection In 2008, Naval Facilities Engineering Command, Pacific (NAVFAC PAC) conducted a site inspection at the USMC property. A reconnaissance survey was conducted over 9.55 acres of transects and 5.2 acres within 42 grids to evaluate the presence of MEC, MC, or other munitions-related items. The soil sampling team collected 35 composite samples in the lower elevations of the site and 10 discrete samples at locations where MEC items had been found. Samples were analyzed for select metals and for explosives. Four target areas were identified as Areas of Concern (AOC). Seventy MEC items were found including 66 3.5-inch HEAT rockets, one 2.36-inch HEAT rocket, and three HEAT rifle grenades. Copper and lead were elevated above project PALs in four soil samples; the elevated metals are believed to be related to high concentrations of munitions debris at the four AOCs where the samples were collected. 2008 Abbreviated Site Investigation An abbreviated Site Investigation (SI) was conducted in 2008 by USACE, Honolulu District focusing on the FUDS property. The sampling team collected two multi-incremental soil samples in areas where MEC had been found during the EE/CA, and collected two collocated surface water and sediment samples from the Waikane Stream down stream of where MEC was found. The samples were analyzed for TAL metals and explosives. Resulting contaminants of potential concern (COPC) identified in the SI were chromium, iron, vanadium, cobalt, mercury, and RDX.
A synopsis of secondary data or information from site reports: See above.
The possible classes of contaminants and the affected matrices: Selected metals (copper and lead) and explosives may be present in soil, sediment, groundwater and surface water. Perchlorate may also be present in surficial groundwater.
The rationale for inclusion of chemical and nonchemical analyses: ZAPATA will use EPA Method 6020A (for metals in aqueous samples), 6010C (for metals in soils) and 8330A and 8330B (for explosives) to evaluate the media described above. If necessary, ZAPATA will used EPA Method 6850 for perchlorate. Munitions Constituents were identified and discussed during the TPP process. Select metals (Pb and Cu) were chosen for analysis based on knowledge of munitions used onsite and a review of the Munitions Items Disposition Action System (MIDAS).
Information concerning various environmental indicators: Based on munitions used at the site, Munitions Constituents for environmental sampling are a copper (Cu) lead (Pb) and 8330B/8330A explosives including Pentaerythritol Tetranitrate (PETN), Nitroglycerin (NG) and perchlorate (if applicable).

Project decision conditions ("If..., then..." statements):

Numerous statistical methods may be appropriate for processing the data collected at Waikane. The method selected depends on such things as number of samples, distribution of the data, and percent of samples with values reported as less than method detection limit or reporting limit. To simplify this process, the EPA offers a statistical package known as the Pro UCL Calculator. ZAPATA obtained the Pro UCL Calculator v4.00.04, from the Technical Support Center for Monitoring and Site Characterization Section of the EPA website (http://www.epa.gov/esd/tsc/TSC_form.htm). Following the calculation of summary statistics and upper confidence limit of the background data during the preliminary data analysis, ZAPATA will perform a comparative analysis of results from the site and background data. ZAPATA referred to two USEPA documents – Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites (USEPA, 2002) and Data Quality Assessment: Statistical Methods for Practitioners, QA/GS-9 (USEPA, 2006) – for statistical guidance. For purposes of this work, background refers to concentrations not impacted from potential site-specific releases. An outlier test will be used to identify potential data outliers; those samples will be removed from further statistical analysis to prevent distortion of the statistical results. Chemical analytical results will be processed using Pro UCL v4.00.04. Data will be tabulated into a single column and partitioned, if necessary. Laboratory qualifier codes J and U will be used in the adjacent column to signify an estimated value or value below detection, respectively. For analytical results reported below the reporting limit, a value of one half of the method detection limit will be substituted into the table for calculation.

A statistical hypothesis is a statement that may be supported or rejected by examining relevant data. A null hypothesis (H_0) is any testable presumption set up to be rejected. An alternative hypothesis (H_A) is the logical opposite of the null hypothesis. When analyzing data, stakeholders must establish the level of precision required of the data. Because of uncertainties that result from sampling variation, decisions made using hypothesis tests will be subject to errors. There are two ways to err when analyzing data:

- Type I Error – Based on the observed data, the test may reject the null hypothesis when in fact the null hypothesis is true (false positive). The probability of making a Type I error is designated alpha (α).
- Type II Error – Based on the observed data, the test may fail to reject the null hypothesis when the null hypothesis is in fact false (false negative). The probability of making a Type II error is designated beta (β).

The acceptable level of decision error associated with hypothesis testing is defined by two key parameters; confidence level and power. These parameters are closely related to the two error probabilities α and β.

- Confidence level $100(1-\alpha)\%$ - As the confidence level is lowered, the likelihood of committing a Type I error increases.
- Power $100(1-\beta)\%$ - As the power is lowered, the likelihood of committing a Type II error increases.

EPA (USEPA, 2002) recommends minimum performance measures for Background Test Form 2 of confidence level greater than or equal to 90% ($\alpha = 0.10$) and power greater than or equal to 80% ($\beta = 0.20$). ZAPATA will determine the appropriate test for statistical analysis to allow for an evaluation of the difference in means between the site and background samples following the preliminary data analysis. The specific hypotheses to be used in the test are as follows (USEPA, 2002):

- The null hypothesis (H_0) is that the mean contaminant concentration in samples (μ_s) from the site is not different from the mean concentration in samples (μ_b) from background areas. (H_0: $\mu_s - \mu_b = 0$)
- The alternative hypothesis (H_A) is that the mean contaminant concentration in samples (μ_s) from the site is different from the mean concentration in samples (μ_b) from background areas. (H_A: $\mu_s - \mu_b > 0$)

If the null hypothesis is rejected, it can be concluded with statistical significance that the mean of the site contaminant concentration is different from the mean of the background contaminant concentration (i.e., the site and background mean are not similar). If the null hypothesis not rejected, it can be assumed that the mean contaminant concentration from the site is not different from the mean contaminant concentration of background. When testing the data, the lower the confidence limit, the more likely this test is to find that the site's mean contaminant concentrations are not different from the background mean contaminant concentrations. Choosing the rejection range for the hypothesis involves balancing both kinds of error (Type I and II). In general, EPA (USEPA, 2002) recommends a minimum confidence limit of 80% and a maximum confidence limit of 95%. These hypothesis will be tested at the 95% confidence level ($\alpha = 0.05$).

If chemical analytical results are detected above background concentrations, then those results will be compared to appropriate risk-based screening levels. The risk assessment process is provided in Section 3.12 of the Work Plan.

If chemical analytical results are detected above threshold criteria, then further sampling may be required to delineate the nature and extent of the contaminant.

QAPP Worksheet #11
(UFP-QAPP Manual Section 2.6.1)

☐ Worksheet Not Applicable (State Reason)

Project Quality Objectives /Systematic Planning Process Statements

Who will use the data? Data will be used by ZAPATA, the Risk Assessor (Black & Veatch), the USACE, and HDOH.
What will the data be used for? ZAPATA will use the data to determine the nature and extent of selected metals and explosives and to conduct human health and ecological risk assessments at each MRS. The USACE will use the data to determine potential site-specific follow on activities. The HDOH will use the data to assess potential human and ecological impacts of the former military activity.
What type of data are needed? (target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques) Representative sampling locations will be selected following the geophysical survey (and analog) activities. Samples will be collected using standard protocols for sample collection, handling, and shipping. The laboratory will produce Level IV data packages for all analytical samples. Parameters and analytical methods are identified in Worksheets #15 and #19.
How “good” do the data need to be in order to support the environmental decision? Data must meet the requirements for Level IV Laboratory Data Deliverables to allow for data validation. Analytical data meeting those criteria will be validated. Only those data approved during the validation process will be reported and evaluated. Project action levels are listed in Worksheet #15.
How much data are needed? (number of samples for each analytical group, matrix, and concentration) The sampling protocol was decided during TPP meetings and is based on allowable quantities set forth in ZAPATA's Performance Work Statement from the USAESCH. The quantities planned for this investigation are provided in detail in Worksheet #20.
Where, when, and how should the data be collected/generated? The locations of the MRSs are identified on Figures 2, 3, Appendix B in the work plan. Past sampling locations are shown on Figure 4, Appendix B of the work plan. Environmental samples will be collected from locations within the MRSs and from across the site at locations to be determined based on MEC characterization results. Refer to Worksheet #14.
Who will collect and generate the data? Wil Chee-Planning & Environmental personnel will collect all analytical samples. All samples will be shipped to Accutest for analysis, with the exception of QA samples; QA samples will be shipped to TestAmerica for analysis. Accutest will be provided analytical results in electronic format as ADR-compatible SEDD 2a files and as EPA Level IV reports (hardcopy or pdf) to HSW Engineering for data validation. HSW Engineering validated data will be provided to ZAPATA and Black & Veatch for evaluation. TestAmerica will be provided analytical results in electronic format as ADR-compatible SEDD 2a files and as EPA Level IV reports (hardcopy or pdf) to the USAESCH Chemist for evaluation/data validation. The USAESCH Chemist may provide an evaluation of the QA data for incorporation into the final report. Data will be generated at each step along that process. ZAPATA will manage the project database.
How will the data be reported? Data will be summarized in text form in the RI/FS report. Electronic versions of the complete data set will be provided as ADR-processed (reviewed) electronic data on CD in the report or by request.
How will the data be archived? Data will be permanently archived by the USAESCH. Approved deliverables will be stored in the public repository; text and electronic data will be provided in those reports.

