FINAL

REMEDIAL INVESTIGATION WORK PLAN

PACIFIC JUNGLE COMBAT TRAINING CENTER

OAHU, HAWAII

FUDS Project Number H09HI027401
Contract: W912DY-10-D-0053
Task Order: 0002

Prepared for:

United States Army Corps of Engineering, Honolulu District

and

United States Army Engineering and Support Center, Huntsville

by:
Huikala, LLC
3375 Koapaka St., STE F200
Honolulu, HI 96819

October 2013
Revision 3

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Reviewed by:

Richard Whipple, Corporate and Program Quality Control Manager

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Acronyms and Abbreviations

AHA	activity hazard analysis
AP	armor piercing
APP	Accident Prevention Plan
ARAR	applicable or relevant and appropriate requirements
ARPA	Archaeological Resources Protection Act
BATFE	Bureau of Alcohol, Tobacco, Firearms and Explosives
BWS	Honolulu Board of Water Supply
CEPOH	United States Army Corps of Engineers, Honolulu District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHSO	Corporate Health and Safety Officer
COPC	contaminant of potential concern
CQCM	Corporate Quality Control Manager
CSM	conceptual site model
DA	Department of Army
DD	Decision Document
DDESB	Department of Defense Explosives Safety Board
DERP	Defense Environmental Restoration Program
DFW	definable feature of work
DGM	digital geophysical mapping
DID	data item description
DLNR	Department of Land and Natural Resources, State of Hawaii
DMM	discarded military munitions
DoD	Department of Defense, United States
DOFAW	Division of Forestry and Wildlife, State of Hawaii
DOT	Department of Transportation, United States
DQO	data quality objective
DS	Demolition Supervisor
DU	decision units
EAL	environmental action level
EM	Engineer Manual
EOD	explosives ordnance disposal
EP	Engineer Pamphlet
EPA	Environmental Protection Agency, United States

ER	Engineer Regulation
ESP	Explosives Siting Plan
°F	degrees Fahrenheit
FCR	field change request
FFP	firm fixed price
FS	feasibility study
FUDS	Formerly Used Defense Sites
GIS	geographic information system
GPS	global positioning system
HA	hazard assessment
HAZWOPER	hazardous waste operations and emergency response
HDOH	State of Hawaii Department of Health
HE	high explosives
HEER	Hazard Evaluation and Emergency Response
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotients
HSP	health and safety procedure
HTRW	hazardous, toxic, and radioactive waste
IAW	in accordance with
IDW	investigation derived waste
INPR	Inventory Project Report
IS	incremental sample
ISO	industry standard objects
IVS	instrument verification strip
KO	Contracting Officer
m	meter
MC	munitions constituent
MD	munitions debris
MDAS	material documented as safe
MEC	munitions and explosives of concern
MFD	maximum fragment distance
MGFD	munition with greatest fragmentation distance
mm	millimeter

MPPEH	material potentially presenting an explosive hazard
MMRP	Military Munitions Response Program
MRS	munitions response site
MRSPP	munitions response site prioritization protocol
MSD	minimum separation distance
MSR	monthly status report
NAGPRA	Native American Graves Protection and Repatriation Act
NAS	National Academy of Sciences
NCP	National Contingency Plan
NDAI	No DoD Action Indicated
NG	nitroglycerin
NOAA	National Oceanic and Atmospheric Administration
OE	ordnance and explosives
OESS	Ordnance and Explosives Safety Specialist
OSHA	Occupational Safety and Health Administration
PETN	pentaerythritol tetranitrate
PgM	Program Manager
PJCTC	Pacific Jungle Combat Training Center
PM	Project Manager
PPE	personal protective equipment
PQCM	Program Quality Control Manager
PWS	performance work statement
QA	quality assurance
QC	quality control
QCP	Quality Control Plan
QR	qualitative reconnaissance
RA	risk assessment
RAC	risk assessment code
RCRA	Resource Conservation and Recovery Act
RDX	research development explosive (cyclotrimethylenetrinitramine)
RI	remedial investigation
RRD	range-related debris
RTE	rare, threatened, and endangered
SAP	Sampling and Analysis Plan
SI	site inspection

SSHP	Site Safety and Health Plan
SU	sampling unit
SUXOS	Senior UXO Supervisor
T&E	threatened and endangered
TBC	to be considered
TGM	Technical Guidance Manual
TNT	2,4,6-trinitrotoluene
TO	task order
TP	Technical Paper
TPP	Technical Project Planning
UFP-QAPP	Uniform Federal Policy – Quality Assurance Project Plan
UIC	underground injection control
USACE	United States Army Corps of Engineers
USAESCH	United States Army Engineering and Support Center, Huntsville
USC	United States Code
USFWS	United States Fish and Wildlife Service
UXO	unexploded ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer
VSP	Visual Sample Plan
WERS	Worldwide Environmental Remediation Services
WP	Work Plan

1.0 Introduction

1.0.1 This Work Plan (WP) has been prepared by Huikala Joint Venture, LLC (herein referred to as Huikala or the Contractor) for the United States Army Corps of Engineers (USACE), Honolulu District (CEPOH) and the United States Army Engineering and Support Center, Huntsville (USAESCH) under Contract No. W912DY-10-D-0053 Task Order (TO) 0002. This WP was developed in accordance with (IAW) Data Item Description (DID) Worldwide Environmental Remediation Services (WERS) – 001.01 and Engineer Manual (EM) 1110-1-4009.

1.0.2 The activities and plans outlined herein are in support of the Military Munitions Response Program (MMRP) at Formerly Used Defense Sites (FUDS). The activities described are based on three sources: (1) the performance work statement (PWS) entitled "Remedial Investigation/Feasibility Study, Pacific Jungle Combat Training Center, Honolulu County, Island of Oahu, Hawaii, H09HI027401" Revision 1 dated 3 August 2011; (2) the findings from the August 27, 2012 site visit; and (3) the Technical Project Planning (TPP) process.

1.1 Project Authorization

The Remedial Investigation (RI) / Feasibility Study (FS) activities required under the PWS (Appendix A) are being conducted under the Defense Environmental Restoration Program (DERP) – FUDS Program. Activities will be performed in a manner consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); the National Oil and Hazardous Substances Pollution Contingency Plan (NCP); 29 Code of Federal Regulations (CFR) 1910.120; and Engineer Regulation (ER) 200-3-1. All activities involving work in areas potentially containing unexploded ordnance (UXO) hazards will be conducted in full compliance with CEPOH, USAESCH, and Department of Defense (DoD) requirements regarding personnel, equipment, and procedures.

1.2 Task Order Purpose and Scope

1.2.1 The overall purpose of this TO is to achieve acceptance of a Decision Document (DD) in compliance with CERCLA, DoD, Department of Army (DA), and USACE regulations and guidance at the former Pacific Jungle Combat Training Center (PJCTC), Oahu, Hawaii FUDS Property No. H09HI027401. A RI needs to be conducted in order to achieve this goal.

1.2.2 The purpose of this WP is to describe the RI processes, procedures, and methods that will be used to gather data, assess risks to human health and the environment, and adequately characterize the nature and extent of contamination. The following activities will be conducted:

- Research historic documents and identify the historic boundaries of former training activities at PJCTC;
- Develop a transect design utilizing Visual Sample Plan (VSP) software;
- Conduct a munitions and explosives of concern (MEC) investigation;
- Utilize UXO Estimator to bound the extent of MEC contamination;
- Collect samples of environmental media where concentrated use of MEC is evident;
- Determine background concentrations of metals in environmental media;
- Identify potential site-specific human and ecological receptors; and
- Identify areas of concern and exposure (i.e., migration pathways).

1.2.3 The data gathered during the RI will be used to assess risk to potential receptors and adequately characterize the nature and extent of MEC and munitions constituents (MC) contamination at the former PJCTC. Results of the RI will be presented in a RI Report. If necessary, a FS and Proposed Plan will be prepared and submitted in order to support the development, evaluation, and selection of the appropriate munitions response alternative(s) to achieve acceptance of a DD.

1.3 Work Plan Organization

1.3.1 This WP contains the requirements as specified in EM 1110-1-4009 and DID WERS – 001.01 and is organized as follows:

Section 1.0 – Introduction
Section 2.0 – Technical Management Plan
Section 3.0 – Field Investigation Plan
Section 4.0 – Quality Control Plan
Section 5.0 – Explosives Management Plan
Section 6.0 – Explosives Siting Plan
Section 7.0 – Environmental Protection Plan
Section 8.0 – Property Management Plan (not applicable)
Section 9.0 – Interim Holding Facility Siting Plan (not applicable)
Section 10.0 – Physical Security Plan (not applicable)
Section 11.0 – References
Section 12.0 - Appendices

1.3.2 The following appendices are also provided:

Appendix A – Task Order Performance Work Statement

Appendix B – Figures
Appendix C – Points of Contact
Appendix D – Accident Prevention Plan
Appendix E – Munitions Constituents Sampling and Analysis Plan (Uniform Federal Policy for Quality Assurance Project Plan)
Appendix F – Contractor Forms
Appendix G – Minimum Safety Distance Calculation Sheets (to be included under separate cover)
Appendix H – Technical Project Planning Memorandum
Appendix I – Visual Sample Plan Report
Appendix J – Explosives Siting Plan
Appendix K – Biological Monitoring Plan

1.4 Project Location

1.4.1 The former PJCTC (also herein referred to as "project site" or "site") located on the northeast end of the island of Oahu, Hawaii. It consists of several non-contiguous parcels within the adjacent Kahana and Punaluu Valleys that total approximately 2,545 acres based on the 2004 Inventory Project Report (INPR) Supplement (USACE, 2004). The parcels are collectively considered a munitions response site (MRS). Portions of the MRS are located within the boundaries of the Ahupua'a 'O Kahana State Park and Hauula Forest Reserve.

1.4.2 In February 2013, CEPOH corrected the MRS boundaries in both Kahana and Punaluu Valleys to align them with the property boundaries in the historical real estate records used to establish the property's FUDS eligibility. Appendix B, Figure B1-1 depicts both the former and corrected MRS boundaries.

1.4.3 The majority of Kahana Valley parcels can be accessed via Kahana Valley Road, a public vehicular thoroughfare. Locked gates or chained barriers are located at the end of the public vehicular thoroughfare. Gates are maintained by the State of Hawaii Department of Land and Natural Resources (DLNR) Division of State Parks or the Honolulu Board of Water Supply (BWS). Vehicular access beyond the gates requires permission of DLNR or BWS, as appropriate. Pedestrian access is available to the numerous public hiking trails throughout the valley. Several of the smaller parcels located at the mouth of Kahana Valley can be accessed via Trout Farm Road.

1.4.4 Punaluu Valley can be accessed via a Punaluu Valley Road (sometimes referred to as Green Valley Road), a paved public thoroughfare. Punaluu Valley Road becomes unpaved and is blocked by a vehicle gate, controlled by private landowners. A privately owned and controlled irrigation access road off of Kamehameha Highway also provides access to the site.

1.5 Property Description and Setting

1.5.1 Topography and Vegetation

The MRS is located along northeastern slope of the Koolau Range and the coastal plain of Oahu. Kahana and Punaluu Valleys are mostly undeveloped, rugged, and densely forested land with mixed residential, agricultural, and recreational uses. The topography of each valley is relatively flat to gently sloping in the lower portions of the valleys with shallow to deep gulches and moderate to steep slopes further into the valleys. Elevations range from near sea level to approximately 2,000 feet above sea level in the mountainous interior regions. Vegetation is dense in the interior portions of both valleys. The natural vegetation includes ferns, guava, Christmas berry, java plum, rice grass, hilograss, and paragrass (Parsons, 2008). Both valleys include areas of ancient wet taro cultivation systems.

1.5.2 Geology

1.5.2.1 Oahu consists of the eroded remains of two coalesced shield volcanoes, the Waianae Volcano and the Koolau Volcano. Shield-building lavas emanated mainly from rift zones of the volcanoes. Subaerial eruptions of the Waianae Volcano occurred between 3.9 and 2.5 million years ago. Eruptions of the Koolau Volcano occurred between 2.6 and 1.8 million years ago. The volcanoes have subsided more than 6,000 feet and erosion has destroyed all but the western rim of the Koolau Volcano and the eastern part of the Waianae Volcano, represented by the Koolau and Waianae Ranges, respectively (Hunt, 1996).

1.5.2.2 The geology in the interior parts of the MRS along the slope of the Koolau Range is mapped as the Koolau Basalt which consists of tholeiitic basalt lava flows and feeder dikes (Hunt, 1996). The lower elevation areas that lie in the Kahana and Punaluu Valleys are underlain by alluvium at shallow depths. Marine sediment may underlie the alluvium in the lower parts of the valleys near the coast. Both valleys were cut back into the ancient cliffs of the Koolau Range by erosion during a higher stand in sea level and are considered to be “drowned valleys” as the floor of each valley extends offshore (Parsons, 2008).

1.5.2.3 Chemical weathering readily decomposes basaltic rocks to produce thick zones of clay rich saprolite that is easily eroded. The soil covering most of the MRS is the Waikane Series dark brown silty clay on steep terraces and alluvial fans. The Hanalei series dark gray silty clay is found in the less well drained floodplains of the lower valleys (Parsons, 2008).

1.5.3 Hydrology

1.5.3.1 The surface water hydrology is characterized by the occurrence of numerous streams that flow from the high elevation mountain areas of the Koolau Range into the valleys where they coalesce and eventually discharge into the ocean. Two primary streams referred to as “pristine” are located in the MRS: the Punaluu Stream which drains Punaluu Valley and the Kahana Stream

which drains Kahana Valley. There are no lakes or other large bodies of water in the MRS, although there are wetlands in the lower parts of both valleys and a fishpond in the lower Kahana Valley (Parsons, 2008).

1.5.3.2 Volcanic-rock aquifers are the most extensive and productive groundwater sources in the Hawaiian Islands. On Oahu, the primary aquifers occur in the thick accumulations of thin-bedded permeable lavas of the Koolau Basalt and the Waianae Volcanics. The aquifers of Oahu contain two flow regimes; shallow freshwater and deep saltwater. The basal freshwater, derived primarily from the infiltration of rainfall through the permeable lavas in the mountainous regions, floats as a lens on the underlying saltwater in a condition of buoyant displacement. Another important source of freshwater is dike-impounded groundwater. The intrusion of near vertical, relatively impermeable basaltic dikes particularly along the rift zones has isolated smaller compartments of fresh groundwater at levels higher than the regional basal freshwater lens. The upper parts of Kahana and Punaluu Valleys are within the Koolau rift zone which contains dike impounded groundwater (Parsons, 2008).

1.5.3.3 The MRS is located in the eastern Oahu groundwater flow system. In this flow system, which lies east of the Koolau Range topographic divide, fresh groundwater flows east-northeast from the high elevation mountainous areas of the Koolau Range towards the low elevation coastal plain. A narrow band of caprock (sedimentary deposits) along the northeast Oahu coast confines the fresh groundwater in the area. Springs present along the slope of the Koolau Range in the western part of the MRS result from the release of confined basal and/or dike impounded groundwater. The depths to groundwater in the MRS are uncertain, but likely vary considerably depending on the ground surface elevation. The topography and ground surface elevations are shown in Appendix B, Figure B1-1. In the lower parts of the valleys near the coast, groundwater probably occurs at relatively shallow depths that approximate sea level elevation. In the inland portions of the MRS where surface elevations are considerably higher, the depth to groundwater is probably much deeper relative to surface grade. Most of the MRS is located above the State of Hawaii Department of Health (HDOH) Underground Injection Control (UIC) Line which means the underlying aquifer is considered a drinking water source (Parsons, 2008).

1.5.3.4 According to the Banks Environmental Data Water Well Report, there are 76 registered wells within a 4-mile radius of MRS, of which 41 are listed as active wells. No active wells are present in any of the MRS parcels. There are 11 public water supply (municipal) wells located less than 0.5 miles of the MRS parcel boundaries. These municipal wells are owned by the Honolulu BWS (Banks, 2008).

1.5.4 Climate

Due to the location of the Hawaiian Islands in the northern tropics, Oahu's climate is mild and pleasant, primarily due to the presence of cooling trade winds. Average temperatures range from 65° to 88° F with moderate humidity of 53% during the day, with decreasing temperatures in

higher elevations. Temperatures are coolest in January/February and warmest in August/September. Mean relative humidity on Oahu ranges from 61 to 80% per month (NOAA, 2013). The main mechanism for rainfall is warm, moist ocean air rising and cooling as it passes over the mountains causing precipitation. This results in higher rainfall in the windward and mountain areas, and little in the leeward and coastal zones. The average annual rainfall ranges from 69 inches/year to 235 inches/year in the vicinity of the MRS (Giambelluca, 2012).