QAPP Worksheet #12
(UFP-QAPP Manual Section 2.6.2)

☐ Worksheet Not Applicable (State Reason)

Measurement Performance Criteria Table

Matrix	Surface Water
Analytical Group	Metals
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
SOP FO-015	EPA Method 6020A (Cu and Pb)	Precision*	• If sample or duplicate <DL, ≤5x difference • If sample or duplicate <RL, ≤3x difference • If both sample and duplicate >RL, ≤2x difference	Field Duplicate (Co-located)	S & A
		Accuracy/Bias	No detectable target analytes less than 1/2 RL	Field Blank	S
		Accuracy in Quality System Matrix	+/- 20%	Lab Control Sample	A
		Precision	80-120 % Recovery, 20% RPD	Matrix Spike / Matrix Duplicate	A
		Accuracy/Bias	No detectable target analytes less than 1/2 RL	Equipment Blank	S

* As given in Table 4-1 of EM 200-1-6 *Chemical Quality Assurance for HTRW Projects*, 10 October 1997.

Measurement Performance Criteria Table

Matrix	Surface Water
Analytical Group	Explosives
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
SOP FO-015	EPA Method 8330A	Precision*	• If sample or duplicate <DL, ≤5x difference • If sample or duplicate <RL, ≤3x difference • If both sample and duplicate >RL, ≤2x difference	Field Duplicate (Co-located)	S & A
		Accuracy/Bias	No detectable target analytes less than 1/2 RL	Field Blank	S
		Accuracy in Quality System Matrix	See Attachment A	Lab Control Sample	A
		Precision	See Attachment A	Matrix Spike / Matrix Duplicate	A
		Accuracy/Bias	No detectable target analytes less than 1/2 RL	Equipment Blank	S

* As given in Table 4-1 of EM 200-1-6 *Chemical Quality Assurance for HTRW Projects*, 10 October 1997.

Measurement Performance Criteria Table

Matrix	Soil (MIS and Discrete)
Analytical Group	Explosives
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
SOP FO-003 and HEER (2009)	EPA Method 8330B (MIS) and EPA Method 8330A (Discrete)	Precision*	• If sample or duplicate <DL, ≤5x difference • If sample or duplicate <RL, ≤3x difference • If both sample and duplicate >RL, ≤4x difference	Field Duplicate (Co-located)	S & A
		Accuracy in Quality System Matrix	Laboratory in-house %R limits in effect when ADR project library is finalized, or %R limits provided in the DoD QSM Version 4.1, whichever is more stringent for each target analyte	Lab Control Sample	A
		Precision	Laboratory in-house limits for %R and %RPD in effect at the time the ADR project library is finalized, or limits provided in the DoD QSM Version 4.1, whichever are more stringent for each target analyte.	Matrix Spike / Matrix Duplicate	A
		Accuracy/Bias	No detectable target analytes less than 1/2 RL	Equipment Blank	S

* As given in Table 4-1 of EM 200-1-6 *Chemical Quality Assurance for HTRW Projects*, 10 October 1997.

Measurement Performance Criteria Table

Matrix	Soil (MIS and Discrete)
Analytical Group	Metals
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
SOP FO-003 and HEER (2009)	EPA Method 6010C (Cu and Pb)	Precision*	• If sample or duplicate <DL, $\leq$5x difference • If sample or duplicate <RL, $\leq$3x difference • If both sample and duplicate >RL, $\leq$2x difference	Field Duplicate (Co-located)	S & A
		Accuracy in Quality System Matrix	+/- 20 %	Lab Control Sample	A
		Precision	80-120 % Recovery, 20% RPD	Matrix Spike / Matrix Duplicate	A
		Accuracy/Bias	No detectable target analytes less than 1/2 RL	Equipment Blank	S

* As given in Table 4-1 of EM 200-1-6 *Chemical Quality Assurance for HTRW Projects*, 10 October 1997.

Measurement Performance Criteria Table

Matrix	Sediment
Analytical Group	Metals
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
SOP FO-004	EPA Method 6010C (Cu andPb)	Precision*	• If sample or duplicate <DL, $\leq$5x difference • If sample or duplicate <RL, $\leq$3x difference • If both sample and duplicate >RL, $\leq$2x difference	Field Duplicate (Co-located)	S & A
		Accuracy in Quality System Matrix	+/- 20 %	Lab Control Sample	A
		Precision	80-120 % Recovery, 20% RPD	Matrix Spike / Matrix Duplicate	A
		Accuracy/Bias	No detectable target analytes less than 1/2 RL	Equipment Blank	S

* As given in Table 4-1 of EM 200-1-6 *Chemical Quality Assurance for HTRW Projects*, 10 October 1997.

Measurement Performance Criteria Table

Matrix	Sediment
Analytical Group	Explosives
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
SOP FO-004	EPA Method 8330A	Precision*	• If sample or duplicate <DL, ≤5x difference • If sample or duplicate <RL, ≤3x difference • If both sample and duplicate >RL, ≤4x difference	Field Duplicate (Co-located)	S & A
		Accuracy in Quality System Matrix	Laboratory in-house %R limits in effect when ADR project library is finalized, or %R limits provided in the DoD QSM Version 4.1, whichever is more stringent for each target analyte	Lab Control Sample	A
		Precision	Laboratory in-house limits for %R and %RPD in effect at the time the ADR project library is finalized, or limits provided in the DoD QSM Version 4.1, whichever are more stringent for each target analyte.	Matrix Spike / Matrix Duplicate	A
		Accuracy/Bias	No detectable target analytes less than 1/2 RL	Equipment Blank	S

* As given in Table 4-1 of EM 200-1-6 *Chemical Quality Assurance for HTRW Projects*, 10 October 1997.

Measurement Performance Criteria Table

Matrix	Groundwater
Analytical Group	Perchlorate
Concentration Level	Low

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
SOP FO-007	EPA Method 6850	Precision*	• If sample or duplicate <DL, ≤5x difference • If sample or duplicate <RL, ≤3x difference • If both sample and duplicate >RL, ≤4x difference	Field Duplicate (Co-located)	S & A
		Precision	80-120 % Recovery, 20% RPD	Matrix Spike / Matrix Duplicate	A
		Accuracy/Bias	No detectable target analytes less than 1/2 RL	Equipment Blank	S

[1]Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[2]Reference number from QAPP Worksheet #23 (see Section 3.2).
* As given in Table 4-1 of EM 200-1-6 *Chemical Quality Assurance for HTRW Projects*, 10 October 1997.

QAPP Worksheet #13
(UFP-QAPP Manual Section 2.7)

☐ Worksheet Not Applicable (State Reason)

Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Abbreviated Site Inspection Report	Abbreviated Site Inspection Report, Waikane Training Area, (USACE 2009)	Wil Chee-Planning prepared for U.S. Army Engineering and Support Center, Huntsville	Creation of CSM	Data to be used as reference only.
Engineering Evaluation / Cost Analysis	EE/CA: Waikane Training Area, Oahu, Hawaii (USACE 2009)	ZAPATA for prepared for U.S. Army Engineering and Support Center, Huntsville	Creation of CSM	Data to be used as reference only.

QAPP Worksheet #14
(UFP-QAPP Manual Section 2.8.1)

☐ Worksheet Not Applicable (State Reason)

Summary of Project Tasks

Sampling Tasks:

1) ZAPATA will conduct multi-incremental soil (MIS) sampling in accordance with the HEER Interim Final Guidance on Incremental Soil Sampling dated June 2009. MIS sampling will be conducted in 100 ft. x 100 ft. decision units (DUs) placed in areas thought to constitute former target locations and ranges, based on confirmation from historical photographic analysis, and analog-and-dig data analysis. Sampling locations (MIS, DUs, subsurface samples, sediment and surface water samples) will be determined based on the results of transect and grid MEC intrusive investigations. Data sets (i.e., discrete and MIS samples) will be collected separately and results reported independently. Thirty-six DUs will be placed within the three MRSs. Within each DU, primary soil samples will be collected in triplicate, with each sample consisting 50 subsamples (grab/aliquots) collected at randomly selected, evenly-spaced points along uniformly-spaced parallel lines traversing the DU. The subsamples will be collected from from 0 to 2-1/2 inches below ground surface (bgs). These MIS samples will be analyzed for explosives constituents using sample preparation and analysis methodology outlined in Appendix A of EPA Method 8330B. In addition, we will analyze for select metals (Cu and Pb) using EPA Method 6010C. These will be collected from soil splits segregated from the MIS sample at the laboratory prior to grinding.

2) Soil, sediment and surface-water samples will be collected as discrete samples from locations across the site; 20 collocated surface water and sediment samples, and 40 discrete subsurface soil samples will be collected from the three MRSs at locations to be determined. Soil samples will be collected from an approximate depth of six inches to 12 inches bgs. Those samples will be analyzed for selected metals and explosives variously using EPA Methods 6010C for soils and 6020A for water, and 8330A. Groundwater sampling may also be conducted and analyzed for perchlorate using EPA Method 6850, if existing wells are in use. The groundwater samples would be collected from existing wells, if they are in use and accessible.

(3) Pre Blow-In-Place (BIP) Sampling
Pre-Blow-in-Place (BIP) samples will be collected as discrete samples from locations where MEC is designated for BIP. Those samples will be analyzed using EPA Method 8330A.

(4) Post Blow-In-Place (BIP) Sampling
Post-BIP samples will be collected following a BIP detonation. Post-detonation soil sampling shall occur within 72 hours of detonation (or sooner if rain is predicted). Samples will be tested for the same analytes as the Pre-BIP samples, but will be collected using a composite pattern based on the Cold Regions Research Engineering Laboratory (CRREL) 7-sample wheel approach (as described in ERDC SR96-15), as shown in Figure E-1 below. Field personnel will collect seven samples in a wheel pattern (IAW SOP FO-003) with sample number 1 in the center of the blast crater. The radius of the wheel will be 61 cm, with samples arranged around the wheel and separated by 61 cm. Personnel will collect all seven soil samples at the surface from 0 to 2.5 inches bgs using a stainless-steel trowel. If vegetation is present, it must be removed. Samples will be placed in plastic zip lock bags and taken to a processing area. A composite sample shall be collected from a mixture of the seven grab samples from within the wheel. The seven portions used to make the composite will be approximately equal in weight. The soil will be homogenized by hand mixing, with clumps reduced by hand crushing. The soil will be dispersed, coned and quartered and a 50-g sample removed and placed in an amber glass bottle for subsequent laboratory analysis. Sample representativeness will be maximized to the extent practical.

5) Background soil (discrete and MIS), sediment and surface-water samples will be collected from locations across the site; 15 collocated surface water and sediment samples, 15 discrete subsurface soil samples, and 12 MIS samples collected in triplicate, will be used to determine background metals concentrations. Multiple background samples will be collected to address the potential for variability in the background sample concentrations (specifically trace element metals). It is suspected that soil properties will not very significantly across the MRSs at shallow depths (i.e., < 1 ft) and that background samples will be representative of the areas potentially affected by MC contamination. Background locations will be outside of contaminated area and in areas representative of site conditions. These locations will be determined in the field based on site observations. Those locations will be sampled in a manner consistent with the approach described. These samples will be analyzed for selected metals and explosives using EPA Methods 6010C for soils and 6020A for water, and 8330B, respectively.

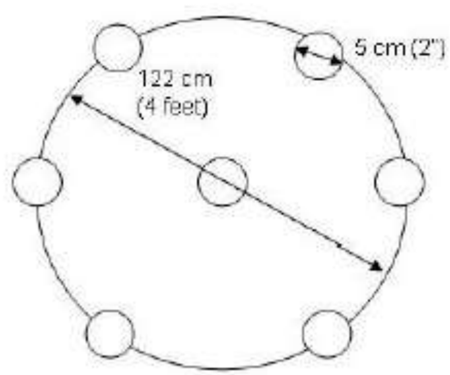
Analysis Tasks: The analytical laboratory (Accutest) will prepare, process, and analyze the soil, sediment, and water samples. The analytical laboratory (Accutest) will analyze the samples as noted in worksheet #12. The results of the analytical data will be sent to the data validators. Refer to Worksheets #15, #18, #19, #28 and #30.
Quality Control Tasks: Quality Assurance and Quality Control Samples Quality Assurance (QA split) and Quality Control (QC duplicate) samples are analyzed for the purpose of assessing the quality of the sampling effort and of the analytical data. These samples include QA split samples, QC duplicates of field samples, QC equipment rinsate blanks, trip blanks, and ambient (background) samples. Split or duplicate samples are collected as a single sample, homogenized (with the exception of soil VOC samples), divided into two or more equal parts, and placed in separate containers. The number of duplicate samples is generally 10% of the field samples. QA samples will be collected for analysis by the QA laboratory (TestAmerica). MIS samples will be collected in triplicate (one primary and two replicates) within each DU and sent to a laboratory for processing and analysis. One primary sample and one replicate sample will be to be sent to the primary laboratory (Accutest). The other replicate sample will be sent to the QA laboratory (TestAmerica). The frequency of QC replicates and QA samples for this project is 100%. Quality Control Duplicate Samples The sampling team will collect Quality Control (QC) samples for analysis by the contract laboratory. QC duplicate samples will be generated from field duplicates collected from the standard samples. The identity of QC samples will not be provided to the analysts or laboratory personnel (see Work Plan Section 3.8.5.2 for QC sample identification). ZAPATA will keep a log identifying each Quality Control sample to its duplicate soil or surface water sample. This procedure ensures that the laboratory will not know which Quality Control sample matches the field sample. A table will be provided in the report that designates the QC sample to the duplicate field sample. The purpose of the QC samples is to provide site-specific, field-originated checks of the quality of the data generated by the laboratory. Quality Assurance Split Samples Quality Assurance (QA) samples will be sent by overnight delivery to the government QA laboratory to evaluate the performance of the contract laboratory. These samples will be generated from field splits. The QA Laboratory Advance Notification (QALAN) will be provided to the QA laboratory notifying them of the impending shipment of samples not less than 10 days before shipment, so that the QA laboratory will be prepared to receive and process the QA samples within the time limits specified by applicable EPA Region regulations and guidelines. ZAPATA will notify the USACE Technical Manager approximately three weeks before samples for chemical analysis are taken in the field to allow sufficient time to arrange for necessary glassware and documentation from the QA Laboratory. TestAmerica's QA Manual is included in Attachment C. QC Equipment Rinsate Blanks Rinsate blanks (or equipment blanks) are samples consisting of analyte-free water collected from a final rinse of sampling equipment after the decontamination procedure have been performed. The purpose of rinsate blanks is to measure the effectiveness of the decontamination process and materials storage/handling protocols. By analyzing rinsate blanks, the potential for cross-contamination of samples by the drilling or sampling equipment may be evaluated.
Secondary Data: Data from previous documents will be reviewed and evaluated for the use in this project. See Worksheet #13.
Data Management Tasks: All soil, sediment, and water sample results will be provided by the analytical laboratory (Accutest) and the contracted data validator in hard copy and electronic format. All analytical data collected during the field work portion of this project will be summarized and included in the final report. See Worksheet #34.
Documentation and Records: Worksheet #29 contains a list of the project documents and records that will be generated from the data gathered. The GPS coordinates of all sample locations will recorded in the field logbook. Chains-of-Custody will be used to track the sample from the site to the laboratory. Shipping airbills related to sample shipments will be retained.
Assessment/Audit Tasks: The laboratory QA Officer will implement performance and/ or system audits to insure that data of known and defensible quality are produced during the project. System audits are qualitative evaluations of components of the laboratory quality control measures systems. They determine if the measurement systems are being used appropriately. The audits may be carried out before all systems are operational, during the laboratory program, or after the completion of the program. Such audits typically involve a comparison of the activities specified in the QA/QC Plan with activities actually scheduled or performed. The data management audit addresses only data collection and management activities. The performance audit is a quantitative evaluation of the measurement systems of a program. It requires testing the measurement systems with samples of known composition or behavior to evaluate precision and accuracy. The performance audit is carried out by or under the auspices of the QA Officer without knowledge of the analyst. Based on this evaluation, the laboratory QA Officer will implement corrective actions as necessary to ensure that reliable data are achieved.

Data Review Tasks:
Accutest Laboratories Southeast employs multiple levels of data review to assure that reported data has satisfied all quality control criteria and the client specifications and requirements have been met. The analyst conducts the primary review of all data. Analyst checks focuses on a review of qualitative determinations and checks of precision and accuracy data to verify that existing laboratory criteria have been achieved. Secondary data reviews are performed at the peer level by analysts who have met the qualification criteria for the method in use. It includes a check of all manual calculations; an accuracy check of manually transcribed data from bench sheets to the LIMS, a check of all method and instrument QC criteria, baseline manipulations (if applicable) and a comparison of the data package to client specified requirements. Secondary reviewers have the authority to reject data and initiate re-analysis, corrective action, or reprocessing of data. The report generation group reviews all data and supporting information delivered by the laboratory for completeness and compliance with client specifications. Missing deliverables are identified and obtained from the laboratory. The group also reviews the completed package to verify that the delivered product complies with all client specifications. Non-analytical defects are corrected before the package is sent to the client. The QA Staff reviews approximately 10% of the data produced. The QA review focuses on all elements of the deliverable including the client's specifications and requirements, analytical quality control, sample custody documentation and sample identification. QA reviews at this step in the production process are geared towards systematic process defects, which require procedural changes to effect a corrective action.

HSW will establish an electronic project library in ADR automated data review software. This project library will reflect the data review acceptance criteria established in this UFP-QAPP. For any project library requirements that are not specified in this document, HSW will use either the contract laboratory's in-house data review acceptance criteria or those specified in the DoD Quality Systems Manual Version 4.1, whichever are more stringent. HSW will process ADR Stage 2a SEDD files through ADR against the criteria established in the project library. Professional judgement will be used by HSW to evaluate the ADR data review qualifiers and to modify them as needed. HSW will also compare a representative portion of the data in the ADR SEDD files to that in the corresponding hard copy or pdf reports to confirm that there is consistency between the two forms of reporting. HSW will summarize the data review scope, process, and findings in a Quality Control Summary Report (QCSR). Included in this QCSR will be a review of Daily Quality Control Reports (DQCRs), as well as a section summarizing any recommendations for future investigations ("lessons learned").

ZAPATA will review a random subset of valided data (between 5 - 10%) as an additional quality control check before incorporating the data into a final database for further evaluation.

FIGURE E-1 CRREL 7-SAMPLE WHEEL DIAGRAM (FROM USACE, 2005)



QAPP Worksheet #15
(UFP-QAPP Manual Section 2.8.1)

☐ Worksheet Not Applicable (State Reason)