1.5.5 Biological and Ecological Resources

1.5.5.1 It is indeterminate as to how many of the 344 federally listed threatened and endangered (T&E) species actually occupy the PJCTC. According to the 2005 Hawaii's Comprehensive Wildlife Conservation Strategy report (Division of Forestry and Wildlife [DOFAW]), the animal species of most concern for the island of Oahu are: the Hawaiian hoary bat (*Lasiurus cinereus semotus*), Oahu 'elepaio (*Chasiempis sandwichensis ibidis*), Hawaii stilt (*Himantopus mexicanus knudseni*), Hawaii coot (*Fulica Americana alai*), Hawaii duck (*Anas wyvilliana*), Hawaii common moorhen (*Gallinula cholorpus sandvicensis*), Oahu creeper (*Paroeomyza maculate*), Hawaiian petrel (*Pterodroma sandwichensis*), Newell's shearwater (*Puffinus auricularis newelli*), Oahu tree snail (*achatinella spp.*), and the green sea turtle (*Chelonia mydas agassizi*) (Parsons, 2008).

1.5.5.2 The Hawaii Coot *(Fulica americana alai*) and Hawaii Gallinule (*Gallinula chloropus sandvicensis*) inhabit Huilua Fishpond and lowland areas of Kahana Valley. The upper regions of both valleys support native bird species such as the '*Apapane* (*Himatione sanguinea*) and the Oahu '*Amakihi* (*Himignathus v. chloris*) (Wil Chee, 1993).

1.5.5.3 According to the Hawaii Coastal Zone Management Program, administered by the State of Hawaii Department of Business, Economic Development, and Tourism, portions of the MRS lie within the coastal zone area.

1.5.5.4 Appendix B, Figure B1-2 outlines several areas within the lower portions of MRS are classified as wetlands per the United States Fish and Wildlife Service (USFWS) Wetlands Online Mapper. The types of wetlands include:

- E1UBL – Estuarine and Marine Deepwater (Open water estuary, bay, sound, open ocean)
- E2FO3N – Estuarine and Marine Wetland (Vegetated and non-vegetated brackish and saltwater marsh, shrubs, beach, bar, shoal, or flat)
- PABHh – Freshwater Pond
- PEM1C – Freshwater Emergent Wetland (Herbaceous marsh, fen, swale, and wet meadow)

- PFO3C – Freshwater Forested/Shrub Wetland (Forested swamp or wetland shrub bog or wetland)

1.5.5.5 Refer to Appendix K for additional biological and ecological resource information.

1.5.6 Cultural and Archaeological Resources

1.5.6.1 According to the National Register Information System, National Register of Historic Places, and National Historic Landmarks databases, there are many recorded archaeological/cultural resources on Oahu. According to the State Historic Preservation Division database there are nine archaeological/cultural resources recorded on the Kahana (06) quadrangle map where the site is located. Specific locations of these nine areas are not available due to address restrictions on sensitive areas (Parsons, 2008).

1.5.6.2 An ancient wet taro system is believed to have dominated Kahana Valley at one time. Remnants of the system include as many as 120 small wet terraces and 12 irrigation canals. A temple or *heiau* is located in Kahana Valley in addition to three fishing shrines. Huilua Fishpond at the mouth of Kahana Valley, but outside of the MRS boundary, is listed on both the National and Hawaii registers of historic sites (Wil Chee, 1993).

1.5.6.3 Archaeological and cultural features are also present in the Punaluu Valley. Surveys have been conducted within the valley by the landowner, however, the information has not been provided to Huikala.

1.5.6.4 Additional cultural and archaeological information is provided in a separate Archaeological Monitoring Plan.

1.6 Property Ownership and History

1.6.1 Historic Use

1.6.1.1 The Army initially leased 485.25 acres in Kahana Valley in November 1944, retroactive to May 1943. Between 1943 and 1947, the Army acquired an additional 1,781.52 acres in the neighboring Punaluu Valley. The properties were established as a unit jungle combat training center beginning in September 1943. The training center was used to teach basic and advanced jungle warfare as well as instructor training.

1.6.1.2 Training was divided among Blue, Red, and Green Courses. Basic jungle warfare training was conducted at Blue and Red Courses while advanced jungle warfare training and the Instructor Jungle Training School were conducted on the Green Course. Live ammunition was reportedly utilized during jungle warfare training scenarios. The Army reportedly constructed Japanese villages and pillboxes for training purposes. Temporary barracks, a mess hall, a bakery, and shower facilities were also erected, though no longer exist. Advanced training on the Green Course was discontinued in May 1944 to focus on basic jungle warfare training.

1.6.1.3 In March 1945, the center became known as Unit Combat Training Centers. One month later, it was re-designated as Pacific Combat Training Center to de-emphasize jungle warfare. Over 241,000 men received basic, advance, or instructor training at the center.

1.6.1.4 Postwar plans called for closing the majority of the center except for the Green Course in Punaluu Valley which was to be retained to fulfill the Army's postwar training requirements. The Army re-opened Punaluu Valley on 01 April 1946 to provide emergency shelter for area residents displaced by a tsunami. Tents were erected for sleeping quarters, to render medical treatment, and to feed approximate 1,700 individuals. De-dudding efforts were conducted in Punaluu Valley in 1949 as a result of live ammunition used during training.

1.6.1.5 Parcels in Kahana Valley were returned to previous landowners in August 1946. The Leases, licenses, and permits for parcels in Punaluu Valley terminated between April 1945 and November 1950 and reverted back to previous owners.

1.6.2 Ownership

1.6.2.1 The Kahana Valley parcels are owned by the State of Hawaii and managed by the DNLR, Division of State Parks.

1.6.2.2 The Punaluu Valley parcels are primarily owned by Kamehameha Schools Bishop Estate. Kamehameha Schools leases land for agricultural purposes. Several of the smaller parcels are owned by private landowners.

1.6.3 Current and Future Land Use

1.6.3.1 The Kahana Valley parcels are located in the Ahupuaʻa ʻO Kahana State Park. The park was established as a "living park" with the primary purpose to nurture and foster native Hawaiian cultural traditions and the cultural landscape of rural windward Oahu. Thirty-one families live within the ahupuaa of Kahana. They assist with interpretive programs that share the Hawaiian values and lifestyle. Additionally, there are public hiking trails, campsites, and hunting areas within the park that intersect with the project site. Permits are required to access the campsites and hunting areas. There are no known plans for future development that deviate from the current usage.

1.6.3.2 Interior portions of the Punaluu Valley parcels are located in the Hauula Forest Reserve. Residential dwellings are located at the mouth of the valley; however the majority of the land is being used for agricultural purposes. Hunting is allowed in the valley though access is generally restricted to valley residents, guests, and landowner and lease personnel. Kamehameha Schools has developed the Punaluu Ahupuaa Plan that identifies 29 projects and programs to be developed in the future. Several have target dates within the next three to five years. Future projects and programs focus on economic and agricultural development, educational programs, cultural support, and environmental management.

1.7 Previous Investigations

1.7.1 1993 Inventory Project Report

1.7.1.1 The 1993 INPR established the former PJCTC as a site under the FUDS program. The INPR identified the boundaries of the PJCTC and describes the site as 2,266.77 acres of land located in Kahana Valley (485.25 acres) and Punaluu Valley (1,781.52 acres).

1.7.1.2 The INPR also documented the types of munitions found during site visits. Munitions in Kahana Valley included: tail section of a 2.36-inch bazooka round and a 105-millimeter (mm) armor piercing (AP) projectile. Munitions in Punaluu Valley included: .30-caliber bullets, expended M1 and M2 cartridges, 75-mm AP or high explosive (HE) projectile, expended MK28 sea marker, and an 81-mm mortar (Appendix B, Figure B1-3).

1.7.1.3 A risk assessment was performed to evaluate hazard severity and hazard probability. These factors are calculated to determine a Risk Assessment Code (RAC) between 1 and 5, with 1 being "Imminent Hazard" and 5 being "Recommend no further action." The hazard severity was determined to be "Critical" based on the large caliber munitions found at the site. The hazard probability was determined to be "Frequent." Ordnance was found during site visits and anecdotally confirmed in areas near inhabited structures or locations with little access restrictions. Based on this information, the RAC was 1.

1.7.2 2004 Inventory Project Report Supplement

1.7.2.1 The INPR Supplement increased the site from 2,266.77 acres to approximately 2,545 acres. No explanation was provided and the boundary map did not change.

1.7.2.2 Risk assessment factors were re-evaluated. The hazard probability was revised downward to "Probable." This adjustment changed the RAC to 2, "Recommend and approve further action as appropriate."

1.7.3 2008 Site Inspection Report

1.7.3.1 The 2008 Site Inspection (SI) was conducted to determine whether the site warranted further MEC or MC response action or a determination of No Department of Defense Action Indicated (NDAI). Qualitative reconnaissance (QR) and MC sampling were performed in July 2008.

1.7.3.2 Approximately 11.91 miles was covered as part of the QR. MEC (unexpended smoke grenade) and munitions debris (MD) (.30 caliber casings) were found during the QR. Additionally, one gun emplacement was found in Punaluu Valley and four gun emplacements were found on a ridge in the upper part of Kahana Valley (Parsons, 2008). Refer to Appendix B, Figure B1-4.

1.7.3.3 Incremental samples (IS) of surface soil were collected from three of four decision units (DU). The remaining DU was being used for agricultural and aquacultural purposes and not available to be sampled. Two ambient surface soil samples were also collected at locations not expected to be affected by munitions activities. IS of surface soil were collected in triplicate. Surface water and sediment samples were collected from Punaluu Stream and Kahana Stream, within the MRS boundary. Refer to Appendix B, Figure B1-5. No groundwater sample was collected because there is no drinking water source within the MRS.

1.7.3.4 Surface soil, surface water, and sediment samples were analyzed for explosives (2,4-dinitrotoluene) and metals (antimony, copper, lead, and zinc). The soil and sediment sample results were screened and evaluated using the HDOH Environmental Action Levels (EALs) for Soil (groundwater is a potential drinking water source; < 150 meters [m] to surface water). Surface water sample results were evaluated using the HDOH EAL for Surface Water.

1.7.3.5 No explosive compounds were detected in the surface soil samples collected from the three DUs. However, 2,4-dinitrotoluene was detected in one replicate ambient surface soil sample. Antimony, copper, lead, and zinc were detected in the surface soil samples at concentrations above the ambient concentrations derived from the ambient samples collected under this effort. Ambient concentrations are not considered background concentrations due to the detection of explosives in the ambient sample.

1.7.3.6 Human health and ecological screening level risk assessments for soil were conducted. The maximum concentration of 2,4-dinitrotoluene, antimony, copper, lead, and zinc did not exceed their respective screening levels in soil. The risk assessments concluded that no unacceptable risks to human or ecological receptors are expected from exposure to the MCs detected in surface soil.

1.7.3.7 No explosive compounds or metals were detected in surface water samples.

1.7.3.8 No explosive compounds were detected in sediment samples. However, copper, lead, and zinc were detected. As a result, human health and ecological screening level risk assessments for sediment were conducted. The maximum concentrations of copper, lead, and zinc in sediment did not exceed their respective screening levels. The risk assessments concluded that no unacceptable risks to human or ecological receptors are expected from exposure to MCs detected in surface water or sediment.

1.8 Fill Information for Anticipated MEC

The types of munitions found during previous investigations and the type of filler for the MEC anticipated to be found are provided in the Table 1-1.

Table 1-1: Fill Information for Anticipated MEC

General Munitions Type	Type/Model	Case Composition	Filler
105-mm HE Projectile	M1	Steel	2,4,6-trinitrotoluene (TNT) or Composition B (research development explosive [RDX, cyclotrimethylenetrinitramine] and TNT)
Mortar, 81-mm HE	M43A1	Steel	TNT Double base powder, Composition B, and Amatol (TNT and ammonium nitrate)
Mortar, 81-mm, Practice	M43A1	Steel	Black Powder
75-mm AP Projectile	M72	Steel	Igniter Composition K29 (Magnesium, Barium Peroxide, Laminac, Graphite) Tracer Composition R45 (Strontium Nitrate, Magnesium Aluminum Alloy, Polyvinyl Chloride)
75-mm HE Projectile	M48	Steel	Amatol, TNT
2.36-inch Rocket	M7A1	Steel	Pentolite (TNT, pentaerythritol tetranitrate [PETN])
M28 Sea Marker*	M28	Steel	titanium tetrachloride or sulfuric oxide mixture
Smoke Grenades	M18	Steel	potassium chlorate, dextrose, colored dye
Small Arms, General .30, and .50 Caliber	M2 Ball M1 Tracer M10 Tracer M17 Tracer M21 Tracer M2 AP Propellant Primer Percussion B	Brass	Soft steel Tracer Composition Tracer Composition Tungsten Chrome Steel Single- or double-base powder Primer Composition Strontium, lead, molybdenum, antimony, nitroglycerin (NG), PETN

* The Sea Marker was noted in the 1993 INPR as part of the Donaldson Enterprises Trip Report. However, it was not included in subsequent reports. The fillers are not considered contaminants of potential concern (COPC).

1.9 Initial Summary of MEC Explosive Hazards

1.9.1 The potential for MEC hazards within both Kahana and Punaluu Valleys is high. MEC and MD were recovered during the 1993 INPR site visits and the 2008 SI. There is also documented evidence that both MEC and MD have been recovered by area residents and users of recreational areas (i.e., hunters). The Honolulu Police Department has received reports from the general public of MEC in the MRS. The explosives ordnance disposal (EOD) team was subsequently called to dispose of the items. Refer to Appendix B, Figure B1-6 for a comprehensive map depicting known MEC and MD finds to date.

1.9.2 Additionally, given the site accessibility and the proximity to agricultural, recreational, and residential areas, there is a high potential for individuals to be exposed to MEC. Further MEC investigation will be performed as part of the RI.

1.10 Initial Summary of MC Risk

1.10.1 2008 Site Inspection

1.10.1.1 Surface soil, surface water, and sediment samples were collected and analyzed during the 2008 SI. Refer to Appendix B, Figure B1-5. Samples were analyzed for explosives and metals (antimony, copper, lead, and zinc).

1.10.1.2 Although, four metals (antimony, copper, lead, and zinc) were detected in the surface soil samples at concentrations above ambient concentrations and 2,4-dinitrotoluene was detected in one replicate ambient sample, the maximum concentrations of antimony, copper, lead, zinc, and 2,4-dinitrotoluene did not exceed their respective screening levels in soil. Screening-level risk assessments concluded that no unacceptable risks to human or ecological receptors are expected from exposure to the MCs detected in surface soil.

1.10.1.3 No explosive compounds or metals were detected in surface water samples.

1.10.1.4 No explosive compounds were detected in sediment samples. Three metals (copper, lead, and zinc) were detected; however, the maximum concentrations of copper, lead, and zinc in sediment did not exceed their respective screening levels. The risk assessments concluded that no unacceptable risks to human or ecological receptors are expected from exposure to MCs detected in surface water or sediment.

1.10.2 Munition Constituents for Additional Evaluation

1.10.2.1 The MRS has potential for MCs associated with historical use of MEC based on the results of the 2008 SI. Although antimony, copper, lead, zinc, and 2,4-dinitrotoluene were determined to not pose a risk to human or ecological receptors, the metals were still detected above ambient concentrations. There is no background concentration for 2,4-dinitrotoluene. Antimony, copper, lead, zinc, and 2,4-dinitroltoluene are considered COPCs for this project.

1.10.2.2 Other MCs that are potentially present based on the munitions and suspected munitions at the site include explosive compounds (HMX, RDX, TNB, DNB, TNT, DNT, NT, PETN, and NG) and molybdenum. These MCs are considered COPCs for this project.

1.10.2.3 Ammonium nitrate, a component of Amatol (filler for the 75-mm HE Projectile and 81-mm HE Mortar), was eliminated from consideration because ambient concentrations of this compounds likely result from agricultural use of fertilizers in the area. It is extremely difficult to conclusively show that concentrations at the site are due to MC contamination or are representative of the ubiquitous anthropogenic and natural background concentration.

1.10.2.4 Aluminum, magnesium, potassium, strontium, titanium, and tungsten have no known risk-based thresholds and are not considered COPCs.

1.10.2.5 Laminac, graphite, polyvinyl chloride, sulfuric oxide mixtures, dextrose, and colored dye are filler components but are not considered COPCs as these constituents are neither a metal or explosive and do not have an established risk-based threshold.

1.10.2.6 A list of all COPCs is provided in the UFP-QAPP, Table 15-1 (Appendix E).

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2.0 Technical Management Plan

The purpose of the Technical Management Plan is to provide an overview of the project objectives and detail the management and organizational aspects for achieving these objectives. The plan will identify roles and responsibilities of the Huikala project team, outline communication methods, review project deliverables, and discuss schedule, data management procedures, and data quality objectives.