Reference Limits and Evaluation Table

Matrix: Soil/Sediment

Analytical Group: Explosives

Concentration Level: Low

Analyte	Abbreviation	CAS #	Project Action Limit (Human Health)^ Based on EPA Regional Screening Levels for Residential Soil/Sediment (mg/kg)	Project Action Limit (Human Health)^ Based on HDOH Environmental Action Levels Soil/Sediment ++ (mg/kg)	Project Action Level (Ecological Soil) (mg/kg)	Project Action Level Source (Ecological Soil)	Project Action Level (Ecological Sediment) (mg/kg)	Project Level Source (Ecological Sediment)	Achievable Laboratory Limit Minimum Detection Limits (mg/kg)***	Achievable Laboratory Limit Quantitation Limit (mg/kg)***	EPA Method
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	121-82-4	5.5	5.5	5.8	C	102	F	0.085	0.2	8330 A/B
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	2691-41-0	3,800*	100	43	C	126	F	0.086	0.062	8330 A/B
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	19	7.2	8	C	0.1	F	0.05	0.2	8330 A/B
1,3,5-Trinitrobenzene	1,3,5-TNB	99-35-4	2,200*	5.4	0.38	C	1	F	0.05	0.2	8330 A/B
1,3-Dinitrobenzene	1,3-DNB	99-65-0	6.1*	1.1	0.66	D	NA	--	0.053	0.2	8330 A/B
2,4-Dinitrotoluene	2,4-DNT	121-14-2	1.6	2.7	1.28	D	NA	--	0.06	0.053	8330 A/B
2,6-Dinitrotoluene	2,6-DNT	606-20-2	61*	2.7	0.3	C	0.5	F	0.053	0.2	8330 A/B
2-Amino-4,6-dinitrotoluene	4-Am-DNT	35572-78-2	150*	0.25	5.3	C	23	F	0.05	0.2	8330 A/B
2-Nitrotoluene	2-NT (o)	88-72-2	2.9	1.9	4.1	C	NA	--	0.05	0.2	8330 A/B
3-Nitrotoluene	3-NT (m)	99-08-1	1,200*	21	5.3	C	NA	--	0.084	0.2	8330 A/B
4-Amino-2,6-dinitrotoluene	2-Am-DNT	19406-51-0	150*	0.25	NA	--	NA	--	0.11	0.053	8330 A/B
4-Nitrotoluene	4-NT (p)	99-99-0	30	30	9.4	C	4.06	--	0.062	0.084	8330 A/B
Nitroglycerin	NG	55-63-0	29	1.2	150	C	NA	--	0.7	0.066	8332
Methyl-2,4,6-trinitrophenylnitramine	Tetryl	479-45-8	240*	49	2	C	0.5	F	0.051	0.085	8330 A/B
Pentaerythritol Tetranitrate	PETN	78-11-5	**	4.4	21,000	C	NA	--	0.7	0.086	8332
Copper	Cu	7440-50-8	3100*	230	28	A	31.6	E	0.11	1.3	6010C
Lead	Pb	7439-92-1	400*	200	30.2	B	35.8	E	0.23	5	6010C

^The most conservative value is the default Project Action Level.
If the laboratory cannot meet any of the required RLs with routine SW846 methodology (as supported by MDLs that are no greater than 1/3 RL), laboratory's RL will be identified in Laboratory submittal as failing to meet the RL. Some screening values cannot be obtained with routine methodology to the RL. In those cases, the bolded **RL** achievable with a routine SW846methodology would be accepted.
Adapted from USAESCH, 2005. The values indicated are from various sources compiled for the Sampling and Analysis Plan for Military Munitions Response Program Site Inspections, dated September 2005.

(1) Based on *Regional Screening Levels for Chemical Contaminants at Superfund Sites* dated April 2009, Carcinogenic Target Risk = 1E-06, Total values.

* Based on Noncancer Hazard Index (HI) = 1, Total values (Carcinogenic Target Risk = 1E-06, Total values are not available).

** Neither Industrial/Residential EPA Regional Screening Level (RSL) are available.
+ If the laboratory cannot meet any of the preferred QLs with routine SW846 methodology (as supported by MDLs that are no greater than 1/3 QL), laboratory's QL will be identified in Laboratory submittal as failing to meet the QL. Some screening values cannot be obtained with routine methodology to the QL. In those cases, the QL achievable with a routine SW846 methodology would be accepted.
++ Based on *HDOH TABLE B. ENVIRONMENTAL ACTION LEVELS (EALs), Groundwater IS NOT Current or Potential Source of Drinking Water, ≤150m to Surface Water Body* (update October 2008).

NA - None Available

*** Laboratory specific MDLs and QLs

ECO Screening Value Sources
A - EPA Ecological Soil Screening Levels (EPA, 2007)

B - Twice local background (ambient)

C - Los Alamos National Laboratory ECORISK Database (LANL, 2005)

D - EPA Region 5 Ecological Quality Levels (EPA, 2005)

E - MacDonald, et al. (2000)

F - Lotufo, et al. (2009)

G - EPA recommended Water Quality Standards (EPA, 2006)

H - EPA Region 3 Freshwater Screening Benchmarks (EPA, 200

I - Talmage, et al. (1999)

J - EPA Region 4 Screening Values (EPA, 2000)

Reference Limits and Evaluation Table								
Matrix: Water								
Analytical Group: Explosives								
Concentration Level: Low								
Analyte	**Abbreviation**	**CAS #**	**Project Action Limit (Human Health) based on HDOH Environmental Action Levels ++ (mg/L)**	**Project Action Limit (Ecological) (mg/L)**	**Project Action Limit Source (Ecological)**	**Achieveable Laboratory Limit Method Detection Limit (mg/L)*****	**Achievable Laboratory Limit Quantitation Limit (mg/L)*****	**EPA Method**
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	121-82-4	0.19	0.36	H	0.000075	0.0002	8330 A/B
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	2691-41-0	0.33	0.15	H	0.00011	0.0002	8330 A/B
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	0.13	0.1	H	0.000069	0.0002	8330 A/B
1,3,5-Trinitrobenzene	1,3,5-TNB	99-35-4	0.03	0.011	I	0.00005	0.0002	8330 A/B
1,3-Dinitrobenzene	1,3-DNB	99-65-0	0.03	0.02	I	0.000051	0.0002	8330 A/B
2,4-Dinitrotoluene	2,4-DNT	121-14-2	0.015	0.044	H	0.000065	0.0002	8330 A/B
2,6-Dinitrotoluene	2,6-DNT	606-20-2	0.015	0.081	H	0.000093	0.0002	8330 A/B
2-Amino-4,6-dinitrotoluene	2-Am-DNT	35572-78-2	0.015	1.48	H	0.000077	0.0002	8330 A/B
2-Nitrotoluene	2-NT	88-72-2	1	NA	--	0.000064	0.0002	8330 A/B
3-Nitrotoluene	3-NT	99-08-1	0.38	0.75	H	0.000097	0.0002	8330 A/B
4-Amino-2,6-dinitrotoluene	4-Am-DNT	19406-51-0	0.015	NA	--	0.00005	0.0002	8330 A/B
4-Nitrotoluene	4-NT	99-99-0	1.6	1.9	H	0.000076	0.0002	8330 A/B
Nitrobenzene	NB	98-95-3	0.06	0.27	J	0.00005	0.0002	8330 A/B
Nitroglycerin	NG	55-63-0	0.14	0.138	H	0.0005	0.002	8332
Methyl-2,4,6-trinitrophenylnitramine	Tetryl	479-45-8	0.13	5.8	C	0.000078	0.0002	8330 A/B
Pentaerythritol Tetranitrate	PETN	78-11-5	22	85	H	0.0007	0.002	8332
Copper	Cu	7440-50-8	0.029	0.009	G	0.005	0.025	6020A
Lead	Pb	7439-92-1	0.056	0.0025	G	0.002	0.005	6020A
Perchlorate	ClO4	14797-73-0	0.6	9.26	K	0.0000617	0.0002	6850

* If the laboratory cannot meet any of the preferred screening levels with routine SW846 methodology (as supported by MDLs that are no greater than 1/3 QL), laboratory's RL will be identified in laboratory submittal as failing to meet the RL. Some screening values cannot be obtained with routine methodology to the RL. In those cases, the **bolded RL** achievable with a routine SW846 methodology would be accepted.

++ Based on *HDOH TABLE B. ENVIRONMENTAL ACTION LEVELS (EALs), Groundwater IS NOT Current or Potential Source of Drinking Water, ≤150m to Surface Water Body* (update October 2008).

NA - None Available

ECO Screening Value Sources

A - EPA Ecological Soil Screening Levels (EPA, 2007)

B - Twice local background (ambient)

C - Los Alamos National Laboratory ECORISK Database (LANL, 2005)

D - EPA Region 5 Ecological Quality Levels (EPA, 2005)

E - MacDonald, et al. (2000)

F - Lotufo, et al. (2009)

G - EPA recommended Water Quality Standards (EPA, 2006)

H - EPA Region 3 Freshwater Screening Benchmarks (EPA, 200

I - Talmage, et al. (1999)

J - EPA Region 4 Screening Values (EPA, 2000)

K - Draft Chronic Water Quality Value for Protectin of Aquatic Organisms

L - EPA Region 3 Mid-Atlantic Risk Assessment, BETAG Freshwater and Sediment Screening Benchmarks (EPA, 2006)

QAPP Worksheet #16
(UFP-QAPP Manual Section 2.8.2)

☐ Worksheet Not Applicable (State Reason)

Project Schedule Timeline Table

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
The project schedule is provided in Appendix K of the Work Plan.					

QAPP Worksheet #17
(UFP-QAPP Section 3.1.1)

☐ Worksheet Not Applicable (State Reason)

Sampling Design and Rationale

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach): Refer to Worksheet #14 and Section 3.8 of the Work Plan for a detailed description of the sampling approach.
Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations) [May refer to map or Worksheet #18 for details]: Refer to Worksheet #18 and Figures 2 and 3, Appendix B of the Work Plan for MRSs boundaries and Figure 4 for past sampling locations.

QAPP Worksheet #18
(UFP-QAPP Manual Section 3.1.1)

☐ Worksheet Not Applicable (State Reason)

Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (inches)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates	Sampling SOP Reference[1]	Rationale for Sampling Location
A total of 24 MIS samples will be collected in triplicate across the site	Soil	0 to 2.5	Explosives	Low	24 primary collected in triplicate (total of 72) and 18 equipment rinsate blanks	FO-003	Locations TBD based on MEC characterization
A total of 24 MIS samples will be collected in triplicate across the site	Soil	0 to 2.5	Metals	Low	24 primary collected in triplicate (total of 72) and 18 equipment rinsate blanks	FO-003	Locations TBD based on MEC characterization
A total of 40 subsurface soil samples will be collected across the site	Soil	6 to 12	Explosives	Low	40 primary, 4 field duplicates, 4 MS/MSD, 5 equipment rinsate blanks, 5 QA duplicate splits	FO-003	Locations TBD based on MEC characterization (subsurface samples are to be collocated with 24 of the MIS samples)
A total of 40 subsurface soil samples will be collected across the site	Soil	6 to 12	Metals	Low	40 primary, 4 field duplicates, 4 MS/MSD, 5 equipment rinsate blanks, 5 QA duplicate splits	FO-003	Locations TBD based on MEC characterization (subsurface samples are to be collocated with 24 of the MIS samples)
A total of 20 surface water samples will be collected across the site	Surface Water	0 to 3	Explosives	Low	20 primary, 2 field duplicates, 2 MS/MSD, 2 equipment rinsate blanks, 2 QA duplicate splits	FO-15	Locations TBD based on MEC characterization (sediment and surface water samples will be collocated)

Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (inches)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates	Sampling SOP Reference[1]	Rationale for Sampling Location
A total of 20 surface water samples will be collected across the site	Surface Water	0 to 3	Metals	Low	20 primary, 2 field duplicates, 2 MS/MSD, 2 equipment rinsate blanks, 2 QA duplicate splits	FO-015	Locations TBD based on MEC characterization (sediment and surface water samples will be collocated)
A total of 20 sediment samples will be collected across the site	Sediment	0 to 3	Explosives	Low	20 primary, 2 field duplicates, 2 MS/MSD, 2 equipment rinsate blanks, 2 QA duplicate splits	FO-004	Locations TBD based on MEC characterization (sediment and surface water samples will be collocated)
A total of 20 sediment samples will be collected across the site	Sediment	0 to 3	Metals	Low	20 primary, 2 field duplicates, 2 MS/MSD, 2 equipment rinsate blanks, 2 QA duplicate splits	FO-004	Locations TBD based on MEC characterization (sediment and surface water samples will be collocated)
Background (MIS)	Soil	0 to 2.5	Metals	Low	12 primary collected in triplicate (total of 36) and 6 equipment rinsate blanks	FO-003	Background locations will be outside of contaminated area and in areas representative of site conditions. These locations will be determined in the field based on site observations

Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (inches)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates	Sampling SOP Reference[1]	Rationale for Sampling Location
Background (Discrete samples)	Soil	6 to 12	Metals	Low	15 primary, 2 field duplicates, 2 MS/MSD, 2 equipment rinsate blanks, 2 QA duplicate splits	FO-003	Background locations will be outside of contaminated area and in areas representative of site conditions. These locations will be determined in the field based on site observations
Background (Discrete samples)	Surface Water	0 to 3	Metals	Low	15 primary, 2 field duplicates, 2 MS/MSD, 2 equipment rinsate blanks, 2 QA duplicate splits	FO-015	Background locations will be outside of contaminated area and in areas representative of site conditions. These locations will be determined in the field based on site observations
Background (Discrete samples)	Sediment	0 to 3	Metals	Low	15 primary, 2 field duplicates, 2 MS/MSD, 2 equipment rinsate blanks, 2 QA duplicate splits	FO-015	Background locations will be outside of contaminated area and in areas representative of site conditions. These locations will be determined in the field based on site observations

Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (inches)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates	Sampling SOP Reference[1]	Rationale for Sampling Location
Groundwater samples may be collected at existing wells if the wells are in use, accessible, and serviceable	Groundwater	TBD	Perchlorate	Low	TBD primary, TBD field duplicate, TBD MS/MSD, TBD equipment rinsate blanks, TBD QA duplicate split	FO-007	If present, perchlorate would only be expected at this shallow well - no other suspected pathways exist

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #21). Sampling SOPs are included in Attachment B.

QAPP Worksheet #19
(UFP-QAPP Manual Section 3.1.1)

☐ Worksheet Not Applicable (State Reason)

Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference [1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Soil	Explosives	Low	8330A and B OP046, GC034 (8330B), OP019, GC016 (8330A)	Approx. 1 kg in clear polyethylene bag (8330B), and approx. 4 oz. in Clear Wide Mouth Jar (8330A)	Gallon bag and 4 oz Jar	Cool to 4^{o}C	14 days
Soil	Metals	Low	6010C MET100, MET104	Clear Wide Mouth Jar	4 oz	Cool to 4^{o}C	180 days
Surface Water	Explosives	Low	8330A OP018, GC016	Amber Jar	2, 1 liter	Cool to 4^{o}C	7 days
Surface Water	Metals	Low	6020A MET100, MET103	Polyethylene bottle	250 ml	HNO_3/ Cool to 4^{o}C	180 days
Sediment	Explosives	Low	8330A OP019, GC016	Amber Jar	4 oz	Cool to 4^{o}C	14 days
Sediment	Metals	Low	6010C MET100, MET104	Clear Wide Mouth	4 oz	Cool to 4^{o}C	180 days
Groundwater	Perchlorate	Low	6850 LC/MS-CLO4	Amber Jar	2, 1 liter	Cool to 4^{o}C	28 days

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

QAPP Worksheet #20
(UFP-QAPP Manual Section 3.1.1)

☐ Worksheet Not Applicable (State Reason)

Field Quality Control Sample Summary Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference[1]	No. of Sampling Locations	No. of Field Duplicate Pairs	No. of MS / MSDs	No. of Field Blanks	No. of Equip. Blanks	No. of QA Samples	Total No. of Samples to Lab
Soil, MIS	Explosives	Low	8330B OP046, GC034	36	NA	NA	NA	24	0	132
Soil, MIS	Metals	Low	6010C MET100, MET104.8	36	NA	NA	NA	24	0	132
Soil, Discrete	Explosives	Low	8330A OP019, GC016	55*	6	6	0	7	6	80*
Soil, Discrete	Metals	Low	6010C MET100, MET104	55	6	6	0	7	6	80
Surface Water	Explosives	Low	8330A OP018, GC016	35	4	4	0	4	4	51
Surface Water	Metals	Low	6020A MET100, MET103	35	4	4	0	4	4	51
Sediment	Explosives	Low	8330A OP019, GC016	35	4	4	0	4	4	51
Sediment	Metals	Low	6010C MET100, MET104	35	4	4	0	4	4	51
Groundwater	Perchlorate	Low	6850 LC/MS-CLO4	TBD	TBD	TBD	0	TBD	TBD	TBD

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).
*This does not include Blow in Place (BIP) samples. The number of ordnance items found will dictate number of BIP samples.

QAPP Worksheet #21
(UFP-QAPP Manual Section 3.1.2)

☐ Worksheet Not Applicable (State Reason)

Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Check if yes)	Comments
FO-002	Field Logbook	ZAPATA	NA	☐	SOP Included in Attachment B
FO-003	Soil Sampling	ZAPATA	NA	☐	SOP Included in Attachment B
FO-004	Sediment Samping	ZAPATA	NA	☐	SOP Included in Attachment B
FO-007	Groundwater Purging and Samping	ZAPATA	NA	☐	SOP Included in Attachment B
FO-008	Sample Labeling	ZAPATA	NA	☒	Sample IDs specified in Section 3.8 of the Work Plan
FO-009	Chain of Custody	ZAPATA	NA	☐	SOP Included in Attachment B
FO-010	Sample Packing and Shipping	ZAPATA	NA	☐	SOP Included in Attachment B
FO-011	Equipment Decontamination	ZAPATA	NA	☐	SOP Included in Attachment B
FO-015	Surface Water Sampling	ZAPATA	NA	☐	SOP Included in Attachment B
DID MR-005-10	Munitions Constituents Chemical Data Qualifier	USAESCH	NA	☐	DID MR-005-10
DID MR-005-11	Quality Control Plan	USAESCH	NA		DID MR-005-11
DID MR-005-13	Investigative Derived Waste Plan	USAESCH	NA		DID MR-005-13

QAPP Worksheet #22
(UFP-QAPP Manual Section 3.1.2.4)

☑ Worksheet Not Applicable (State Reason) Field equipment associated with MC sampling is not anticipated for this site.

Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]

[1]Specify the appropriate reference letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #23
(UFP-QAPP Manual Section 3.2.1)

☐ Worksheet Not Applicable (State Reason)

Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
MET100	Metals by ICP, 2009	Definitive	Metals, ICP 6020A	TJA Trace	Accutest Laboratories Southeast, Inc., Orlando, FL	☐
MET104	Digestion of Soils for ICP Analysis, 2009	Definitive	Prep Method Metals – ICP SW-846 3050B	SCP Science	Accutest Laboratories Southeast, Inc., Orlando, FL	☐
MET103	Digestion of Waters for ICP Analysis, 2009	Definitive	Prep Method Metals – ICP SW-846 3010A	SCP Science	Accutest Laboratories Southeast, Inc., Orlando, FL	☐
OP046	Standard Operating Procedure For The Extraction Of Nitroaromatics And Nitramines (Explosives) From Soil Samples For HPLC Analysis by 8330B	Definitive	Explosives	ESTA Mill	Accutest Laboratories Southeast, Inc., Orlando, FL	☐
OP022	Standard Operating Procedure For The Extraction Of Nitroaromatics And Nitramines (Explosives) From Water Samples For HPLC Analysis	Definitive	Explosives	Solid Pase Extractor	Accutest Laboratories Southeast, Inc., Orlando, FL	☐
GC034	Analysis Of Nitroaromatics, Nitramines, And Nitrate Esters By HPLC Method Sw-846 8330B	Definitive	Explosives	Agilent 1100	Accutest Laboratories Southeast, Inc., Orlando, FL	☐

Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
GC016	Analysis Of Nitroaromatics, Nitramines, And Nitrate Esters By HPLC Method Sw-846 8330A	Definitive	Explosives	Agilent 1100	Accutest Laboratories Southeast, Inc., Orlando, FL	☐
LC/MS-CLO4	The Determination of Perchlorate in Water, Soil and Biota by Liquid Chromatography / Mass Spectrometry Revision 6 September 18, 2009.	Definitive	Perchlorate	LCMS-2	ALS Lake City, Utah	☐

QAPP Worksheet #24
(UFP-QAPP Manual Section 3.2.2)

☐ Worksheet Not Applicable (State Reason)

Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
Agilent 1100	SW-846 8330A and 8330B	As needed	%RSD <20%, or Correlation coefficient R>0.995	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	GC016, GC034
TJA Trace	SW-846 6020A	As needed	%RSD <5%, or Correlation coefficient R>0.995	Instrument maintenance, standard inspection, recalibration	Laboratory Analyst	MET100
Agilent 1100 LC/MS (LCMS-2)	EPA 6850	After Maintenance and Daily	Correlation coefficient of 0.995 or Higher	Re-do	Laboratory Analyst	LC/MS-CLO4