2.1 Project Objectives

2.1.1 The project objectives listed below support achieving the goals set forth in the TPP Site Closeout Statement from the approved TPP 1 Memorandum (Appendix H). The closeout statement is as follows: "To manage MEC and MC through a combination of land use controls, removal/remediation (if necessary), and public education; thereby rendering the site as safe as reasonably possible to humans and the environment under the current and anticipated future land uses." The project objectives are:

- Delineate nature and extent of MEC within accessible areas (for safety concerns, this is defined as areas up to 18 degrees slope) of the MRS
- Determine the nature and extent of MC in soil, sediment, and surface water with potential exposure pathways to human and ecological receptors
- Define current and future land use
- Analyze MEC/MC impacts to the site and the resulting risk to human and ecological receptors
- Eliminate from further consideration those releases of DoD origin that pose no significant threat to human health or environment

2.1.2 The following sections of this plan discuss how the project will be managed and organized to achieve these objectives.

2.2 Project Organization

Appendix C presents a list of project personnel and contact information. Additionally, Appendix C presents the hierarchical organization chart depicting lines of communication and lines of authority.

2.2.1 Project Personnel

This section describes the primary roles and responsibilities of the Huikala personnel assigned to the project.

2.2.1.1 Program Manager

The Program Manager (PgM) is responsible for the overall execution of the contract. He will act as the primary point of contact for communicating with the USAESCH Contracting Officer (KO) regarding management and contracting issues.

2.2.1.2 Project Manager

The Project Manager (PM) has the overall responsibility for meeting project objectives. The PM will manage the Huikala resources needed for site operations and is responsible for the overall implementation of the project plan. The PM will have the following responsibilities:

- Managing day-to-day project resources and activities
- Overseeing technical and managerial responsibility for the project
- Understanding the requirements of the PWS and project objectives
- Coordinating and communicating with the USAESCH PM and CEPOH PM
- Reporting directly to the PgM
- Monitoring performance with respect to project schedules, budgets, and objectives
- Ensuring deliverables are submitted

2.2.1.3 Corporate/Program Quality Control Manager

The Corporate Quality Control Manager (CQCM), also serving as the Program Quality Control Manager (PQCM), is responsible for the overall quality management, quality control (QC), quality auditing, and process improvement for the contract. The CQCM/PQCM has the responsibility of ensuring implementation of the Quality Control Plan (QCP). The purpose of QC is to verify conformance of field activities with the project plans. The CQCM/PQCM will conduct inspections of the work performed by Huikala, subcontractors, or suppliers. The CQCM/PQCM is responsible for scheduling and coordinating inspections and tests. In the event that a non-conformance is discovered, the CQCM/PQCM has the authority to stop all work until all corrective action measures have been conducted to restore project quality. If the CQCM/PQCM is not satisfied with the resolution of the non-conformance, the PM will be contacted.

2.2.1.4 UXO Quality Control Specialist

The UXO Quality Control Specialist (UXOQCS) is a member of the QC team who will have the responsibility of ensuring that the QC requirements are achieved in accordance with the approved WP and that all site deliverables meet the requirements of the PWS. The specific responsibilities of the UXOQCS are outlined in the QCP included in this WP.

2.2.1.5 Project Chemist

The Project Chemist is responsible for overseeing the MCs sampling and analyses activities on this project. Specifically, the Project Chemist tasks will include:

- Preparing the Uniform Federal Policy for Quality Assurance Plan (UFP-QAPP)
- Determining the appropriateness of sampling and analytical methods
- Selecting laboratory and verifying qualifications
- Coordinating with the laboratory during contract execution
- Notifying the CQCM/PQCM and PM of any problems or non-conformance issues
- Implementing and monitor corrective action, as needed
- Performing data review and compare results against project-determined action levels

2.2.1.6 Corporate Health and Safety Officer

The Corporate Health and Safety Officer (CHSO) will provide occupational safety and health management duties as presented in detail in the Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP) for this project. The CHSO will direct how the APP/SSHP are implemented to include delegating authority to other personnel and directing the enforcement of the APP/SSHP, including removing individuals from the project for environmental, safety or health non-compliance.

2.2.1.7 UXO Safety Officer

The UXO Safety Officer (UXOSO), also referred to as the Site Safety and Health Officer, will be responsible for the operational items listed below in addition to the safety and health responsibilities:

- Issuing and/or approving "Stop Work" orders for safety and health reasons;
- Conducting on-site safety and health training for Huikala and subcontractor personnel;
- Identifying and evaluating any known or potential safety problems that may interfere with or interrupt site operations and endanger site personnel;
- Consulting with the PM on identifying and implementing any necessary safety-related corrective actions;
- Coordinating with the PM for the implementation of the safety requirements in the APP; and

- Ensuring that all site activities are conducted IAW this WP and relevant Federal, State, DoD, and DA rules and regulations.

2.2.1.8 Senior UXO Supervisor

The Senior UXO Supervisor (SUXOS) controls operations of all field teams performing MEC activities and monitors their performance to achieve maximum operational safety and efficiency. The SUXOS reports directly to the PM and will implement the approved plans in the field and must review and approve any changes. The SUXOS supervises all UXO teams on a project and coordinates subcontractor field activities. The SUXOS is authorized to temporarily stop work to correct an unsafe condition or procedure. The SUXOS will meet or exceed the requirements for that position as presented in the Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP) Number 18 – Minimum Qualifications for UXO Technicians and Personnel.

2.2.1.9 UXO Team Leader(s)

The UXO Team Leader(s) will have the responsibility of ensuring all MEC operations are conducted IAW this WP under the direction of the SUXOS.

2.2.1.10UXO Demolition Supervisor

The UXO Demolition Supervisor (DS) will be designated by the SUXOS. The DS will be present during and have direct control over all demolition operations at the site. The DS will be responsible for providing a pre-demolition briefing. The DS will also make sure that applicable forms, documentation, and records are completed and signed by appropriate project personnel. The DS will make sure that the logs and records accurately reflect the demolition events conducted and the demolition materials used during that day's operations.

2.3 Communication Plan

2.3.1 Hierarchy

2.3.1.1 A hierarchical depiction of the communication chain of command is provided in Appendix C.

2.3.1.2 The Huikala PM will interact with the USAESCH PM and CEPOH PM for all matters concerning management and the PWS. All contract-related issues will be reported directly to the USAESCH KO for consideration and/or approval. The SUXOS will report directly to the Huikala PM for all matters concerning site operations. Huikala field investigation sweep teams will report directly to the SUXOS.

2.3.1.3 Regarding safety issues, the UXOSO will have direct access to and will report functionally to the CHSO, in addition to the PM. For matters concerning QC, the UXOQCS will

have direct access to and will report functionally to the CQCM/PQCM, in addition to the PM. The UXOSO and UXOQCS will report administratively to the SUXOS.

2.3.1.4 Project management communications for this project will generally be conducted as:

- Task Order Management – Huikala's PM or other staff members will address all task order management information (e.g., budgetary issues, change orders) directly to USAESCH and CEPOH PMs.

- Field Investigation Tasks – The SUXOS will communicate field investigation/removal action information to on-site CEPOH Ordnance and Explosives Safety Specialist (OESS), Huikala's PM, who will in-turn inform USAESCH and CEPOH PMs.

2.3.1.5 A correspondence log, provided in Appendix F, will be maintained by Huikala for all formal project correspondence IAW DID WERS 014.01 and 015-01. Electronic copies of reports, meeting minutes, and correspondence will be kept on-site during the field operations, for inspection by the client personnel as well as members of the field team. Electronic copies will also be kept at the main office.

2.3.1.6 All written and verbal (i.e., person-to-person or via telephone) correspondence will be documented and routed to the Huikala PM. Incoming written communications will be annotated with the date received. Documentation of activities that deviate from the requirements of the WP or suspend work will require communication to or from the USAESCH KO and the USAESCH and CEPOH PMs. Any deviation communications will also include the USAESCH Technical Manager as well as appropriate subject matter experts.

2.3.2 Reporting

Report templates are provided in Appendix F.

2.3.2.1 Daily Status Reports

A daily status report will serve as the basic document for recording field activities. It will be signed by the SUXOS and UXOQCS and submitted the following work day. The daily status report will merge the Daily, Safety, QC, and Photographic Logs into one submittal. The Daily Field Activity Log will be completed by the SUXOS and will provide detailed information regarding job site location, work performance, weather conditions, safety meetings, results of inspections and tests, descriptions of non-conformances, corrective actions, and other comments. Contents of the Safety and QC Logs are discussed in the APP/SSHP and QCP, respectively.

2.3.2.2 Weekly Status Reports

A weekly field status report will be prepared IAW DID WERS 016.02 and submitted on Monday of each week; the report will summarize field activities accomplished during the reporting week

and field activities scheduled for the two following weeks. The report will only be submitted during the field effort.

2.3.2.3 Monthly Status Reports

A monthly status report (MSR) will be submitted for the project duration IAW DID WERS 016.02. The MSR will summarize activities performed during the month and discuss any issues/resolutions that occur. Financial and schedule status will also be provided. Additionally, the report will include a Munitions Response Monthly Progress Summary Report and an Exposure Data Report. A monthly payment milestone invoice will be submitted in conjunction with the MSR.

2.3.3 Meetings

2.3.3.1 Status meetings will be conducted throughout the duration of the project to introduce new team members, discuss significant events or deliverables, and review contract, schedule, and financial status. Frequency will be as-needed.

2.3.3.2 QC meetings will be conducted during field work to discuss status of activities with respect to defined QC metrics identified in the QCP. Frequency will be as-needed and may be combined with regular status meetings.

2.3.3.3 Notes will be taken during every meeting. Meeting minutes will be distributed to all invitees and participants IAW DID WERS 014.01.

2.4 Deliverables

2.4.1 Submittal Register

A copy of the submittal register is provided in Appendix F. The submittal register lists all project deliverables that were identified in the PWS and Base Contract in addition to new deliverables identified in the July 2012 Kickoff Meeting.

2.4.2 Project Records

Official project records will be maintained in Huikala's main office for the contract duration. Copies of project records may be available on-site during field activities.

2.4.3 Administrative Record

2.4.3.1 Upon completion of the project, all deliverables will be consolidated and submitted electronically (e.g., CD, DVD, USB flash drive) IAW the PWS and Engineer Pamphlet (EP) 200-3-1. Hard copies of final plans and reports will be provided during the course of the TO.

2.4.3.2 Information repositories have also been established at the locations provided below. Hard copies of final documents will be filed at these locations.

Kahuku Public Library
56-490 Kamehameha Highway
Kahuku, Hawaii 96731
Telephone: (808) 293-8935

Ahupua'a 'O Kahana State Park
52-222 Kamehameha Highway
Kahana, Hawaii 96717
Telephone: (808) 237-7767

Kaneohe Public Library
45-829 Kamehameha Hwy.
Kaneohe, Hawaii 96744
Telephone: (808) 233-5676

2.5 Schedule

MICROSOFT Project will be used to compile and track scheduled project activities. A baseline schedule will be established between USAESCH, CEPOH, and Huikala. The baseline will be used by the PM to monitor actual progress. The proposed baseline schedule is provided in Appendix B, Figure B2-1. An updated monthly schedule will be provided in the MSR.

2.6 Costing and Billing

2.6.1 This project is a Firm Fixed-Price (FFP) task order. Huikala will use accounting software to ensure that the project costs are maintained within the proposed FFP. In the event that unexpected and/or unplanned changes occur that have a cost impact, the Huikala PM will immediately contact USAESCH and CEPOH PMs to evaluate any potential for changes to the FFP task order based upon the cost differential associated with the project change.

2.6.2 Payment milestones have been established for this project. A monthly invoice will be submitted to USAESCH in conjunction with the MSR.

2.7 Public Relations Support

Huikala will participate in stakeholder meetings to facilitate the TPP process and provide support and coordination for public meetings as directed. Huikala personnel will not make available or publicly disclose any data generated or reviewed under this contract or TO. When approached by any person or entity requesting information about the contract or TO, Huikala personnel shall defer questions to the CEPOH Public Affairs Office or the CEPOH PM for response and also notify the USACESCH PM.

2.8 Subcontractor Management

2.8.1 Subcontractors will be utilized for features of work that Huikala does not perform with internal resources. Activities anticipated to be subcontracted are:

- Geographic Information System (GIS) Support
- Land Surveying
- Biological Monitoring
- Archaeological Monitoring
- Laboratory Analysis and Third Party Data Validation

2.8.2 On-site subcontractor activities will be coordinated in the field by the SUXOS who will ensure that the work is being conducted in the appropriate sequence. On-site subcontractors are required to have 40-hour hazardous waste operations and emergency response (HAZWOPER) certification and will receive site-specific biological and archaeological training.

2.8.3 Monitoring procedures, specific deliverables, and fixed schedules will be specified in subcontracts with our vendors. Huikala's QC program provides for subcontractor site evaluations, supplier ratings, and inspections by Huikala, as appropriate. Our QC program also ensures the flow-down of contract requirements to all subcontractors.

2.8.4 Once work on an activity has been initiated, resource control is conducted through the analysis and reporting process. Based on the specific activity and duration, subcontractors must submit a comparison of actual performance figures against those presented in the approved plan. In questionable instances, Huikala will take action with the subcontractor as circumstances dictate.

2.9 Field Operation Management

2.9.1 The SUXOS will oversee all aspects of the field operations. There will be daily communication between field staff (including subcontractors and the CEPOH OESS) and the Huikala PM. The biologist and archaeologist and will document the findings of their survey operations and report any findings to the SUXOS, PM, and CEPOH OESS. The SUXOS will coordinate with the PM to resolve any unexpected issues or concerns that arise during field operations. All issues, actions, and resolutions will be documented in the daily and weekly reports. Field reports will be provided to the on-site CEPOH OESS. The SUXOS will be involved in issue resolution and will be aware of any changes in site conditions or planned modification to field procedures.

2.9.2 Changes or modifications will be documented in field reports. The PM will then initiate field change requests (FCR) for deviations from the WP or changed site conditions. FCRs will be submitted to the USACE KO, the USAESCH PM, and the CEPOH PM for approval and prior to putting changes into effect. Appropriate government personnel will review the FCR to insure PWS objectives can still be met.

2.10 Data Management Procedures

Electronic data and records will be managed to prevent loss of information. All data will be backed up periodically and data will not be stored only on one single media. CDs, DVDs, USB, or other means of storage will be used in addition to standard computer hard drives to assure data is not lost by the failure of any one device. Hard copy records such as journals, daily logs, etc. will be copied when possible and transferred to electronic media for storage. All records will be maintained with at least one backup copy.

2.11 Data Quality Objectives

2.11.0.1 Data quality objectives (DQOs) are statements defining the quality, quantity, and type of data required, and the acceptance criteria for those data, necessary to provide an adequate database to support project decisions. To generate data that will meet the project objectives, it is necessary to define the types of decisions that will be made and identify the intended use of the data in an effort to characterize the residual risk remaining at the MRS.

2.11.0.2 Data needs specific to this RI have been identified by evaluating existing data and through discussions of project requirements with stakeholders. The process by which data needs were developed is documented in the TPP Memorandum (Appendix H) and Worksheet #10 of the UFP-QAPP (Appendix E). The DQOs developed for MC, as well as the analytical data quality level requirements, are provided in Worksheet #11 of the UFP-QAPP.

2.11.1 General DQOs

2.11.1.1 General DQOs for MEC and MC as agreed upon during the TPP process are listed below.

- MEC
  - Delineate the nature and extent of MEC contamination in accessible areas (areas up to 18 degrees slope)
  - Determine if threatened and endangered species and critical habitats are present within the MRS
  - Assess potential risks to human health and the environment associated with MEC and evaluate effective remedial alternatives given the anticipated future land use
- MC
  - Delineate the nature and extent of MC in available media
  - Evaluate naturally occurring background concentrations of metals in site soils

- Determine if sensitive habitats and/or cultural resources are present within the MRS (i.e., threatened and endangered species, culturally significant sites, etc.)
- Assess potential risks to human health and the environment associated with MC and evaluate effective remedial alternatives, given the anticipated future land use.

2.11.1.2 A general DQO for satisfying the munitions response site prioritization protocol (MRSPP) requirement was identified subsequent to the TPP Meeting 1 and is provided below.

- MRSPP
  - Determine the MRS Priority score for each MRS.

2.11.2 Specific DQOs

Specific DQOs have been developed based on the general DQOs. DQOs for the MEC investigation are summarized in the following paragraphs and also defined in Table 2-1. DQOs for MC are summarized in the following paragraphs with further discussion provided in the UFP-QAPP (Appendix E). These DQOs are listed below:

<u>MEC DQOs</u>

- Delineate the nature and extent of MEC contamination in accessible areas with at least a 90% confidence level of identifying impact areas within the MRS.
- For areas outside of the MEC-contaminated areas, determine with 90% confidence that the concentration of UXO in residential areas are less than or equal to 0.1 UXO per acre, low-use areas are less than or equal to 0.5 UXO per acre, and 1.0 UXO per acre in areas without intrusive activity.

Table 2-1: MEC DQOs

DQO Step	Description
Step 1: State the Problem	The former PJCTC was used as a unit jungle combat training center in the 1940s, to teach basic and advanced jungle warfare as well as instructor training. MEC has been identified or is suspected of being present including an 81-mm mortar, a 75-mm AP or HE projectile, and smoke grenades. MD found includes 105-mm AP projectile, 2.36-inch bazooka round tail section, M1 and M2 cartridges, and small arms ammunition. Additional investigation is required to assess whether MEC and/or MC are present at the site, to evaluate risk, and to guide further management decisions.
Step 2: Identify the Goal of the Study	***Goals*** • Delineate the nature and extent of MEC contamination in accessible areas (areas up to 18 degrees slope) • Determine if threatened and endangered species and critical habitats are present within the MRS • Determine potential risks to human health and the environment associated with MEC and evaluate effective remedial alternatives, given the anticipated future land use • Collect sufficient data to determine alternative actions ***Principal Study Questions*** • Are MEC present at the site? • What types of MEC (i.e., energetic material category) are present? • Do known MEC items comprise the extent of MEC present within the MRS? • Do MEC items exist outside of the current boundaries of the MRS? • Do MEC items pose an unacceptable hazard to human receptors? • If MEC or MD is present at the MRS, is MC contamination present? ***Possible Alternative Actions*** • No further investigation is required and a No Further Action determination may be sought for the site. • Collect incremental surface soil samples in areas identified as having MEC or MD contamination. • Implement Institutional Controls to reduce the MEC hazard to an acceptable level • Perform a removal/remedial action to reduce the MEC hazard to an acceptable level. • Determine the type and spatial extent of MEC and the exposure pathways for humans.

DQO Step	Description
Step 3: Identify Information Inputs	Historical Data and Previous Investigations: Historical information, investigation results, and analytical data from previous reports. Current RI: • Analog geophysical data. • Results of visual and instrument investigations along transects and in grids. • Results of intrusive investigation of identified anomalies. • Evaluation of site receptors.
Step 4: Define the Boundaries of the Study	***Lateral and Vertical Boundaries*** • Only areas up to 18 degrees slope will be investigated. • Instrument investigation is bound by 1-meter wide transects. • Transects will be spaced approximately 100 meters apart where feasible. In areas where parallel transects are not feasible, meandering transects will be performed. • Lateral boundary is limited to the 2013 corrected MRS boundary. Refer to Figure B1-1. • Perpendicular transects will be used to refine potential target areas, where feasible. • Analog grid investigation will used to define and bound target areas. • Grid locations will be determined based on results of transect investigations. • Vertical boundary will consist of the depth to which the metal detection device can detect metal in the subsurface. ***Constraints*** Rights-of-Entry, environmental setting, weather, current land use activities, e.g., agricultural, recreational.
Step 5: Develop the Analytical Approach	***IF MEC:*** a) are identified, THEN determine the lateral and vertical extents and distribution of the MEC. b) are not identified, THEN collect sufficient data to assess potential hazards and develop and evaluate effective remedial alternatives. ***IF the MEC investigation:*** a) does indicate areas of high density, THEN investigate additional transects/grids to determine lateral and vertical extent of MEC to an accuracy of at least +/- half the transect spacing, maximum 250 feet horizontal and a 90% confidence has been achieved for bounding the potential depth. b) does not indicate areas of high density, THEN collect sufficient data to assess risk and develop and evaluate effective remedial alternatives. ***IF the results of the MEC investigation:*** a) do not indicate the presence of MEC within the MRS, THEN the MRS (or portions of the MRS) will be considered for unrestricted use in the FS.

DQO Step	Description
	b) do indicate the presence of MEC/MD at the MRS, THEN incremental sampling of surface soil will be conducted and the results analyzed for MC associated with MEC/MD item identified.
Step 6: Specify Performance or Acceptance Criteria	• Repeatability (Instrument Functionality) - All items in test strip detected. • Dynamic Repeatability (transects) - Repeat a segment of transect and show extra flags/digs with not greater than the greater of 20% or 8 flags/digs, or within range of adjacent segments. • Coverage (grids) - Blind coverage seeds and blind detection seeds recovered 75% if MEC 90% if no MEC. • Detection and Recovery (grids) - Blind detection seeds recovered 80% if MEC, 100% if no MEC. • Anomaly Resolution - QC checks open holes to determine if MEC: 70% confidence <10% anomalies unresolved, and a 90% confidence < 5% unresolved if no MEC is found. • Identification of MEC-contaminated areas (areas with elevated anomaly densities relative to background density of 50 anomalies per acre) with at least a 90% statistical confidence. • Analog grids demonstrate that areas surrounding MEC-contaminated areas do not exceed 0.1 UXO per acre for residential areas, 0.5 UXO per acre for low use areas, and 1.0 UXO per acre in areas without intrusive activities.
Step 7: Develop the Detailed Plan for Obtaining Data	• Design transect plan to allow at least a 90% probability of identifying impact areas (areas with elevated anomaly densities relative to background density of 50 anomalies per acre), where feasible. In areas where parallel transects are not feasible, meandering transects will be performed. • Conduct visual and instrument investigation on transects. • Collect data 30.42 miles/11.06 acres of transects. • If impact areas are identified, investigate perpendicular transects to bound impact area, where feasible. • Locate grids surrounding impact areas and collect sufficient anomaly data to estimate the anomaly density and verify that it is below 0.1 UXO per acre for residential areas, 0.5 UXO per acre for low use areas, and 1.0 UXO per acre in areas without intrusive activities. • Conduct intrusive investigation of anomalies identified during transect and grid sweeps. • Perform a MEC Hazard Assessment using investigation data to determine the overall hazard potential.

MC DQOs

DQOs for MC are summarized in the following paragraphs with further discussion provided in the UFP-QAPP (Appendix E).

- Within MEC-contaminated areas or potential target areas, determine the nature and extent of MC concentrations in surface soil by collecting incremental surface soil samples IAW Hawaii Department of Health (HDOH) Hazard Evaluation and Emergency Response (HEER) Technical Guidance Manual (TGM), analyzing samples using EPA approved methods, and following general DoD guidelines (DoD, 2009).

- Determine if MC concentrations in surface soil are above acceptable risk thresholds by comparing concentrations against HDOH environmental action levels (EALs) and, if necessary, performing a Tier 2 site-specific screening level risk assessment (RA).

- If MC concentrations are above acceptable risk thresholds in surface soil, delineate the nature and extent of MC contamination in subsurface soil as well as sediment and surface water. Incremental subsurface soil samples will be collected at the same locations as the surface soil samples but at a depth of 6 to 12 inches below ground surface. Discrete sediment and surface water samples will be collected downgradient from MC contamination in surface soil. Analysis will be conducted using EPA approved methods following general DoD guidelines (DoD, 2009). Surface water will only be sampled if sediment concentrations are above HDOH EALs.

- Determine background concentrations of metals in surface soil through collection of eight incremental background soil samples from areas with the least probability of DoD activity and where no MEC was found; analyze samples using EPA approved methods following general DoD guidelines (DoD, 2009).

- If sediment and surface water samples are collected, determine background concentrations of metals in sediment and surface water by collecting eight discrete sediment samples and one surface water sample upgradient of MC contamination and where no MEC was found; analyze samples using EPA approved methods following general DoD guidelines (DoD, 2009).

MRSPP DQOs

- Determine the MRS Priority score for each MRS by collecting MRS-specific data from historical documentation and the RI field work. The Explosive Hazard Evaluation, Chemical Warfare Materiel Hazard Evaluation, and Health Hazard Evaluation modules from the MRSPP Scoring Tables will be updated using this data.

3.0 Field Investigation Plan

3.1 Overall Approach

The overall approach to the field investigation is divided into to two separate areas: (1) the MEC field investigation and (2) the MC field investigation. Huikala will conduct analog geophysical investigations with handheld metal detection instrumentation on predetermined transect lines to achieve the MEC-related project objectives. Environmental samples analyzed for metals and explosives will be collected in order to fulfill data requirements for MC-related project objectives. Data from both aspects of the field investigation will be used to determine the nature and extent of MEC and MC contamination at the site and will be incorporated into the RI Report. The DQOs for the project are presented in Section 2.11.

3.1.1 MEC Investigation Technical Approach

3.1.1.1 The MEC investigation technical approach is designed to collect sufficient surface and subsurface anomaly data along pre-determined transects using an all-metals detector (i.e., MINELAB Explorer SE or equivalent). The transect design optimizes determination of MEC density, and the limits of MEC contamination, to ensure a 90% confidence level of identifying impact areas (e.g., areas with elevated anomaly densities relative to background) given the munitions of concern with the smallest expected fragmentation dispersion pattern. As discussed in the Geophysical Investigation Plan (Section 3.4), VSP software is used to calculate the probability of traversing and detecting a target area using 1-meter wide transects with a parallel pattern. A background anomaly density of 50 anomalies per acre was selected for the MRS.

3.1.1.2 In addition to parallel transects, meandering transects will be used in areas where parallel transects cannot be performed.

3.1.1.3 The target radius for MRS was assumed to be 500 feet based on the 2.36-inch rocket and the 75-mm AP Projectile. Once potential impact areas are identified, the team will subsequently collect sufficient anomaly data within each MEC-contaminated area to estimate the anomaly density and verify that it exceeds the appropriate UXO per acre threshold. The approach is comprised of the following steps:

- Transect Design (using VSP and meandering transects)
- Biological Monitoring
- Cultural Resource Monitoring
- Limited Vegetation Removal
- MEC Investigation – Analog/handheld instruments
- MEC Disposal

- Quality Control
- MEC/MD Accountability
- Disposal/Disposition of material potentially presenting an explosive hazard (MPPEH)
- Grid Design and Survey

3.1.1.3 Analog geophysical surveys will be carried out to delineate the nature and extent of MEC. Intrusive investigation will be conducted to identify anomalies identified in the geophysical survey. Data from the MEC survey will be used to determine the overall hazard potential for MEC.

3.1.2 MC Investigation Technical Approach

3.1.2.1 The objective of the MC sampling and analysis is to collect sufficient data that meets the project DQOs, of known quality and quantity, to determine the nature and extent of MC contamination, and assess risk to human health and the environment. To meet this objective, incremental sampling (IS) techniques will be used following the HDOH HEER TGM to characterize the nature and extent of MC contamination. The sampling field work and data will meet established criteria within the accepted UFP-QAPP, Sampling and Analysis Plan (SAP) (Appendix E), and WP. The MC investigation technical approach is comprised of the following steps:

- Cultural and biological monitoring to avoid sensitive resources
- Identification of sampling units (SU) with potential MC in available media as evidenced by the presence of MEC or MD
- Use of IS techniques to determine concentrations of MC in surface soil
- Comparison of MC data in surface soil against HDOH EALs in a Tier 1 screening level RA and, if necessary, performing a Tier 2 site-specific screening level RA
- If MC concentrations exceed acceptable Tier 2 thresholds, collection of subsurface soil, sediment and surface water samples in locations potentially impacted by migration of surface soil MC contamination

3.1.2.2 Acceptable Tier 2 thresholds are specific Tier 1 screening levels that have been adjusted or deleted to more closely reflect site conditions or alternative risk assumptions. Replacing only targeted components of the Tier 1 EALs reduces the need to prepare and justify an independent, detailed RA when Tier 1 EALs cannot or should not be fully applied. These modifications can be made once contamination is located and site characteristics such as land use, and distance from water sources, are evaluated. A typical adjustment may be consideration of natural background concentrations in place of EALs.

3.1.2.3 In addition, background soil samples will be collected from areas where no MEC was found and there is a low probability of past military activity to establish ambient levels of metals in surface soils, and, if necessary, sediment and surface water.

3.1.2.4 Sampling will be performed in a phased approach following identification of potential target areas. If potential target areas are identified during the field investigation, MC incremental sampling of surface soil will be conducted within the potential target area. A single IS will be collected biased toward an area of high MD/MEC concentration within the boundaries of the potential target area defined through VSP. The boundaries of the MC contamination are presumed to coincide with the boundaries of the potential target area. In the case where the IS unit is larger than the potential target area, the dimensions of the IS unit will be equivalent to the potential target area. The sampling will be conducted IAW HDOH HEER TGM.

3.1.2.5 The results of the MC sampling will be compared against HDOH EALs and background soil concentrations. If MC concentrations exceed Tier 1 EALs (the most conservative values), a Tier 2 site-specific screening level RA will be conducted to further refine the assessment of risks. If the Tier 2 RA indicates risks above acceptable thresholds, additional subsurface soil as well as surface water and sediment that may be impacted by the MC-contaminated soil will be subsequently sampled. A baseline human health risk assessment (HHRA) will also be conducted. Further discussion regarding MC sampling and DQOs is provided in Appendix E.

3.1.3 Data Incorporation into the RI Report

All relevant data (e.g., reconnaissance observations, finds, and MC analytical data) acquired during the RI fieldwork and post-fieldwork analyses will be compiled within a project-wide GIS database. This database will be managed and updated as additional data are provided or generated. The database will be designed such that specific queries, tables, and reports can be generated for analysis and presentation of the existing MEC hazards within the MRS for the report.

3.1.4 MEC Exposure Analysis

Any potential risk posed by MEC contamination will be assessed by evaluating the ordnance, site characteristics, and human exposure pathways after the RI field work is completed. The ordnance category includes the type of MEC identified, the level of sensitivity (i.e., the potential adverse health effects associated with exposure to the specified MEC), the density of MEC in a specified area, and the depth of the MEC. Together, these parameters will be evaluated to define the level of risk the MEC poses to potential receptors.

3.2 Identification of Areas of Concern

Both Kahana and Punaluu Valleys have been identified for further MEC and MC investigation based on records reviews, previous investigation findings, and emergency response actions by Honolulu Police Department and EOD.

3.3 Geophysical Prove Out

3.3.1 Huikala will install an instrument verification strip (IVS) at the site for daily instrument and operator verification. Industry standard objects (ISOs) will be used as the seed items for the IVS. ISOs have been defined as schedule 40 pipe nipples, threaded on both ends, made from black welded steel, manufactured to an American Society for Testing and Materials specification. The objects are available through most hardware and plumbing stores. The three ISO sizes that will be used for the IVS are listed in Table 3-1.

3.3.2 An IVS will be determined in the field by the SUXOS, UXOQCS, and CEPOH OESS. The IVS will be approximately 50 feet long and 5 feet wide and will be cleared of all anomalies prior to use. The UXOQCS will place ISOs along the IVS at various depths and orientations. These ISOs will be selected from the list of items shown in Table 3-2. The IVS will be established in accordance with DID WERS-004.01. If the depths for the ISOs cannot be achieved, the ISOs will be placed in a manner that best represents the area to be investigated.

Table 3-1: Industry Standard Objects for IVS Construction

Item	Nominal Pipe Size	Outside Diameter	Length
Small ISO	1-inch	1.315-inch (33-mm)	4.000-inch (102-mm)
Medium ISO	2-inch	2.375-inch (60-mm)	8.000-inch (204-mm)
Large ISO	4-inch	4.500-inch (115-mm)	12.000-inch (306-mm)

Table 3-2: IVS Seed Items

Seed Item Number	Seed Item	Depth (relative to diameter)	Depth (inches)	Orientation	Separation (meters)
1	Small ISO	3x	3	Horizontal	3
2	Small ISO	3x	3	Vertical	3

Seed Item Number	Seed Item	Depth (relative to diameter)	Depth (inches)	Orientation	Separation (meters)
3	Small ISO	5x	5	Horizontal	3
4	Small ISO	5x	5	Vertical	3
5	Small ISO	7x	7	Horizontal	3
6	Small ISO	7x	7	Vertical	3
7	Medium ISO	3x	6	Horizontal	5
8	Medium ISO	3x	6	Vertical	5
9	Medium ISO	5x	10	Horizontal	5
10	Medium ISO	5x	10	Vertical	5
11	Medium ISO	7x	14	Horizontal	5
12	Medium ISO	7x	14	Vertical	5
13	Large ISO	5x	20	Horizontal	7
14	Large ISO	7x	28	Horizontal	7

3.4 Geophysical Investigation Plan

3.4.1 VSP software was used to determine the number of transects and transect spacing required to characterize the nature and extent of MEC contamination IAW DID WERS-004.01. Input parameters to the VSP were presented and discussed during the TPP process. The VSP Report is included in Appendix I. The transect design generated by the VSP software and depicted in Appendix I, is conceptual and used for illustration purposes. The planned transect design, provided in Appendix B, Figure B3-1, takes existing features, such as access points, trails and roads, into account. As mentioned previously, where feasible, the transect design optimizes determination of MEC density, and the limits of MEC contamination to ensure a 90% confidence level of identifying impact areas (e.g., areas with elevated anomaly densities relative to background). In addition, meandering transects will supplement parallel transects in the investigation where parallel transects are infeasible. After the results of the transect data have been reviewed, analog grids will be strategically placed to determine the nature of the MEC contamination.