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

QAPP Worksheet #25

(UFP-QAPP Manual Section 3.2.3)

☐ Worksheet Not Applicable (State Reason)

Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
TJA Trace	Torch, nebulizer, spray chamber, autosampler, pump tubing maintenance,	SW-846 6020A	Check connections, flush lines, clean nebulizer	Frequency determined by instrument remaining in calibration and free of interference – Met 100	Passing calibration	Reconnect sample pathways, recalibrate, reanalyze affected samples	Laboratory Analyst	MET100
High Performance Liquid Chromatography (HPLC)	Replace disposables, check LC pump tubing, inspect mobile phase degasser, autosampler and temperature control column compartment	Accutest Laboratories Southeast	Check LC pump tubing, inspect eluant degasser, autosampler and temperature control column compartment, replace disposables	See Worksheet 23, SOP GC016; GC020	See Worksheet 23, SOP GC016, GC020	Inspect system; correct problem; re-run calibration and affected samples	Analyst	SOP GC016, GC034
Agilent 100 LC/MS (LCMS-2)	Refer to SOP "LAB-002" Flushed with Isopropanol. Source Module and needle checked Daily PM	Flush and Check	Check module	Some daily some At least Monthly	Passes Method Criteria	Clean and Repeat	Laboratory Analyst	LC/MS-CLO4

[1]Specify the appropriate reference letter or number from Analytical SOP References table (Worksheet #23).

QAPP Worksheet #26
(UFP-QAPP Manual Appendix A)

☐ Worksheet Not Applicable (State Reason)

Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Environmental Technician or UXO Technician/ZAPATA Incorporated and Wil Chee-Planning & Environmental
Sample Packaging (Personnel/Organization): Environmental Technician or UXO Technician/ZAPATA Incorporated and Wil Chee-Planning & Environmental
Coordination of Shipment (Personnel/Organization): Environmental Technician or UXO Technician/ZAPATA Incorporated and Wil Chee-Planning & Environmental
Type of Shipment/Carrier: FedEx
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Sample Receiving/Accutest Labs and TestAmerica Labs
Sample Custody and Storage (Personnel/Organization): Sample Receiving/Accutest Labs and TestAmerica Labs
Sample Preparation (Personnel/Organization): Sample Receiving/Accutest Labs and TestAmerica Labs
Sample Determinative Analysis (Personnel/Organization): Analytical Analyist/Accutest Labs and TestAmerica Labs
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): 60 Days
Sample Extract/Digestate Storage (No. of days from extraction/digestion): 90 days or til they expire
Biological Sample Storage (No. of days from sample collection): NA
SAMPLE DISPOSAL
Personnel/Organization: Sample Controle/Accutest Labs and TestAmerica Labs
Number of Days from Analysis: 60 Days

QAPP Worksheet #27

(UFP-QAPP Manual Section 3.3.3)

☐ Worksheet Not Applicable (State Reason)

Sample Custody Requirements

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory): Refer to SOP FO-009.
Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal): Refer to SOP SAM101, SAM108.
Sample Identification Procedures: Refer to Section 3.8 of the Work Plan.
Chain-of-custody Procedures: Refer to SOP FO-009.

QAPP Worksheet #28
(UFP-QAPP Manual Section 3.4)

☐ Worksheet Not Applicable (State Reason)

QC Samples Table

Matrix	Soil (MIS Samples)
Analytical Group	Explosives
Concentration Level	Low
Sampling SOP	SOP FO-003
Analytical Method/ SOP Reference	8330B
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	24

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Subsampling Triplicate	One per MIS sample/24	8330B	None	Laboratory Analyst	Accuracy	Minimum of 30, 0.33 gram increments per 10 gram subsample
Field Blank	One per matrix per analytical method for each batch of at most 20 samples.	8330B	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL
Laboratory Control Sample	One per matrix per analytical method for each batch of at most 20 samples.	8330B	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy in quality system matrix	See Attachment A
Matrix Spike/ Matrix Spike Duplicate (inorganics)	One per matrix per analytical method for each batch of at most 20 samples.	8330B	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Precision	See Attachment A

QC Samples Table

Matrix	Soil (MIS Samples)
Analytical Group	Explosives
Concentration Level	Low
Sampling SOP	SOP FO-003
Analytical Method/ SOP Reference	8330B
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	24

QC Sample:	**Frequency/Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Method Blank	One per matrix per analytical method for each batch of at most 20 samples.	8330B-No detectable analytes greater than ½ RL	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL
Equipment Blank	One per matrix per analytical method for each batch of at most 20 samples.	8330B	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL

QC Samples Table

Matrix	Soil (MIS Samples)
Analytical Group	Metals
Concentration Level	Low
Sampling SOP	SOP FO-015
Analytical Method/ SOP Reference	6010C
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	24

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Subsampling Triplicate	One per MIS sample/24	6010C/7471A	None	Laboratory Analyst	Accuracy	Minimum of 30, 0.33 gram increments per 10 gram subsample
Field Blank	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL
Laboratory Control Sample	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy in quality system matrix	+/- 20%
Matrix Spike/ Matrix Spike Duplicate (inorganics)	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Precision	80-120 % Recovery, 20% RPD
Method Blank	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A-No detectable analytes greater than ½ RL	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL

QC Samples Table

Matrix	Soil (MIS Samples)
Analytical Group	Metals
Concentration Level	Low
Sampling SOP	SOP FO-015
Analytical Method/ SOP Reference	6010C
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	24

QC Sample:	**Frequency/Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Equipment Blank	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL

QC Samples Table

Matrix	Soil (Discrete Samples)
Analytical Group	Explosives
Concentration Level	Low
Sampling SOP	SOP FO-015
Analytical Method/ SOP Reference	8330A
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	40

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	One per matrix per analytical method for each batch of at most 10 samples.	8330A	None	Laboratory Analyst	Precision	RPD Less than or equal to 30%
Field Blank	One per matrix per analytical method for each batch of at most 20 samples.	8330A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL
Laboratory Control Sample	One per matrix per analytical method for each batch of at most 20 samples.	8330A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy in quality system matrix	See Attachment A
Matrix Spike/ Matrix Spike Duplicate (inorganics)	One per matrix per analytical method for each batch of at most 20 samples.	8330A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Precision	See Attachment A

QC Samples Table

Matrix	Soil (Discrete Samples)
Analytical Group	Explosives
Concentration Level	Low
Sampling SOP	SOP FO-015
Analytical Method/ SOP Reference	8330A
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	40

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per matrix per analytical method for each batch of at most 20 samples.	8330A-No detectable analytes greater than ½ RL	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL
Equipment Blank	One per matrix per analytical method for each batch of at most 20 samples.	8330A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL

QC Samples Table

Matrix	Soil (Discrete Samples)
Analytical Group	Metals
Concentration Level	Low
Sampling SOP	SOP FO-015
Analytical Method/ SOP Reference	6010C
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	40

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	One per matrix per analytical method for each batch of at most 10 samples.	6010C/7471A	None	Laboratory Analyst	Precision	RPD Less than or equal to 30%
Field Blank	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL
Laboratory Control Sample	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy in quality system matrix	+/- 20%
Matrix Spike/ Matrix Spike Duplicate (inorganics)	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Precision	80-120 % Recovery, 20% RPD

QC Samples Table

Matrix	Soil (Discrete Samples)
Analytical Group	Metals
Concentration Level	Low
Sampling SOP	SOP FO-015
Analytical Method/ SOP Reference	6010C
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	40

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A-No detectable analytes greater than ½ RL	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL
Equipment Blank	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL

QC Samples Table

Matrix	Surface Water (Discrete Samples)
Analytical Group	Explosives
Concentration Level	Low
Sampling SOP	SOP FO-016
Analytical Method/ SOP Reference	8330A
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	One per matrix per analytical method for each batch of at most 10 samples.	8330A	None	Laboratory Analyst	Precision	RPD Less than or equal to 30%
Field Blank	One per matrix per analytical method for each batch of at most 20 samples.	8330A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL
Laboratory Control Sample	One per matrix per analytical method for each batch of at most 20 samples.	8330A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy in quality system matrix	See Attachment A
Matrix Spike/ Matrix Spike Duplicate (inorganics)	One per matrix per analytical method for each batch of at most 20 samples.	8330A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Precision	See Attachment A

QC Samples Table

Matrix	Surface Water (Discrete Samples)
Analytical Group	Explosives
Concentration Level	Low
Sampling SOP	SOP FO-016
Analytical Method/ SOP Reference	8330A
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per matrix per analytical method for each batch of at most 20 samples.	8330A-No detectable analytes greater than ½ RL	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL
Equipment Blank	One per matrix per analytical method for each batch of at most 20 samples.	8330A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL

QC Samples Table

Matrix	Surface Water (Discrete Samples)
Analytical Group	Metals
Concentration Level	Low
Sampling SOP	SOP FO-016
Analytical Method/ SOP Reference	6020A
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	20

QC Sample:	**Frequency/Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Field Duplicate	One per matrix per analytical method for each batch of at most 10 samples.	6010C/7471A	None	Laboratory Analyst	Precision	RPD Less than or equal to 30%
Field Blank	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL
Laboratory Control Sample	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy in quality system matrix	+/- 20%
Matrix Spike/ Matrix Spike Duplicate (inorganics)	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Precision	80-120 % Recovery, 20% RPD

QC Samples Table

Matrix	Surface Water (Discrete Samples)
Analytical Group	Metals
Concentration Level	Low
Sampling SOP	SOP FO-016
Analytical Method/ SOP Reference	6020A
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A-No detectable analytes greater than ½ RL	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL
Equipment Blank	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL

QC Samples Table

Matrix	Sediment (Discrete Samples)
Analytical Group	Explosives
Concentration Level	Low
Sampling SOP	SOP FO-016
Analytical Method/ SOP Reference	8330A
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	One per matrix per analytical method for each batch of at most 10 samples.	8330A	None	Laboratory Analyst	Precision	RPD Less than or equal to 30%
Field Blank	One per matrix per analytical method for each batch of at most 20 samples.	8330A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL
Laboratory Control Sample	One per matrix per analytical method for each batch of at most 20 samples.	8330A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy in quality system matrix	See Attachment A
Matrix Spike/ Matrix Spike Duplicate (inorganics)	One per matrix per analytical method for each batch of at most 20 samples.	8330A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Precision	See Attachment A

QC Samples Table

Matrix	Sediment (Discrete Samples)
Analytical Group	Explosives
Concentration Level	Low
Sampling SOP	SOP FO-016
Analytical Method/ SOP Reference	8330A
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	20

QC Sample:	**Frequency/Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Method Blank	One per matrix per analytical method for each batch of at most 20 samples.	8330A-No detectable analytes greater than ½ RL	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL
Equipment Blank	One per matrix per analytical method for each batch of at most 20 samples.	8330A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL

QC Samples Table

Matrix	Sediment (Discrete Samples)
Analytical Group	Metals
Concentration Level	Low
Sampling SOP	SOP FO-016
Analytical Method/ SOP Reference	6010C
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	One per matrix per analytical method for each batch of at most 10 samples.	6010C/7471A	None	Laboratory Analyst	Precision	RPD Less than or equal to 30%
Field Blank	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL
Laboratory Control Sample	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy in quality system matrix	+/- 20%
Matrix Spike/ Matrix Spike Duplicate (inorganics)	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Precision	80-120 % Recovery, 20% RPD

QC Samples Table

Matrix	Sediment (Discrete Samples)
Analytical Group	Metals
Concentration Level	Low
Sampling SOP	SOP FO-016
Analytical Method/ SOP Reference	6010C
Sampler's Name	Field Personnel
Field Sampling Organization	ZAPATA
Analytical Organization	Accutest
No. of Sample Locations	20

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A-No detectable analytes greater than ½ RL	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL
Equipment Blank	One per matrix per analytical method for each batch of at most 20 samples.	6010C/7471A	If outside of control, reanalyze. Qualify data as needed.	Laboratory Analyst	Accuracy/Bias	No detectable target analytes less than ½ RL

QAPP Worksheet #29

(UFP-QAPP Manual Section 3.5.1)

☐ Worksheet Not Applicable (State Reason)

Project Documents and Records Table

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records	Other
Field Logbook Sampling Logs Daily Quality Summary Report Chain-of-Custody Records Shipping Records	N/A	Laboratory Analytical Reports Laboratory Quality Control Report Laboratory Chain-of-Custody Records ADR SEDD	Data Validation Report	GIS database, updated as appropriate

QAPP Worksheet #30

(UFP-QAPP Manual Section 3.5.2.3)

☐ Worksheet Not Applicable (State Reason)

Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Location/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	QA Laboratory/Organization (Name and Address, Contact Person and Telephone Number
Soil	Explosives	Low	Waikane Training Area	SW-846 8332B GC034	30 days	Accutest Laboratories Sue Bell Southeast, Inc. 4405 Vineland Rd, Ste C-15, Orlando, FL 32811 (407) 425-6700	TestAmerica Laboratories Debra Henderer 4955 Yarrow Street Arvada, CO 80002 (303) 736-0134
Soil	Metals	Low	Waikane Training Area	MET100, MET104	30 days	Accutest Laboratories Sue Bell Southeast, Inc. 4405 Vineland Rd, Ste C-15, Orlando, FL 32811 (407) 425-6700	TestAmerica Laboratories Debra Henderer 4955 Yarrow Street Arvada, CO 80002 (303) 736-0134
Surface Water	Explosives	Low	Waikane Training Area	SW-846 8330A; GC016;	30 days	Accutest Laboratories Sue Bell Southeast, Inc. 4405 Vineland Rd, Ste C-15, Orlando, FL 32811 (407) 425-6700	TestAmerica Laboratories Debra Henderer 4955 Yarrow Street Arvada, CO 80002 (303) 736-0134
Surface Water	Metals	Low	Waikane Training Area	MET100, MET103	30 days	Accutest Laboratories Sue Bell Southeast, Inc. 4405 Vineland Rd, Ste C-15, Orlando, FL 32811 (407) 425-6700	TestAmerica Laboratories Debra Henderer 4955 Yarrow Street Arvada, CO 80002 (303) 736-0134
Sediment	Explosives	Low	Waikane Training Area	SW-846 8332B GC034	30 days	Accutest Laboratories Sue Bell Southeast, Inc. 4405 Vineland Rd, Ste C-15, Orlando, FL 32811 (407) 425-6700	TestAmerica Laboratories Debra Henderer 4955 Yarrow Street Arvada, CO 80002 (303) 736-0134
Sediment	Metals	Low	Waikane Training Area	MET100, MET104	30 days	Accutest Laboratories Sue Bell Southeast, Inc. 4405 Vineland Rd, Ste C-15, Orlando, FL 32811 (407) 425-6700	TestAmerica Laboratories Debra Henderer 4955 Yarrow Street Arvada, CO 80002 (303) 736-0134

Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Location/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	QA Laboratory/Organization (Name and Address, Contact Person and Telephone Number
Groundwater	Perchlorate	Low	Waikane Training Area	6850 LC/MS-CLO4	30 days	ALS Kevin Griffiths 960 West Levoy Drive, Salt Lake City, Utah 84123 (801) 904-4302	TestAmerica Laboratories Debra Henderer 4955 Yarrow Street Arvada, CO 80002 (303) 736-0134

QAPP Worksheet #31

(UFP-QAPP Manual Section 4.1.1)

☐ Worksheet Not Applicable (State Reason)

Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)
Laboratory* Audit		External			Sue Bell Project Manager (Accutest)		
Field Safety Audit	Weekly	Internal	ZAPATA	Eric Brundage UXO QC/SO (ZAPATA)	Field Personnel	Eric Brundage UXO QC/SO (ZAPATA)	George Dwiggins, Ph.D., CIH, CSP Corporate Safety Officer (ZAPATA)
Field Document Audit	Weekly during field operations	Internal	ZAPATA	Eric Brundage UXO QC/SO (ZAPATA)	Field Personnel	Eric Brundage UXO QC/SO (ZAPATA)	Suzy Cantor-McKinney, Quality Manager (ZAPATA)
Analytical Data Review Audit	Daily during field operations	External	HSW Engineering, Inc.	Cindy Lee Westergard Data Validator (HSW Engineering, Inc.)	Sue Bell Project Manager (Accutest)	Suzy Cantor-McKinney Project Manager (ZAPATA)	Suzy Cantor-McKinney, Quality Manager (ZAPATA)
Field Sampling Audit	One; conducted at the start of field operations	Internal	ZAPATA	Eric Brundage UXO QC/SO (ZAPATA)	Field Personnel	Eric Brundage UXO QC/SO (ZAPATA)	Suzy Cantor-McKinney, Quality Manager (ZAPATA)

* Certificate of Accreditation (Certificate # L2229) dated December 2009 satisfies this requirement.

QAPP Worksheet #32

(UFP-QAPP Manual Section 4.1.2)

☐ Worksheet Not Applicable (State Reason)

Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Field Sampling Audit	Audit Form	David Wolf Project Manager (ZAPATA)	Immediate	Email and telephone call (record-of-communication)	Kim Meacham, Technical Manager (USAESCH) David Wolf, Project Manager (ZAPATA) Field Personnel (ZAPATA)	Immediate
Field Document Audit	Audit Form	David Wolf Project Manager (ZAPATA)	Immediate	Email and telephone call (record-of-communication)	Kim Meacham, Technical Manager (USAESCH) David Wolf, Project Manager (ZAPATA) Field Personnel (ZAPATA)	Immediate
Field Safety Audit	Audit Form	David Wolf Project Manager (ZAPATA)	Immediate	Email and telephone call (record-of-communication)	Kim Meacham, Technical Manager (USAESCH) David Wolf, Project Manager (ZAPATA) George Dwiggins, Ph.D., CIH, CSP, Corporate Safety Manager (ZAPATA) Field Personnel (ZAPATA)	Immediate
Analytical Data Review Audit	Audit Report	David Wolf Project Manager (ZAPATA)	Within 7 days of audit	Memo to project files	Kim Meacham, Technical Manager (USAESCH) David Wolf, Project Manager (ZAPATA) Sue Bell, Project Manager (Accutest) Cindy Lee Westergard, Data Validator (HSW Engineering, Inc.)	Within 7 days of audit

QAPP Worksheet #33
(UFP-QAPP Manual Section 4.2)

☐ Worksheet Not Applicable (State Reason)

QA Management Reports Table

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Field Sampling Audit Report	One, at the start of sampling operations	May 2010	Suzy Cantor-McKinney, Quality Manager (ZAPATA)	Becky Terry, Project Manager (USAESCH) David Wolf, Project Manager (ZAPATA)
Laboratory Audit Report	One, prior to sampling operations	April 2010	Cindy Lee Westergard, Data Validator (HSW Engineering, Inc.)	Becky Terry, Project Manager (USAESCH) David Wolf,, Project Manager (ZAPATA)
Field Document Audit Report	One, at the start of sampling operations	May 2010	Suzy Cantor-McKinney, Quality Manager (ZAPATA)	Becky Terry, Project Manager (USAESCH) David Wolf,, Project Manager (ZAPATA)
Field Safety Audit Report	TBD, as necessary	Summer 2010	George Dwiggins, Ph.D., CIH, CSP, Corporate Safety Manager (ZAPATA)	Becky Terry, Project Manager (USAESCH) David Wolf,, Project Manager (ZAPATA)
Analytical Data Review Audit Report	One, before the start of data validation	Fall 2010	Cindy Lee Westergard, Data Validator (HSW Engineering, Inc.)	Becky Terry, Project Manager (USAESCH) David Wolf,, Project Manager (ZAPATA)
Final RI/FS Report	One, before submittal of final report	2011	Suzy Cantor-McKinney, Quality Manager (ZAPATA)	Becky Terry, Project Manager (USAESCH) David Wolf,, Project Manager (ZAPATA)