3.4.2 The VSP software calculated the probability of traversing and detecting a target area using 1-meter wide transects with a parallel pattern. Fifty anomalies per acre for background were selected for the MRS. The target radius was assumed to be less than 500 feet based on the 2.36-inch rocket and 75-mm AP Projectile, which is less than the maximum fragmentation distance.

3.4.3 Given these parameters, the VSP software calculated the probability of traversing and detecting a target area using 1-meter wide transects with a parallel pattern.

3.4.4 Transects, spaced 100 meters between transects (101 meters on center), will be surveyed equaling 11.06 acres of transect coverage and 30.42 miles of transects over the entire site. Using this transect design, there is at least an approximately 92% chance of traversing and detecting any 1,000-foot diameter (500-foot radius) circular target area having a bivariate normal distribution with an average density of 49.8886 anomalies per acre above the background density of 50 anomalies per acre. This assumes the instrument false negative rate is 0% and flagged windows have at least 95% confidence they have density greater than background.

3.4.5 Parallel and meandering transects was the selected approach to locate target areas within the MRS. Huikala's UXO teams will characterize each transect using handheld metal detectors IAW the procedures listed in Section 3.5.3. Data gathered from parallel and meandering transects during the investigation will be recorded and analyzed in the VSP software to ensure target areas are identified and characterized. If target areas are identified, perpendicular transects will be used to bound the identified impact areas as well as identify the locations for the placement of grids as needed. The perpendicular transects will be placed on the outer edges of the identified targets and additional perpendicular transects will be added in the direction of the target to further define the boundaries of the target areas (e.g., if the original transects are oriented in an east/west direction the perpendicular transects will be oriented in a north/south direction to form a crossing pattern over the target). The perpendicular transects will be long enough to overlap the target area to ensure that the entire target area is defined.

3.4.6 After the potential target area is defined through transect investigation data and VSP, the surrounding area will be divided into sections by land usage (i.e., residential, low use, no intrusive activity). UXO Estimator software will be applied to the surrounding area to determine the number of grids required around the potential target area to ensure at least a 90% confidence that the concentration of UXO does not exceed the respective threshold of 0.1 UXO per acre, 0.5 UXO per acre, and 1.0 UXO per acre for each respective land use. The grids will be investigated and the data will be evaluated by UXO Estimator. If the UXO density is greater than the respective threshold, additional grids will be investigated until the UXO density threshold and confidence limit is achieved.

3.4.7 All information gathered during the site investigation will be included in the GIS database.

3.5 Location Surveys and Mapping Plan

3.5.0.1 Location surveying and mapping will be conducted IAW DID WERS-007.01 and EM 1110-1-4009 to establish site reference data. Site control reference points will be established. All surveyed points will be established at Class I, Third Order, with tolerances of 0.001 meters and 0.01 feet. The survey data will be reported in North American Datum 1983,

Universal Transverse Mercator zone 4N, with vertical datum of Local tide (mean sea level). Once survey control data for the site are established, Huikala personnel will survey and mark the proposed transects using hand held global positioning system (GPS) units (with sub-meter accuracy).

3.5.0.2 In the event that transects cannot be marked using GPS units, traditional land surveying methods will be used.

3.5.1 Control Points

3.5.1.1 Existing permanent monuments will be used.

3.5.1.2 A tabulated list of all control points and monuments showing their final adjusted coordinates established and/or used for survey will be provided to the nearest 0.01-foot.

3.5.1.3 All of the control points recovered and/or established at the site will be plotted at the appropriate coordinate points and input into the GIS database. All plotting will be done IAW the requirement of DID WERS-007.01.

3.5.2 Mapping

Mapping will be completed IAW DID WERS-007.01. The location, identification, coordinates, and elevations of all the control points recovered and/or established at the site will be plotted on reproducible media for planimetric or topographic maps. Each control point will be identified on the map by its name and number and the final adjusted coordinates and elevations (to the closest 0.001-meter and 0.01-foot). Each map will include a grid north, a true north, and a magnetic north arrow with the differences between them in degrees, minutes, and seconds shown. Grid lines or tic marks at systematic intervals with their grid values will be shown on the edges of the map. Also, a legend showing the standard symbols used for the mapping and a map index showing the site in relationship to all other sites within the boundary lines of the project area will be shown. The coordinates for the grid corners will be shown to the nearest foot (1.0-foot). The locations of individual recovered MEC items will be plotted and identified on the map.

3.5.3 Establishing Transects

3.5.3.1 Each transect will be established by a "survey team," which will consist of the project biologist, archaeologist, and two UXO technicians. The survey team will enter the site first and will be responsible for marking the 1-meter wide transects where the geophysical surveys will be conducted.

3.5.3.2 In marking transects, the survey team will be guided by proposed transect location coordinates that will be preloaded into a GPS. Transects will follow the VSP transect design unless field conditions or data requirements make it necessary to depart from the design. The project biologist and archaeologist will be responsible for identifying natural and cultural

resources that should be avoided and for assisting the UXO technicians in rerouting transects appropriately to avoid impacting those resources. Data collected by the project biologist and archaeologist will be documented in daily reports and included in post-field reports.

3.6 Geographic Information System Plan

Spatial data created for the project will be provided in neutral, non-proprietary Spatial Data Transfer Standard format and Spatial Data Standard for Facilities, Infrastructure, and Environments at the completion of the project, as well as in Environmental Systems Research Institute compliant formats (shapefiles, coverages, or geodatabases) during this project. Raster data (e.g., orthophotography, remote sensing imagery, etc.) will be provided at the completion of the project. Supporting tabular data will be provided in MICROSOFT Excel or MICROSOFT Access format at the end of the project. The final submittal in electronic format will contain all required Project (ArcGIS.mxd) files and Layout files for all plates, figures, and drawings conveyed in the RI/FS. All data gathered from this task order will be provided in the appropriate format and IAW DID WERS 007.01 and EM 1110-1-4009.

3.7 Intrusive Investigation

3.7.0.1 Subsurface investigations will be performed within surveyed areas on all anomalies IAW the safety precautions provided in the APP and Explosives Siting Plan (ESP), Appendices D and J, respectively. Intrusive investigation teams, consisting of at least two UXO-qualified individuals under the supervision of a UXO Technician III and equipped with all-metals detector (i.e., MINELAB SE or equivalent) and hand digging implements will conduct excavations. Up to three two-man teams may be supervised by a UXO Technician III. A visual and electronic search of the excavation will be made until the anomaly is located. All excavations will be performed by carefully digging to the side of the suspected MEC item until a positive identification is made. No excavations will be made directly over suspected MEC items. All access/excavation/detonation holes will be backfilled to prevent trip hazards and prohibit erosion. Refer to the ESP (Appendix J) for MEC removal procedures.

3.7.0.2 All information gathered will be recorded on Dig Sheets, including geospatial coordinates, and downloaded into the project GIS database. MEC, MD, and non-MD recovered will be recorded and incorporated into the project database. Recorded data will include, where possible, size, estimated weight, orientation, depth below ground surface, and description of the item excavated.

3.7.0.3 The data collected during intrusive investigations will be uploaded to the VSP software and the project GIS. Huikala will incorporate layers that overlay on maps of the site that identify physical features, MPPEH/MD, and range-related debris (RRD) found during the investigation. Examples include but are not limited to: anomalies, positively identified MEC, identifiable MD, craters, bunkers, and fox holes.

3.7.1 MEC/MD Accountability and Records Management

3.7.1.1 A detailed accounting will be made of all UXO items encountered during the RI activities. This accounting will include the nomenclature (if applicable) type, approximate weight, depth, orientation, condition, and location of the item indicated. The UXO Team Leader will record specific details regarding the material found, including (but not limited to), the following:

- Transect/grid number where the item was found
- Specific nomenclature (item number assigned)
- Type of item;
- Location of item in coordinates;
- Depth below ground surface/orientation; and
- Type of fuzing
- Condition
- Location
- External markings
- Disposition

3.7.1.2 Each MEC/MD item encountered will be entered on the Daily Field Activity Log by the SUXOS. The SUXOS will provide copies of the Daily Field Activity Log to the Huikala PM. The intrusive investigation data will be compiled on a weekly basis and submitted to USAESCH and CEPOH.

3.7.1.3 Additionally, digital photographs will be taken of identifiable MEC/MD during the investigation and included in a photo log. The photo log will also include representative photographs of field activities, non-MD debris, terrain, vegetation, site conditions, and sampling locations. All digital photographs taken will have a white board next to the item with the identification of the item as well as a reference scale showing the size. Photographs will be checked in the field to ensure proper lighting, focus, and no shadows are visible on the photograph.

3.7.1.4 Excavated anomaly attributes will also be added to the project GIS database. Items determined to be acceptable to move by the SUXOS and UXOSO will be transported to the designated disposal area for demolition. Items that are deemed unacceptable to move will be disposed of at the location of discovery (i.e., blow-in-place destruction).

3.7.1.5 The inventory count of MEC items will be conducted by the SUXOS and UXOQC on a weekly basis and any discrepancies with the project database will be reported immediately to the CEPOH OESS, Huikala PM, and the USAESCH and CEPOH PMs.

3.7.1.6 Huikala will document all activities accomplished at the sites, on a transect/grid-by-grid basis. In addition, operational data will be provided to the CEPOH OESS and PM on a daily basis by the SUXOS. Data to be provided includes:

- Personnel on-site
- Transects/Grids started and finished
- MEC/MD, nomenclature and condition, location and depth of MEC, and disposition
- Demolition materials utilized to detonate MEC on-site
- Digital photographs of identifiable MEC/MD found during the investigation
- MD and non-MD scrap (by pound)
- Daily Safety Briefing
- Daily QC Report

3.7.2 UXO Personnel Qualifications

The qualifications requirements for UXO personnel are included in Section 4.1.2.

3.7.3 MEC Sampling Locations

UXO personnel will excavate subsurface geophysical targets identified as a result of the geophysical investigation. The planned transects presented in Appendix I and shown on Appendix B, Figure B3-1, are conceptual in nature and are subject to change in accordance with site topography, vegetation, and avoidance of sensitive species habitat. During the field activities, revised field maps will be generated that illustrate the actual paths taken along with the locations of anomalies encountered.

3.7.4 MEC Sampling Procedures

3.7.4.1 When arriving at the transect, the UXO Team Leader will align the team along the 1-meter wide transect to ensure that no interference occurs with other technicians(s). UXO technicians will advance in a slow, continuous pace; visually inspecting the surface for MEC utilizing an all-metals detector (i.e., MINELAB Explorer SE or equivalent) in a side-to-side sweeping motion scanning the lane for subsurface anomalies until the assigned search lane is completed. The team will then reposition in the next series of lanes and repeat the process until

the transect is completed. While ensuring he/she can continuously visually observe all team members, the UXO Team Leader will closely monitor individual performance throughout the sweep, confirming all intervals and appropriate search techniques are used.

3.7.4.2 Typically, anomalies will be excavated immediately after detection. However, because the explosives are delivered daily, the "cut-off" time for excavating will be several hours prior to the actual end of the work day. The cut-off time allows sufficient time to facilitate delivery, walking to MEC items, shot set-up, detonation, and cleanup. If an anomaly is discovered after the cut-off time, the team will flag the anomaly and continue to conduct brush cutting, magnetometer sweeps, and flagging operations. The flagged anomalies will be excavated the following day.

3.7.4.3 Manual methods will be used to excavate all anomalies due to the occurrence of natural resource constraints (i.e., heavy vegetation, sensitive habitat). Manual digging tools (i.e., hand shovel/trowel) will be used to excavate the earth overburden in 6-inch lifts. After each lift, the anomaly location will be redefined with the all-metals detector (i.e., MINELAB Explorer SE or equivalent) and the anomaly source sought using hand tools. This process will continue until the source of the anomaly has been uncovered and identified.

3.7.5 Munition with the Greatest Fragmentation Distance

The Munition with Greatest Fragmentation Distance (MGFD) for intentional detonations is presented in the ESP (Appendix J).

3.7.6 Minimum Separation Distance

3.7.6.1 The minimum separation distance (MSD) for intentional and unintentional detonations are presented in the ESP (Appendix J).

3.7.7 MEC Identification

3.7.7.1 The MEC identification process starts when suspected MEC is located. If the UXO technician identifies an item as MEC, he or she will contact the UXO Technician III/Team Leader to confirm the identity of the MEC item (i.e., UXO, fuzed discarded military munitions [DMM]). If the item is confirmed to be MEC, the SUXOS and UXOSO, will determine whether it is acceptable to move. Items that are fuzed are considered unacceptable to move. Other items could also be classified as unacceptable to move based upon their condition. The SUXOS will coordinate with CEPOH OESS prior to moving MEC items.

3.7.7.2 If Huikala UXO technicians cannot positively identify an anomaly as MEC, the CEPOH OESS and USAESCH Ordnance and Explosives (OE) Safety Chief will be consulted for proper identification. If the CEPOH OESS and USAESCH OE Safety Chief cannot identity the item, military Explosive Ordnance Disposal (EOD) assistance will be requested.

3.7.7.3 If the UXO technician identifies an item as MD or unfuzed DMM, the item will be documented in accordance with the procedures listed in Section 3.7.1.

3.7.8 MEC Removal

3.7.8.1 MEC removal procedures are presented in the ESP (Appendix J). MEC items that are acceptable to move will be hand-carried to an appropriate area for disposal IAW the approved ESP.

3.7.8.2 If a MEC item is determined to be unacceptable to move, the project biologist and archaeologist will conduct environmental and cultural resource monitoring within the area established by the MSD calculated for the particular MEC item found. The USAESCH/CEPOH PMs will coordinate with relevant stakeholders, the SUXOS, and UXOSO, in order to assess how best to avoid and minimize impacts to endangered or threatened species, critical habitat, or any other species or habitat of particular concern to the landowner within the MSD. Avoidance and minimization strategies may include the use of engineering controls, such as sand bags, timing the detonation operation based on the unique conditions of the site, or other appropriate strategies. Following demolition operations, any engineering controls employed will be removed to the extent practicable.

3.7.8.3 Prior to disposal, the location of each MEC item within the transect/grid and all relevant information related to the MEC item will be recorded in the transect/grid log as described under Section 3.7.1.

3.7.8.4 Subject to the approval of the SUXOS, the project biologist, and archaeologist may document the conditions prior to detonation and after detonation. The documentation may include general observations and photographs; however, detailed measurements will not be collected.

3.7.9 MEC Storage

MEC storage will not be authorized. If an identified UXO item cannot be moved (i.e., blow-in-place destruction is required) and conditions prevent demolition during daylight hours, arrangements will be made to provide overnight security.

3.7.10 MEC Disposal

3.7.10.1 MEC disposal procedures are presented in the ESP (Appendix J). Huikala will be responsible for the disposal of all MEC encountered during site activities. Pre- and post-MEC disposal notification will be coordinated with stakeholders, police, and fire departments.

3.7.10.2 During disposal of MEC, safety is the primary concern. The requirements are to protect personnel, the general public, and the environment from fire, blast, noise, and fragmentation. Huikala will compare the MEC location to known structures and residences in

the vicinity. If structures/residences are within the Maximum Fragment Distance (MFD) of the MEC, evacuation of occupants/residents may be necessary. Advance notifications will be provided to occupants/residents prior to any MEC disposal operations. However, mitigation procedures, as described in the ESP, will be implemented to reduce the need for evacuation.

3.7.10.3 Huikala will use the mitigation procedures described in the ESP. Huikala will communicate with the USAESCH/CEPOH PMs and assist with the coordination for the evacuation of non-essential personnel from all inhabited structures and residences within the MSD IAW with the approved ESP.

3.7.11 Material Potentially Presenting an Explosive Hazard (MPPEH)

This section describes the procedures for processing and certifying MPPEH recovered during the field investigation. This includes MPPEH/MD storage, inspection, and disposal documentation.

3.7.11.1MPPEH/MD Storage

3.7.11.1.1 The SUXOS will coordinate the delivery of lockable storage containers for storage of MD, removed from the transects/grids. The containers will remain locked until the material is delivered to and signed for by the foundry/recycler.

3.7.11.1.2 Location of this container will be coordinated with the CEPOH OESS to ensure it does not obstruct operations being conducted on-site by Huikala field teams.

3.7.11.2MD Inspection and DD Form 1348-1A

3.7.11.2.1 DD Form 1348-1A documents that the MD has been properly inspected and certified as free of explosive hazards or related material. Prior to completing the DD Form 1348-1A, the SUXOS is responsible for ensuring that inspected debris is secured in a closed, labeled, and sealed container and documented as follows:

1. The container will be closed and clearly labeled on the outside with the following information: The first container will be labeled with a unique identification that will start with USACE/PJCTC, Oahu, HI/Huikala, LLC/0001/Seal's unique identification and continue sequentially.

2. The container will be closed in such a manner that a seal must be broken in order to open the container. A seal will bear the same unique identification number as the container or the container will be clearly marked with the seal's identification if different from the container.

3. A documented description of the container will be provided by Huikala with the following information for each container; contents, weight of container; location where munitions or RRD was obtained; name of contractor, names of certifying and verifying individuals; unique container identification; and seal identification, if required.

3.7.11.2.2 Huikala will arrange for maintaining the chain of custody and final disposition of the certified and verified materials. The certified and verified material will only be released to an organization that will follow the appropriate disposal documentation procedures. Upon receiving the unopened labeled containers each with its unique identified and unbroken seal, and after reviewing and concurring with all the provided supporting documentation, the receiving facility will sign for having received and agreeing with the provided documentation that the sealed containers contained no explosive hazards when received. This will be signed on company letterhead and stating that the contents of these sealed containers will not be sold, traded, or otherwise given to another party until the contents have been smelted and are only identifiable by their basic content. Notification and supporting documentation will be sent to Huikala documenting the sealed containers have been smelted and are now only identifiable by their basic content.

3.7.11.2.3 If the chain of custody is broken, the affected MPPEH will undergo a second 100 percent inspection, a second 100 percent re-inspection, and be documented to verify its explosives safety status (identified as either MD or RRD). Material documented as safe (MDAS) is no longer considered MPPEH as long as the chain of custody remains intact. A legible copy of inspection, re-inspection, and documentation will accompany the material through final disposition and be maintained for a period of three (3) years thereafter.

3.7.11.2.4 Upon completion of the above the SUXOS will complete a DD Form 1348-1A IAW Chapter 14 of EM 1110-1-4009 and Errata Sheet No. 2. The DD Form 1348-1A will be submitted to the recycling/salvage facility prior to the transport of any scrap and will also accompany the shipment of scrap to the recycling/salvage facility. The DD Form 1348-1A will contain the following language to certify the scrap has been properly inspected and certified as free of explosive hazards or related material:

> "This certifies that the material listed has been 100 percent properly inspected and, to the best of our knowledge and belief, are free of explosive hazards, engine fluids, illuminating dials and other visible liquid HTRW materials."

3.7.11.3MD QC Inspection

The UXOQCS will be responsible for conducting QC checks and surveillances of the procedures used for processing and certifying MD collected throughout the field operations. The UXOQCS will perform visual inspections on every container of MD generated, to ensure no items of a dangerous or explosive nature are identified as MDAS. All certified-MDAS material will be segregated to prevent commingling and maintain an intact chain of custody, and secured in storage containers by the SUXOS until release from DoD control and/or final disposition. All QC surveillance will be documented on MDAS certification tracking reports. Details of the Quality Plan are described in Section 4.0.

3.7.11.4 Disposal Documentation

3.7.11.4.1 All material will be accounted for in the daily and weekly reports. Disposal documentation receipts will be generated identifying the day of off-site removal, approximate weight and signature of the recipient.

3.7.11.4.2 Once the containers are received at the shredding or smelting facility, the facility will verify that the chain of custody has been maintained and that the supporting documentation accurately represents the shipments received. The facility will also confirm that the sealed containers contain no explosive hazards. The receiving facility shall prepare a signed statement on company letterhead stating that the contents of these sealed containers will not be sold, traded, or otherwise given to another party until the contents have been shredded or smelted and are only identifiable by their basic content. Notification and supporting documentation that the seal containers have been smelted and are now only identifiable by their basic content will be submitted to Huikala. Documentation will be submitted as an appendix to the Final RI Report.

3.8 Investigation Derived Waste Plan

If investigation-derived waste (IDW) is generated during RI fieldwork, it will be handled, stored, and disposed of as indicated in Section 7.7.1.

3.9 Risk Characterization and Analysis

3.9.1 Conceptual Site Models

A diagram of the preliminary conceptual site models (CSMs) for MEC and MC is presented in Appendix B, Figures B3-2 and B3-3. The CSMs provides a preliminary understanding of the possible sources of contamination, potential migration/exposure pathways, and the potential receptors. The CSMs will be updated to include the information gathered during this RI.

3.9.2 MEC Pathways

The potential exposure pathway for human receptors is contact with ordnance in the surface and subsurface soil. Human receptors include residents, construction, commercial and industrial workers, and recreational users. Subsurface contact only occurs if the human receptor is performing intrusive activities.

3.9.3 MEC Hazard Assessment

3.9.3.1 The hazard posed by MEC potentially present at each MRS will be evaluated by performing a MEC Hazard Assessment (HA) at the end of the RI. The purpose of the MEC HA is to (1) support the hazard management decision-making process by analyzing site-specific information and (2) to support hazard communication. The MEC HA was designed to fit the CERCLA regulatory structure as well as address the NCP direction to conduct site-specific RAs

for threats to human health and the environment. The MEC HA addresses human health and safety concerns associated with potential exposure to MEC at a MRS. It does not directly address environmental or ecological concerns associated with exposure to MEC.

3.9.3.2 The MEC HA is structured around three explosive hazard components and their respective input factors shown in Table 3-3:

Table 3-3: Explosive Hazard Components and Input Factors

Explosive Hazard Component	Input Factor
Severity (the potential consequences of the effect (e.g., injury or death) on a human receptor should a MEC item detonate)	Energetic Material Type
	Location of Additional Human Receptors
Accessibility (the likelihood that a human receptor will be able to come in contact with a MEC item)	Site Accessibility
	Total Contact Hours
	Amount of MEC
	Minimum MEC Depth/Maximum Intrusive Depth
	Migration Potential
Sensitivity (the likelihood that a MEC item will detonate if a human receptor interacts with it)	MEC Classification
	MEC Size

3.9.3.3 Each component input factor will be evaluated using information gathered and complied during the RI. The types of information that will be collected include:

- Site description and boundaries (defines area of the MEC HA)
- Physical conditions (site accessibility, migration potential)
- Previous munitions-related activities (energetic material type, location of additional human receptors, amount of MEC, minimum MEC depth relative to maximum intrusive depth, migration potential MEC classification, MEC size)
- Current and future land use activities (location of additional human receptors, site accessibility, potential contact hours, minimum MEC depth relative to maximum intrusive depth)
- Removal/remedial alternatives (energetic material type, location of additional human receptors, site accessibility, potential contact hours, amount of MEC, minimum MEC depth relative to maximum intrusive depth, MEC classification)

3.9.3.4 Using data collected during the RI, each input factor is assigned a score based on specific categories that best represent the site condition being evaluated. The sum of the input factor

scores falls within one of four defined ranges, or Hazard Levels 1 through 4. Hazard Level 1 has the highest potential explosive hazard conditions.

3.9.3.5 The initial MEC HA prepared for the RI Report will assess the explosive hazard that would remain if no action is taken. The 'No Action' scenario will help identify site conditions and use activities that can be addressed in alternatives developed for the FS. MEC HAs for alternatives will be presented in the FS.

3.9.4 MC Pathways

The CSM potential exposure pathways for human receptors are dermal contact, ingestion, and/or inhalation of MC in surface soil, subsurface soil, sediment, and/or surface water. Human receptors include residents, construction, commercial and industrial workers, and recreational users. The CSM potential exposure pathway for ecological receptors is dermal contact, ingestion, and inhalation of MC in surface soil, sediment, and surface water.

3.9.5 Human Health and Ecological Risk Assessments

Data gathered during the RI and the relevant historical data will be used to conduct the screening level RAs. The RAs will be used to determine whether any remedial action(s) need to be implemented or whether no further actions are required.

3.9.5.1 Screening Level Human Health Risk Assessment

3.9.5.1.1 A Tier 2 screening level HHRA will be conducted IAW guidance provided in the Munitions Response RI/FS Guidance (DA, 2009). This guidance is founded on the RA requirements provided in CERCLA and the NCP.

3.9.5.1.2 The RA will follow the four-step process of hazard identification, toxicity assessment, exposure assessment, and risk characterization defined by the National Academy of Sciences (NAS, 1983) and the EPA (1989). All data generated during the RI phase, including information about background conditions, as well as historic data will be evaluated in the RA. If lead is identified as a COPC for the child recreational receptor, the RA will utilize EPA's Integrated Exposure Uptake Biokinetic Model to characterize potential risk (EPA, 2007). For potentially complete exposure pathways for adult receptors, the EPA's Adult Lead Model (EPA, 2003) will be utilized to characterize their potential risk.

3.9.5.1.3 For constituents assumed to cause cancer, estimated lifetime cancer risks from all exposure pathways for a potential receptor will be compared to the National Cancer Program cancer-risk limit range of to one in 1,000,000 (1×10^{-6}) to one in 10,000 (1×10^{-4}) (EPA, 1990). Compounds that exceed this risk limit range will be identified for further evaluation in the FS. For non-cancer endpoints, the estimated total Hazard Index (HI) from multiple exposure pathways for a potential receptor will be compared to a HI limit of one. If the total HI exceeds unity, the compounds will be segregated by critical effects, and the HIs summed by critical

endpoint. The compounds that contribute to an endpoint-specific HI that exceeds unity will be identified as COCs for further evaluation in the FS. Applicable or relevant and appropriate requirements (ARARs) will also be presented.

3.9.5.1.4 The conclusions of the HHRA support risk management decision-making, one decision of which may be the performance of a FS. The HHRA will also summarize the factors that contribute some level of uncertainty to the risk estimates.

3.9.5.2 Ecological Risk Assessment

3.9.5.2.1 The ecological RA will be conducted IAW the Munitions Response RI/FS Guidance (USACE, 2009). This guidance is based on the risk assessment requirements provided in the CERCLA and the NCP. In addition, the RA will be conducted IAW regulations and provisions established by the State of Hawaii.

3.9.5.2.2 The ecological RA will follow the general four-step process of problem formulation, analysis, risk characterization, and uncertainty assessment as established by the EPA (EPA, 1998). All data generated during the RI phase, including background conditions and relevant historic data, will be evaluated in the ecological RA. The potential for risk will be quantified based on the quotient method, with chemical-specific Hazard Quotients (HQs) exceeding unity indicating a potential risk to the receptor in question. Where appropriate, based on additivity of toxic responses, HQs will be summed and evaluated as HIs. Uncertainties associated with each finding of potential risk will be evaluated and the ecological significance of any calculated HQs greater than unity will be discussed.

3.10 General Field Activities and Site Controls

The following section provides an overview of field execution, site controls, communications, and site management.

3.10.1 Preliminary Field Activities

3.10.1.1 During mobilization, site management personnel will coordinate with USAESCH/CEPOH PMs and stakeholders to finalize right-of-entry requirements, locations of temporary facilities to be used, and communications requirements. Temporary facilities may include an office trailer, storage area for drums, and porta-johns. A map of the temporary facilities location will be provided upon receipt of right-of-entry.

3.10.1.2 Site management personnel will contact and coordinate with local fire, medical, and other emergency services to ensure availability of services, and the appropriate response actions IAW the WP and APP. On-site subcontractors will be notified of pending mobilization date.

3.10.2 Site Access and Work Hours

3.10.2.1 Huikala will control access to all work areas. Access will be limited to only those personnel required to accomplish the specific operations or to those personnel who have a specific purpose and authorization to be on the site. All authorized site personnel will wear matching safety vests for easy identification. No hazardous MEC operations will be conducted when non-UXO or unauthorized personnel are inside the defined MSD zone.

3.10.2.2 Operations will be conducted only during daylight hours. Huikala intends to work four 10-hour days with an optional schedule of five 8-hour days. Huikala may decide to work more than 40 hours per week if required by operational needs. However, UXO work will be limited to 40 hours per week. Additionally, a minimum 48-hour rest period will be provided before the start of the next work week.

3.10.3 Site Communications

Handheld portable radios will be the primary method of communication between the office trailer, SUXOS, and the field teams. Cellular telephones will be used as a back-up communication method.

3.10.4 Safety Precautions and Practices

Safety is paramount to the success of the project. All work will be performed in accordance with the approved APP and SSHP provided in Appendix D. The UXOSO will conduct safety and operational briefings daily. Additionally, the SUXOS, UXOSO, or UXOQCS may hold a safety stand-down to conduct training, at any time a deviation or degradation of safety warrants a review. The safety and operational training and briefings will be performed IAW the SSHP. Contractor Forms are provided in Appendix F.

3.10.4.1Daily Safety Briefing

Prior to the commencement of work, a safety briefing will be conducted for all site personnel by the UXOSO, UXOQCS, or SUXOS. A written record of this meeting will be maintained in the Huikala Safety Meeting Attendance Log. The briefing will focus on specific daily hazards, potential hazards and risks that may be encountered, and the safety measures that should be used to eliminate or mitigate those hazards. These briefings will provide personnel with the known or potential task-specific hazards related to the day's operation. The Activity Hazard Analysis (AHAs) forms will be available and used during the safety briefing to inform personnel of the task-related hazards. The AHAs will also be used to inform personnel of the personal protective equipment (PPE) and safe work practices that will be used to mitigate the task hazards.

3.10.4.2UXO Refresher

All UXO personnel will receive UXO refresher training by the UXOSO, UXOQCS, or SUXOS. The refresher will focus on the explosives suspected to be present on the site and will include topics such as the identification of MEC, the hazards associated with MEC, and disposal methods.

3.10.4.3Site-Specific Training

3.10.4.3.1 As part of the mobilization process, Huikala will perform site-specific training for all on-site personnel assigned to this project. The purpose of this training is to ensure that all on-site personnel fully understand the operational procedures and methods to be used during this project. The training sessions will be conducted by the UXOSO and will cover individual responsibilities and safety and environmental and cultural concerns associated with operations, as detailed below:

- Field equipment operation, including the safety and health precautions, field inspection, and maintenance procedures that will be used;
- Interpretation of relevant sections of this WP and APP/SSHP as they relate to the tasks being performed;
- Personnel awareness of potential site and operational hazards associated with site-specific tasks and operations;
- Public relations to ensure that personnel will not make any public statements to the media without prior coordination with and approval of CEPOH;
- Environmental concerns including invasive/endangered/threatened species and historic, archeological, and cultural resource issues;
- Identification of features, hazards, and disposal methods of MEC/UXO that may be encountered; and
- Additional USAESCH training as required.

3.10.4.3.2 The archaeologist and environmental protection specialist will be notified in advance of any site-specific archaeological, biological, or ecological training occurs.

3.10.4.3.3 Further training requirements are contained in the SSHP Section 5.0 Training.

3.10.5 Visitors

3.10.5.1 All visitors entering the site will report to the Huikala field office and sign the visitor's log. The requirements for authorized visitors are listed in EM 385-1-97. Visitors shall receive on-site safety and health training provided by the UXOSO. The training shall be

commensurate with the degree of hazard to which they may be exposed. Personnel limits are 30 personnel including authorized visitors IAW EM 385-1-97. No more than two authorized visitors will be permitted in the exclusion zone at any given time.

3.10.5.2 Non-UXO qualified personnel will be prohibited from performing any operation unless they are accompanied and supervised by a UXO technician.

3.10.5.3 Visitor requirements do not preclude site visits by USACE personnel or Restoration Advisory Board members from site visits during non-work hours.

3.10.6 Site Controls

3.10.6.1 For the purpose of this WP, a MEC operation is defined as any activity that involves investigation, inspection, demolition, or handling any MEC, potential MEC, or explosive materials. Once a MEC operation commences in an area, only essential personnel involved in the on-site activities will be permitted into the MSD. MSD restrictions from MEC areas to non-essential personnel will be applied.

3.10.6.2 To control site access, Huikala will post warning signs at the entrance to the work site and at appropriate locations around the perimeter when fencing is not available or practical. The signs will warn personnel that hazardous operations are being conducted. The signs posted will ensure that non-project personnel are restricted from the site during MEC operations. Project personnel will maintain a sharp vigilance to ensure non-project personnel do not encroach into the project area during MEC operations around posted signage. If a MEC item cannot be destroyed on the day of discovery, then the item will be secured and guarded until destruction can be accomplished. Under no circumstances will MEC be left unsecured.

3.10.7 Work Zones

In addition to the MSD, additional work zones will be established prior to initiating MEC investigation activities. Exclusion zones will be established around the operation defining the investigation areas. The areas outside of the MSD will serve as the support zones. A designated muster area will be established within the support zone and will contain a first aid kit, an eyewash station, a fire extinguisher, and emergency communications.