QAPP Worksheet #34
(UFP-QAPP Manual Section 5.2.1)

☐ Worksheet Not Applicable (State Reason)

Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Field Logbooks	Field logbooks will be reviewed for completeness and placed into the project files. Copies of the field logbook may be included in the final report, as needed.	Internal	David Wolf (ZAPATA)
Chain-of-Custody and shipping airbills	Chain-of-Custody forms will be reviewed internally upon completion and verified against the packed sample coolers. A carbon copy of the chain-of-custody form will be retained on site for the during of the sampling operations. The original chain-of-custody form (minus one carbon copy) will be placed inside a Zip loc bag and taped to the inside of the sample cooler.	Internal	Field Personnel (ZAPATA)
Audits Reports	Original audit reports will be placed in the project files along with any corrective action documentation and implementation.	Internal	David Wolf (ZAPATA)
Laboratory Analytical Data	All analytical data packages will be verified by the laboratory performing the work for completeness prior to submittal.	External	Sue Bell (Accutest)
Laboratory Analytical Data	All analytical data packages will be verified according to the data validation procedures specified in Worksheet #36.	External	Cindy Lee Westergard (HSW Engineering)

QAPP Worksheet #35
(UFP-QAPP Manual Section 5.2.2)

☐ Worksheet Not Applicable (State Reason)

Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	Data Deliverables and QAPP	Ensure the data from Step I was provided.	Suzy Cantor-McKinney, Quality Manager (ZAPATA)
IIa	Analytes	Ensure all analytes specified in Worksheet #15 were analyzed and reported by the laboratory.	See above.
IIa	Chain-of-Custody	Evaluate the traceability of the data from time of sample collection through reporting of the data results.	See above.
IIa	Holding Times	Ensure samples were evaluated within the allowable holding times.	See above.
IIa	Data Qualifiers	Evaluate the laboratory data qualifiers and ensure definitions are appropriate and applied as specified in methods, procedures and contracts.	See above.
IIa	Raw Data	Review 10% of the raw data to confirm laboratory calculations.	See above.
IIb	Sampling Plan	Confirm that the number and type of soil, sediment and surface-water samples specified in Worksheet #20 were collected and analyzed.	See above.
IIb	Sampling Procedure	Confirm sampling SOPs were followed.	See above.
IIb	Field QC Samples	Confirm that the number and type of quality control samples specified in Worksheet #20 were collected and analyzed. Compare the results of collocated field duplicates with criteria established in the QAPP.	See above.
IIb	Project Quantitation Limits	Determine whether the sample results met the project quantitation limits and qualify the data, as necessary.	See above.

QAPP Worksheet #36

(UFP-QAPP Manual Section 5.2.2)

☐ Worksheet Not Applicable (State Reason)

Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
IIa	Soil	Explosives	Low	EPA 8330B and QAPP Worksheets 12, 15 and 23	Cindy Lee Westergard (HSW Engineering, Inc.)
IIb	Soil	Metals	Low	EPA 6010C and QAPP Worksheets 12, 15 and 23	Cindy Lee Westergard (HSW Engineering, Inc.)
IIa	Soil	Explosives	Low	EPA 8330A and QAPP Worksheets 12, 15 and 23	Cindy Lee Westergard (HSW Engineering, Inc.)
IIa	Sediment	Explosives	Low	EPA 8330A and QAPP Worksheets 12, 15 and 23	Cindy Lee Westergard (HSW Engineering, Inc.)
IIb	Sediment	Metals	Low	EPA 6010C and QAPP Worksheets 12, 15 and 23	Cindy Lee Westergard (HSW Engineering, Inc.)
IIa	Surface Water	Explosives	Low	EPA 8330A and QAPP Worksheets 12, 15 and 23	Cindy Lee Westergard (HSW Engineering, Inc.)
IIb	Surface Water	Metals	Low	EPA 6010A and QAPP Worksheets 12, 15 and 23	Cindy Lee Westergard (HSW Engineering, Inc.)

QAPP Worksheet #37
(UFP-QAPP Manual Section 5.2.3)

☐ Worksheet Not Applicable (State Reason)

Usability Assessment

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:

The following section describes the DQOs in terms of precision, accuracy, representativeness, completeness, and comparability for both field and laboratory programs.

Relative Standard Deviation
The Relative Standard Deviation (RSD) of the field triplicate samples is used to demonstrate that the investigation error for each contaminant is within a reasonable range to support a conclusion that average contaminant concentrations are normally-distributed, representative of the DU, and below or above the relevant action level criteria established in the data quality objectives. Theoretically, the MIS sampling approach provides average concentrations that approximate a normal distribution. The RSD is expressed as a percentage using the following equation;

RSD% = (100% * Standard Deviation)/Average

A RSD calculation of 35% or less will represent at acceptable amount of estimated total error for our decision-making needs. However, in the event the RSD calculation exceeds 35%, we will evaluate the contaminant concentrations relative to the established action level criteria; RSD calculations in excess of 35% will be considered acceptable where contaminant concentrations are a factor of three below the relevant contaminant action level criteria. A large number of sub-sample increments within a DU increases the likelihood that samples are more representative of the DU. Zapata's SOP for MIS sampling directs field personnel to collect numerous sub-sample aliquots, usually between 30 and 50 increments per sample.

Precision
Precision is the degree of mutual agreement among individual measurements of a given parameter under the same conditions. The objective for precision is to meet the limits set by the methods and/or in-house limits. Relative percent difference (RPD) is used to express precision between two replicate values for laboratory QC samples (e.g., MS/MSDs, LCS/LCSDs, or laboratory duplicates).

The RPD is calculated as:

$$RPD = \frac{|V1 - V2|}{(V1 + V2) \div 2} \times 100$$

where:

Vl, V2 = Values obtained by analyzing the duplicate samples.

Precision will be evaluated for field duplicates and field splits by the procedures given in USACE document EM 200-1-6 *Chemical Quality Assurance for HTRW Projects* 10 October 1997, summarized as follows.

- When either the sample or duplicate / split result is less than the detection limit (DL), precision is considered acceptable (no disagreement) if the split / duplicate result is within 5x of the sample result.
- When either the sample or duplicate / split result is less than the reporting limit (RL), precision is considered acceptable (no disagreement) if the split / duplicate result is within 3x of the sample result.
- For aqueous samples, when both the sample and duplicate / split results are greater than the RL, precision is considered acceptable (no disagreement) if the duplicate / split is within 2x of the sample result.
- For soil / sediment / solid samples, when both the sample and duplicate / split results are greater than the RL, precision is considered acceptable (no disagreement) if the duplicate / split is within 4x (explosives) or 2x (metals) of the sample result.

Accuracy
Accuracy is the degree of agreement of a measurement or the average of several measurements with an accepted reference or "true" value; it is a measure of bias in the system. Percent recovery (%Rec) is used to express accuracy.

The %Rec is calculated as:

$$\%\text{Rec} = \frac{|\text{SPV} - \text{SAV}|}{\text{SA}} \times 100$$

where:

SAV = The background value obtained by analyzing the sample
SA = Concentration of the spike added to the sample
SPV = Value obtained by analyzing the sample with the spike added

Representativeness
Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Careful choice and use of appropriate methods in the field will ensure that samples are representative. This is relatively easy with water or air samples, given that the components of these media are usually homogeneously dispersed. In contrast, soil and sediment contaminants are unlikely to be evenly distributed; hence, it is important for the sampler and analyst to exercise good judgment when collecting and analyzing a sample.

Completeness
Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that one is expecting to obtain under normal conditions. The data set must contain all analytical results and data specified for the project to be considered complete. In addition, all data are compared to project requirements to ensure that specifications have been met. Any deviations are addressed in the report narrative.

Little data exist on the completeness achieved by individual methods. Screening data will be expected to have lower completeness levels. However, because they often are on-site measurement techniques, providing results in real-time or after minimal delay, measurements can be repeated easily. Thus, a high degree of completeness can be achieved with these analytical levels.

The percent completeness for each set of samples is calculated as follows:

$$\text{Completeness} = \frac{\text{valid data obtained}}{\text{total data obtained}} \times 100$$

Project completeness will primarily be based on the analytical samples collected for the target analytes and less on any field observations, screening, or toxicity characteristics (waste characterization samples). ZAPATA expects a completeness level of at least 90%. The validation process may reject the remaining data.

Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Sampling data should be comparable with data generated using similar methods, samples, and sample conditions. This goal is achieved by using standard techniques to collect and analyze representative samples and reporting analytical results in appropriate units.

The objective for comparability is to strive toward the comparability of sample parameters on similar matrices as they relate to precision and accuracy determinations. Strict adherence to QA/QC procedures promotes the comparability of one set of reference data to another or comparability of data among all facilities.

Describe the evaluative procedures used to assess overall measurement error associated with the project: See above.

Identify the personnel responsible for performing the usability assessment: Fred Tolen, P.G.

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies: The Project Quality Objectives (PQOs) identified in Worksheet #11 will be evaluated to determine if the PQOs were met. Based on the outcome of this evaluation, the overall quality of the data will be determined. Data requiring reconciliation will be noted. The overall quality and useability of the data will be documented in the Final RI/FS Report along with any limitations associated with the assessment, if necessary.

ATTACHMENT A
LABORATORY SPECIFIC LIMITS FOR LCS AND MS/MSD
(INCLUDED ELECTRONICALLY ONLY)

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ATTACHMENT B
STANDARD OPERATING PROCEDURES (SOPS)
(INCLUDED ELECTRONICALLY ONLY)

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ATTACHMENT C
LABORATORY QAPPS
(INCLUDED ELECTRONICALLY ONLY)

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