3.10.8 Equipment Testing

All equipment will be inspected as it arrives to ensure it is in proper working order. Equipment found damaged or defective will be repaired or returned to the point of origin and a replacement will be secured. All instruments and equipment that require routine maintenance and/or calibration will be checked initially upon its arrival and then checked again prior to its use each day. This system of checks ensures that the equipment is functioning properly. If an equipment check indicates that any piece of equipment is not operating correctly, and field repair cannot be made, the equipment will be tagged and removed from service. A request for replacement

equipment will be placed immediately. Replacement equipment will meet the same specifications for accuracy and precision as the equipment removed from service.

3.10.9 Vegetation Removal

3.10.9.1 Vegetation removal will only take place within marked transects, and vegetation will only be removed to the extent necessary to conduct geophysical surveys with the handheld all-metals detectors, anomaly investigation, or MEC removal operations. UXO technicians and general laborers, with site-specific training and escorted by UXO technicians, will perform all vegetation removal activities, using handheld weed-eaters or chainsaws where necessary. Vegetation will be cut to no less than six inches from the ground. Vegetation with trunks or branches greater than four-inch diameter, at chest height, will not be removed. Transects will meander around the item. Cut vegetation will be removed from the area being cleared and placed within or near the same transect, where it will be allowed to degrade naturally. Cut vegetation will only be placed in areas that have been surveyed by the project biologist and archaeologist and determined to be absent of natural or cultural resources of concern.

3.10.9.2 Before and during vegetation removal, UXO technicians will visually search the area where the vegetation will be removed to ensure the area is free of surface MEC items or other items that may present a physical hazard. During the vegetation removal, the affected site personnel will utilize all the safety and health personal protective equipment specified in the APP.

3.10.10Demobilization

Upon completion of the field tasks covered under the PWS, Huikala will demobilize from the sites. The demobilization activities will consist of the following steps.

- Remove temporary facilities.
- Demobilize personnel and any remaining equipment and supplies.

3.11 Environmental Field Sampling Plan

Field activities may include soil and sediment sampling. The proposed sampling follows the HDOH HEER TGM for increment sampling and is further described in the UFP-QAPP (Appendix E). The UFP-QAPP satisfies requirements of the SAP.

3.11.1 Soil and Sediment Sampling

3.11.1.1 Sampling activities will be conducted IAW HDOH HEER TGM guidelines. Sampling will be performed in a phased approach following identification of MEC-contaminated areas. If MEC-contaminated areas are identified during the MEC investigation, MC increment sampling of surface soil will be conducted within the MEC-contaminated area. The results of the

MC sampling will be compared against HDOH EALs and background soil concentrations. EPA Regional Screening Levels will be used if an HDOH EAL is not available for that constituent.

3.11.1.2 If concentrations exceed the higher of either the screening level threshold or the background concentrations, a baseline RA will be conducted to determine if there is an unacceptable level of risk. If there is an unacceptable level of risk, subsurface soil and sediment samples will be collected. Surface water samples will only be collected if the RA for sediment indicates an unacceptable level of risk.

3.11.2 Sampling Locations

3.11.2.1 Final sample locations will be determined after the completion of the MEC geophysical surveys. Figures indicating the sampling locations will be submitted to USAESCH and CEPOH for review. Generally, the surface soil and sediment sample locations will be selected as follows:

- Sampling Units (SU) will be 5,000 square feet with boundaries based on: the MEC boundaries identified during the MEC survey, the presence of available media (i.e., surface soil), and consideration of sensitive habitats. Incremental samples (IS) will be collected from the SUs IAW the HDOH HEER TGM. Each IS will consist of 50 increment subsamples, minimum, composed of approximately 35 grams of soil per subsample. Increments from ISs will be located in a systematic-random manner (e.g., even spacing along a serpentine line traversing the area) along the established MEC transects. Per HDOH guidance, triplicate ISs will be collected from each SU. The two replicate ISs will be located in the same manner as the primary IS, but from a different direction or starting point. The replicate samples will be collected along the same transect as the primary sample but offset to the left and right along the transect.

- A single IS will be collected biased toward an area of high MD/MEC concentration within the boundaries of the potential target area defined through VSP. The boundaries of the MC contamination are presumed to coincide with the boundaries of the potential target area. In the case where the IS unit is larger than the potential target area, the dimensions of the IS unit will be equivalent to the potential target area.

- Background SUs will be established at the site after completion of the MEC survey to determine background concentrations in soil of select metals. The background SUs will be located in areas not impacted by MEC and will contain soil that is similar in composition to the soil found within the impact area. The boundaries of the background SUs will not encroach any closer than 500 feet from any identified MEC or MD identified in the MEC survey. The background SUs will be sampled using incremental sampling methods previously described.

- If required, increment subsurface soil samples will be collected from within the SU, to evaluate the vertical extent of contamination. Subsurface samples will be collected from a depth of 6 inches to 12 inches below ground surface.

- If required, discrete sediment sampling locations will be determined by the site feature in question (i.e., streams). Discrete sediment samples will be collected directly from the impacted area. Discrete background sediment sampling locations will also be established in areas not impacted by MEC and with similar sediment composition.

3.11.2.2 SUs will be established at up to two consolidation points, with no more than one per MRS. The boundary of the SU will be determined based on the expected fragmentation area. The SU will be sampled post-detonation using IS techniques (i.e., collection of 50 increments per IS in a systematic-random manner).

3.11.3 Sample Location Layout and Site Preparation

3.11.3.1 Discrete and increment soil sample locations will be located in the field using a differential handheld GPS device or by measuring distances and directions (i.e., pace-and-compass methods) to fixed benchmarks that can be surveyed with the GPS and used to calculate the coordinates of the sample location. The field team will be escorted by an UXO technician who will clear the sampling locations of UXO prior to access.

3.11.3.2 Field sampling personnel will coordinate with other on-site personnel in order to ensure that abandoned vehicles/equipment, trash dumps, and other items are not included in the SU.

3.11.4 Sample Collection Procedures

The sample collection procedures are presented in the UFP-QAPP (Appendix E), which serves as the SAP for MC. The UFP-QAPP includes detailed descriptions of the surface soil and sediment sample collection procedures, the sample handling procedures, the sample laboratory analyses, and the quality assurance (QA)/QC procedures. The sample collection procedures in the UFP-QAPP have been developed to provide sufficiently detailed instructions to ensure that project activities are performed consistently and with high quality, independent of the individual performing the activity. All sample collection and analyses will be conducted IAW industry standard practice and in strict accordance with the requirements of the project specific APP/SSHP (Appendix D).

3.12 Institutional Analysis

3.12.1 The institutional analysis process involves the collection of data from local institutions needed to design and support an institutional control program at the site. The objectives of the institutional analysis are to (1) illustrate the opportunities that exist to implement an institutional

control program the site, (2) identify local institutions having jurisdiction over the site, and (3) assess the appropriateness, capability, and willingness of these parties to assert their control over the site.

3.12.2 Huikala will collect data from local institutions through interviews, questionnaires, and document research. The types of data that will be gathered include:

- Jurisdiction of the Agency
- Authority Exercised by the Agency within its Jurisdiction
- Mission of the Agency
- Capability of the Agency
- Desire of the Agency to Participate in the Institutional Control Program

3.12.3 This data, in addition to the results of the RI field efforts will be used to develop institutional control strategies, which may consist of a single institutional control or a combination of strategies. The local community and stakeholders drive the development of the appropriate institutional control alternatives. The alternatives for the site will reflect the framework of the local institutions and the needs of the community. The information will be summarized and presented in an Institutional Analysis Report IAW EP 1110-1-24 after the completion of RI field activities.

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4.0 Quality Control Plan

4.0.1 The purpose of the QCP is to ensure that planned activities are successfully completed to the satisfaction of USAESCH and CEPOH and meet and/or exceed established project objectives, plans, and specifications. Following are the specific objectives of the on-site QC program:

- Provide a clear definition of the on-site project scope of work.
- Establish an on-site QC team consisting of experienced and qualified team members.
- Define the position and role of each team member, including the specific responsibilities, authorities, and reporting mechanisms.
- Implement on-site project QC mechanisms, including an inspection and testing program.
- Develop procedures for obtaining qualified subcontractors, and monitor the quality of the subcontracted work.
- Conduct corporate level QC auditing procedures, which include notification of deficiencies, corrective action, and recommended QC improvements.
- Ensure compilation of on-site project documentation in an organized manner with proper QC review.

4.0.2 The key to the QC program is the completion of three phases of inspections prior to and during the performance period of each definable feature of work (DFW). The three-phase inspection approach includes the following tasks:

- Preparatory-phase inspections
- Initial-phase inspections
- Follow-up-phase inspections

4.0.3 This inspection approach ensures that QC requirements are adhered to in the field through multiple inspections during all phases of project performance for each DFW.

4.0.4 QC requirements applicable to chemical analytical testing and data are addressed in the UFP-QAPP (Appendix E).

4.1 Quality Management Structure

Huikala is solely responsible for controlling product and service quality that meets or exceeds contract requirements. To accomplish this, Huikala has established a quality management and reporting structure that allows the QC team to raise issues directly to the PgM or Huikala

President if unable to resolve QC issues at lower levels. All team members are accountable for ensuring that their work is performed IAW all plans and specifications. However, the UXOQCS has the responsibility of ensuring and verifying on-site QC through the implementation of the QCP. The UXOQCS will perform inspections on the work performed by Huikala, subcontractors, or suppliers. The UXOQCS is responsible for scheduling and coordinating inspections and tests. The implementation and documentation of inspections, tests, and monitoring accomplish quality control. In the event that a non-conformance is discovered, the UXOQCS has the authority to stop all work until all corrective action measures have been conducted to restore project quality. If the UXOQCS is not satisfied with the resolution of the non-conformance, the PM, PgM, CQCM/PQCM, Huikala will be contacted in ascending order until resolution is reached.

4.1.1 Roles and Responsibilities

Table 4-1 lists the roles and responsibilities of the quality management team members. Refer to Appendix C for a hierarchical organization chart. The project team will provide the specific technical and management capabilities and qualifications to perform the contract work.

Table 4-1: Quality Management Team Roles and Responsibilities

ROLE	RESPONSIBILITIES
Program Manager (PgM)	• Responsible for the overall quality of contract services, products, and deliverables.
Project Manager (PM)	• Responsible for the overall project quality management and implementation of the QCP. • Responsible for ensuring the availability of the resources needed to implement the QCP. • Ensures that the QC processes are incorporated in the project plans, procedures, and training. • Responsible for the quality and timeliness of all project activities, including those performed by subcontractors and suppliers. • Reviews and approves sampling, testing, and field investigation methods. • Manages QC documentation with the assistance of support personnel. • Coordinates with the SUXOS and UXOQCS to ensure project quality issues are addressed. • Maintains effective contact with the client.
Corporate Quality Control Manager (CQCM)	• Reports to the Huikala President and has the authority and overall responsibility for independently verifying that quality is achieved. • Fosters a culture of excellence for quality. • Manages the QC organization and maintains the Quality Control Plan (QCP). • Approves corporate level QC documents, project and program implementation procedures, and subcontractor QCP. • Assesses the implementation of the QCP. • Ensures that all personnel are properly trained and adequately experienced for the duties. • Establishes guidelines to assist in the development of program, project, site and task specific QC policies and procedures. • Ensures corrective actions are documented and acknowledged by the PM and field

ROLE	RESPONSIBILITIES
	personnel, as well as communicate to the client, when adverse situations or defective work result from a project activity. • Conducts periodic field audits of the programs, projects and sites and submit a report of findings to the PM. • Ensures project deliverables are defined prior to initiation of field operations and are submitted as required by the WP and project schedule. • Reports regularly to the PM on the adequacy, status, effectiveness of the QC program. • Will dual-hat the PQCM role.
Programmatic QC Manager (PQCM)	• Provides input and oversight of the overall quality program. • Reviews plans and results as well as the quality of all documents and deliverables. • Assists with the implementation of the WP; regularly interacts with the SUXOS and UXOQCS to insure the goals of the WP are achieved.
UXO Quality Control Specialist (UXOQCS)	• Reports directly to the CQCM/PQCM and coordinates site activities with the SUXOS. • Enforces the site-specific and corporate QC plans and procedures. • Coordinates to make sure that QC objectives appropriate to the project are set and all personnel are aware of these objectives and standards. • Maintains a QC log to document field activities during QC monitoring activities and reporting. • Coordinates with the SUXOS to ensure that QC procedures are being followed and are appropriate for achieving data validity sufficient to meet QC objectives. • Authority to stop work when significant conditions adversely impact the quality of work and such action is warranted. • Conducts daily QC surveillances of all site activities using the three-phase inspection process and recording the findings. • Completes the QC Reports for the Preparatory, Initial and Follow-on QC Report. • Reports non-compliance with QC criteria to SUXOS and PM and documents these non-conformances on the Non-conformance Report. • Performs Root Cause Analysis for quality deficiencies. • Coordinates corrective measures IAW project specifications. • Develops preventative measures to prevent future occurrences. • Conducts quality, standards and proficiency training. • Initiates a Rework Items List on non-conformance areas that must be accomplished to meet quality specifications. • Conducts QC Meetings as required. Records meeting outcome in the Daily QC Report. • Coordinates Corrective Action Requests for administrative and engineering resolutions. • Ensures that lessons learned are documented.
Senior UXO Supervisor (SUXOS)	• Supervises and directs operations of all field teams performing activities. • Directly supervises field performance assisting personnel to achieve maximum operational safety and efficiency. • Implements the approved plans in the field and review and approve any changes. • Works with the UXOQCS to ensure compliance with contract documents specifications relating to QC. • Assesses the effective implementation of the project QCP. • Authority to stop work when significant conditions adversely impact the quality of work and such action is warranted. • Identifies quality problems and make sure that unsatisfactory conditions are controlled until proper resolution has occurred.

4.1.2 Employee Qualifications

4.1.2.1 Prior to an employee's initial assignment or any change in duties/assignment, the SUXOS will physically review the employee's licenses, training records, and certificates to make sure that the employee is qualified and capable to perform the duties to which they are being assigned.

4.1.2.2 Huikala will make sure the UXO-qualified personnel meet the standards required by DDESB TP 18. UXO personnel may receive years of experience credit being granted for active duty military explosives ordnance disposal (EOD) position and/or for served time as a UXO Technician I, II, III, UXOSO, or UXOQCS through work with a munitions response contractor. Huikala will provide certification for each hired worker showing their proper training and requisite experience per DDESB TP 18 for the position being filled and in compliance with 29 CFR 1910.120.

4.1.3 Training

4.1.3.1 General Training

4.1.3.1.1 All UXO personnel will meet the requirements of DDESB TP 18. All employees at this job site will have completed a training program, prior to beginning work on-site, which complies with Occupational Safety and Health Administration (OSHA) Regulation 29 CFR 1910.120e(9). All employees who work on hazardous sites receive training, which includes an equivalent of 40 hours of training off-site and three days of actual field experience under the direct supervision of a trained, experienced supervisor. Management and supervisors receive an additional eight hours training on program supervision. Each employee annually receives eight hours of OSHA refresher training.

4.1.3.1.2 Training will be conducted by the SUXOS, UXOSO, or certified third-party vendor. Records of attendance (and student performance when applicable) are recorded. Prior to assignment to a duty position or change in duty position, the SUXOS, UXOSO, and UXOQCS will perform a review of the individual's site personnel record to ensure that the employee is qualified to fill the position and is physically fit enough to perform the work.

4.1.3.2 Site Specific Training

Employee training is an integral part of producing quality products and services. Site-specific employee training will be conducted prior to the start of operations and supplemented, as necessary, throughout the remainder of the project. All field personnel receive the following types of training:

- **Safety**: Review of the SSHP with specific emphasis on the hazards known to exist on-site.

- **Equipment Operators Training**: Tailored to the experience level of the operator and objectives of the project.
- **Daily Safety Training**: General and tailgate briefings outlining the day's activities, unique hazards and safety precautions, and other operational issues related to the project.
- **Environmental awareness training**: The project biologist will identify natural resources that should be avoided and assist the UXO technicians in rerouting transects appropriately to avoid impacting those resources. The survey team will mark each resource avoided so that the sweep teams are aware of its presence and location in the vicinity of each transect
- **Cultural awareness training**: The archaeologist will identify archaeological and cultural resources that should be avoided and assist the UXO technicians in rerouting transects appropriately to avoid impacting those resources. The survey team will mark each resource avoided so that the sweep teams are aware of its presence and location in the vicinity of each transect.

4.1.3.3 Training Records

The SUXOS will maintain training and personnel files on each employee, to include copies of licenses, training records and certificates of qualifications that support the employee's placement and position. At a minimum the files will include:

- Naval School, EOD certification or certification IAW DDESB TP 18 approved schools (UXO personnel only);
- Current certificate of medical clearance/annual physical examination IAW 29 CFR 1910.120;
- 40-hour HAZWOPER safety training certification;
- 8-hour HAZWOPER supervisor certification (required by position);
- Current 8-hour annual HAZWOPER refresher certificate;
- Current certificate for cardiopulmonary resuscitation training and first aid (required by position);
- Current and valid driver's license (with restrictions identified) (if required); and
- Attendance records of site-specific training.

4.2 Three-Phase Quality Control

The UXOQCS will ensure that the three-phase control process is implemented for each DFW, regardless of whether they are performed by Huikala or its subcontractors. Each control phase is important for obtaining a quality product. However, the preparatory and initial inspections will be particularly invaluable in preventing problems. Production work will not be performed on a DFW until a preparatory phase inspection has been completed and initial phase inspection criteria have been identified and prepared.

4.2.1 Preparatory Phase Inspection

4.2.1.1 A preparatory phase inspection will be performed prior to beginning each DFW. The purpose of this inspection will be to review applicable specifications and verify the necessary resources, conditions, and controls are in place and compliant before the start of work activities.

4.2.1.2 The UXOQCS will verify with the client that all prerequisite submittals have been submitted and approved, and that lessons learned during previous similar work have been incorporated as appropriate into the project procedures to prevent recurrence of past problems. The UXOQCS will meet with the PM and the staff responsible for the performance of a given task, including subcontractor personnel. The UXOQCS will generate and use a Preparatory Phase Inspection Checklist.

4.2.1.3 WPs and operating procedures will be reviewed by the UXOQCS to ensure they describe pre-qualifying requirements or conditions, equipment and materials, appropriate sequence, methodology, and QC provisions and will verify the following:

- Required plans and procedures have been prepared and approved and are available to the field staff.
- Field equipment is appropriate for its intended use, available, functional, and properly calibrated.
- Responsibilities have been assigned and communicated; the field staff has the necessary knowledge, expertise, and information to perform their jobs.
- The arrangements for support services have been made.
- The prerequisite site work has been completed.

4.2.1.4 Discrepancies between existing conditions and approved plans/procedures will be resolved and corrective actions taken for unsatisfactory and non-conforming conditions identified during a preparatory phase inspection. This will be verified by the SUXOS or his designee prior to granting approval for work to begin.

4.2.1.5 The UXOSO will discuss job hazards with site personnel and verify that the necessary safety measures are in place and ready for use. The UXOQCS will verify the completion of this task.

4.2.2 Initial Phase Inspection

4.2.2.1 An initial phase inspection will be performed the first time a DFW is performed. The purpose of the inspection will be to:

- Check the preliminary work for compliance with procedures and contract specifications.
- Verify inspection and testing and the established acceptable level of workmanship.
- Check safety compliance, review the minutes of the Preparatory Phase Inspection.
- Check for omissions and resolve differences of interpretation.

4.2.2.2 The UXOQCS will be responsible for ensuring that all discrepancies between site practices and approved specifications are identified and resolved.

4.2.2.3 Discrepancies between site practices and the approved plans/procedures will be resolved. Corrective actions for unsatisfactory conditions or practices will be verified by the SUXOS or his designee, prior to granting approval to proceed.

4.2.2.4 The results of the initial phase inspection results will be documented in the QC log book, on the Initial Inspection Checklist, and summarized in the Daily QC Report.

4.2.3 Follow-up Phase Inspection

4.2.3.1 A follow-up phase inspection is performed each day a DFW is performed. The purpose of the inspection is to make sure a level of continuous compliance and workmanship is maintained. The UXOQCS is responsible for on-site monitoring of the practices and operations taking place and verifying continued compliance with the specifications and requirements of the contract and approved project plans and procedures. If a work stoppage is required to correct a procedure, a Stop Work Order will be completed.

4.2.3.2 The UXOQCS is also responsible for verifying that a daily health and safety inspection is performed and documented as prescribed in the SSHP. The SUXOS will oversee and observe the same activities as under the initial inspection. Discrepancies between site practices and the approved plans/procedures shall be resolved and corrective actions for unsatisfactory and non-conforming conditions or practices verified by the SUXOS or his designee, prior to granting approval to continue work. Follow-up phase inspection results will be documented in the QC log book, on the Follow-up Inspection Checklist, and summarized in the Daily QC Report.

4.2.3.3 Additional inspections performed on the same DFW may be required. Additional preparatory and initial inspections and may be warranted under any of the following conditions:

- Unsatisfactory work.
- Changes in key personnel.
- Resumption of work after a substantial period of inactivity (e.g., 2 weeks or more).
- Changes to the project PWS/specifications.

4.2.4 Lessons Learned

4.2.4.1 During the course of field activities, data or information may be discovered that could eliminate or reduce challenges and/or offer opportunities for quality and productivity improvements through value engineering. These lessons learned will be valuable tools in updating plans and procedures for follow-on field operations.

4.2.4.2 Lessons learned will be captured and documented during the entire project. In the event of safety-related events, the UXOSO will perform this function. If the lesson learned will affect the task or project by improving safety, quality, performance or economics, then the PM/SUXOS/UXOQCS will gather this information, and include it with the weekly status report.

4.2.4.3 Topics for consideration for determining lessons learned include:

- Problems encountered;
- Solutions developed to solve the problems;
- Alternative procedures or processes that improve the operations;
- Quality/Productivity Improvements;
- Economic impacts; and
- Resolvable scheduling conflicts.

4.2.4.4 The SUXOS will note any lessons learned in the daily report. This information will be given to the PM and included in daily logs as appropriate. Lessons learned will be included in the final RI/FS report. Any lessons learned of an emergency nature will be brought to the immediate attention of the USAESCH and CEPOH PMs, CEPOH OESS, and the Huikala PM.

4.3 QC Surveillance

Huikala will perform daily, random, and scheduled surveillances of all work areas and definable features of work to maintain control over field activities identified in the WP.

4.3.1 QC Inspections

QC inspections will be conducted according to the criteria specified in the following paragraphs. All inspections will be conducted by the responsible personnel and documented accordingly.

- Functional check of handheld metal detectors will be conducted daily at the instrument verification strip (i.e., "test strip") established for the project as described in Section 3.3. If an instrument is found not to be functioning properly during the daily function test or at any time during the investigation, it will be replaced and not used during field activities until it has been repaired and passes the function test.

- Functionality of GPS equipment, relative to a known control point, will be performed prior to the start of each day of use (vertical control or topography will not be confirmed). The tolerance for testing the GPS equipment functionality will be established at 1-foot, checked against a known benchmark. If the test fails, the equipment will be re-tested, repaired, or replaced.

- At a minimum, the UXOQCS or designated QC assistant will conduct QC checks of each transect/grid the UXO teams have completed magnetometer-assisted sweeps and digging of anomalies. The UXOQCS or designated QC assistant will conduct spot checks at regular intervals (approximately 200 feet or 60 meters). The UXOQCS will use a handheld all-metals detector to conduct QC on the transect/grids. The UXOQCS will notify the CEPOH OESS when one (1) lot (four transects/one grid) have been completed so the Government can conduct a QA check. The UXOQCS will update the OESS on an as-needed basis for the QA checks (i.e., start of each week, every other day, daily, etc.). As described in Table 4-2, a blind seed will placed by the UXOQCS at a rate of two times the number of operators per lot.

- Inspection will be made, as discussed in Section 3.0, on any discovered MEC, UXO or MPPEH to determine if it is acceptable or unacceptable to move. If the item is determined to be acceptable to move, it will be moved to the designated grid consolidation point and destroyed. If it is determined that the item is not acceptable to move, USACE will coordinate with stakeholders prior to any MEC demolition action and conduct evacuations as necessary prior to performing the demolition activities. This coordination will be completed within five (5) business days or less.

- All MD will be inspected by two qualified UXO technicians before it is moved from the transect/grid.

4.3.2 QC Performance Measurement

QC inspections and/or surveillance checklists (Appendix F) have been developed specifically for this project. Inspection and/or surveillance points and sampling frequency for each selected

definable feature of work are shown in Table 4-2 below. Sampling frequencies are at a normal state and may be tightened or relaxed based on a variety of factors such as team performance, project duration, geophysical and intrusive investigative results, etc.

Table 4-2: QC Performance Measurement

Requirement	Limited Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure
Repeatability (Instrument Functionality)	All	All items in test strip detected	Minimum once daily	Remedial training or replacement of faulty equipment
Dynamic Repeatability	Transects with digging	Repeat a segment of transect and show extra flags/digs with not greater than the greater of 20% or 8 flags/digs, or within range of adjacent segments	UXOQCS or designated QC assistant repeats 2% per lot	Redo lot
Coverage	Grids	Blind coverage seeds and blind detection seeds recovered 75%, if MEC, 90%, if no MEC. Notes 2 and 8 of DID. Standard ISOs similar to the ISOs used in the IVS to be used. A minimum of one large ISO and 1 small ISO to be seeded per operator per lot.	Seeds placed at 2 times the # of operators per lot (one grid)	Redo lot
Detection and Recovery	Grids	Blind detection seeds recovered 80% if MEC, 100% if no MEC. Standard ISOs similar to the ISOs used in the IVS to be used. A minimum of one large ISO and 1 small ISO to be seeded per operator per lot.	Variable rate at 2, 3, or 4 times the number of operators per lot with no DGM QC remapping.	Redo lot
Anomaly Resolution	Verification checking of excavated locations	QC checks open holes to determine if MEC: 70% confidence <10% anomalies unresolved, and a 90% confidence < 5% unresolved if no MEC is found.	Lot sampling frequency will employ table D-5 of DID WERS- 004.01 with an initial count of 200 anomalies per acre.	Redo lot
Geodetic Equipment Functionality	All	Position offset of known/temporary control point within expected range.	Daily	Redo affected work

Requirement	Limited Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure
Geodetic Accuracy	Points used for RTK or RTS base stations	Project network must be tied to HARN, CORS, OPUS or other recognized network. Project control points that are used more than once must be repeatable to within 5 centimeters.	For points used more than once, repeat occupation of each point used, either monthly (for frequently used points) or before re-use (if used infrequently).	Re-set points not located at original locations or re-survey point
Geodetic Repeatability	Grid corners/transect points without anomaly reacquisition	Measured locations are reoccupied within 10m.	1 per lot	Redo affected work

4.3.3 Equipment Calibration and Testing

Equipment utilized on-site (e.g., handheld metal detectors, GPS units, sampling pumps, real-time monitors, etc.) will be checked for operational reliability and calibration IAW the manufacturer's specifications. Both daily functional checks and any maintenance actions will be noted on equipment logs.

4.3.3.1 Maintenance Program

4.3.3.1.1 All tools, instruments, and equipment used on-site will be properly maintained and calibrated (as necessary) IAW the manufacturer's specifications or standard industry practices. This applies to communications equipment, vehicles/machinery, environmental monitoring equipment, and PPE.

4.3.3.1.2 Equipment will be protected from dust and contamination and visually checked for damage prior to use. Preventative maintenance will be performed on a regular basis. Critical spare parts will be kept on-site to minimize downtime.

4.3.3.1.3 Huikala has an aggressive maintenance program implemented as summarized in the following bullets.

- **Preventive Maintenance:** The assigned operator of each piece of equipment will perform scheduled, and when necessary, unscheduled, preventative maintenance to ensure the equipment is maintained in a satisfactory operating condition. Preventive maintenance consists of before, during and after operational checks and documentation of these activities, either in the operators log book or in the Team Leader's field log book.
- **Routine Repair and Adjustment:** Routine repair and adjustment is based on the manufacturer's schedule for adjustment, calibration or replacement. All equipment used

on-site will be maintained and submitted for routine repair and adjustment IAW the manufacturer's specifications.

- **Emergency Repair:** Emergency repair includes any unscheduled repair. This type of repair will be conducted using manufacturer required replacement parts and procedures to ensure the continued integrity of the equipment and viable performance.

4.3.4 Subcontractor QC

4.3.4.1 All subcontractors who perform services or supply materials must comply with the requirements of this WP and QCP. Subcontractor personnel qualifications, technical performance levels, QC procedures, acceptability levels, and documentation will be included in the subcontractors' scope of work as part of the subcontract documents. The CQCM/PQCM will review the subcontract procurement documents to verify that all QC requirements have been communicated to each subcontractor.

4.3.4.2 The UXOQCS is responsible for performing on-site inspections, surveillance, document reviews, and other QC activities, and for monitoring the subcontractor to verify compliance with the contract and subcontract requirements. These activities will be documented on inspection reports, checklists, field logs, or other forms appropriate to the function performed. The subcontractor is responsible for the quality of the work performed on a project, as well as the quality of the material, equipment, and supplies furnished by the subcontractor to be incorporated into the work. The subcontractor's QC representative will coordinate with the UXOQCS for required inspections and tests.

4.4 Corporate Level QC Audits

Corporate level QC audits will be performed periodically to ensure systems are functioning as planned. By or under direction of the CQCM/PQCM, management surveillance of the QC program ensures that operations are performed IAW approved plans. The audits include a review of procedures, logs, records, etc. Management audits help to identify discrepancies in information collected or if conditions and practices create the potential for QC problems, so that corrections can be implemented before problems occur. As part of the QAP, Huikala will conduct both internal and external audits. This is to ensure that all procedures and protocols are being followed and that the resulting data is accurate and defensible. Field audits will concentrate on products, procedures, proper documentation, and checks of resulting data for completeness and accuracy within established QC limits including Huikala subcontractor requirements.

4.4.1 Corporate Level QC Audit Procedures

Listed below are QC processes and procedures associated with personnel, data collection/analysis, instruments/sensors and other equipment, data deliverables, which may be audited for measuring the effectiveness of MEC investigations.

- Testing and calibrating equipment used to perform work
  - Each geophysical component will be noted according to make, model, and serial number in the field logbooks.
  - Instrument functionality testing will be performed and digital records of each test will be maintained and tracked in a logbook for review by corporate level QC personnel.
  - All instruments and equipment that require calibration will be checked prior to the start of each workday.
  - Batteries will be replaced as needed, and the instruments will be checked against a known source.
  - Instrument-specific functional testing procedures will be performed.
- QC procedures will be implemented to ensure data acquisition (analog instrumentation operation), data processing (post processing of GPS data), and interpretation methods (anomaly concentration calculations and analysis) are monitored at a sufficient level to meet the overall program objectives. Random audits of procedures will be performed by the PM.
- Monitoring/measuring the effectiveness of work performed
  - The SUXOS is responsible for ensuring that personnel accomplish all QC checks and that the appropriate log entries are made. The SUXOS and the UXOQCS will perform random, unscheduled checks to ensure that personnel accomplish all work specified in the WP and submit reports of their findings to the SUXOS.
  - Project deliverables, such as the WP and RI/FS documents, will be prepared by the PM prior to submittal to USAESCH.
  - QC reports, completed by the UXOQCS, will be submitted to the PM and/or the SUXOS which include descriptions of the areas checked and the results of the QC checks. Records of these inspections will be submitted at the end of the project.
- 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.

4.4.2 Pass/Fail Criteria for Quality Audits

4.4.2.1 Any non-conformance to the work or to contractual requirements will be documented. Non-conformance may include, but is not limited to the following:

- Delivery of items or services that do not meet the contractual requirements of Huikala or any of its subcontractors.
- Errors made in following work instructions, or improper work instructions.
- Unforeseeable or unplanned circumstances, which result in items or services that do not meet quality, contractual, and/or technical requirements.
- Technical modifications to the project by individuals without the requisite responsibility and authority.

4.4.2.2 A failure will be deemed to have occurred if items or services do not pass Huikala's corporate level QC pass/fail metrics.

4.4.3 Corrective/Preventative Action Procedures

Conditions adverse to quality such as malfunctions, deficiencies, deviations, and errors will be promptly reported, documented, evaluated, and corrected. When a significant condition adverse to quality is noted in the field or at subcontractor locations, the cause of the condition will be determined and corrective action taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned will be documented and reported to the SUXOS, the PM, and involved subcontractor management. Implementation of corrective actions will be verified by documented follow-up action. All project personnel have the continuing responsibility to identify problem areas promptly, solicit approved corrective actions, and report any condition adverse to quality. Corrective/preventive actions will 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 are violated;
- As a result of system and performance audits; and/or
- As a result of management assessment.

4.5 QC Documentation

Project records, including QC documentation, will be maintained in project files for the contract duration and be protected from unauthorized access. Upon completion of the project records will be reviewed, purged of unnecessary documents, organized, consolidated, and archived. Digital archiving may be utilized.

4.5.1 File Management

4.5.1.1 Documents generated during the project will be stored in hard copy and electronic form with backup in at least two locations. Documents deemed critically important will have multiple electronic versions archived. Following completion of each deliverable, data will be transferred to the USAESCH and CEPOH.

4.5.1.2 Electronic data and documents will be managed to prevent loss of information. All files will be backed up periodically and will be stored only on multiple media types. CDs, DVDs, USB, or other means of storage will be used in addition to standard computer hard drives to assure data is not lost by the failure of any one device. Hard copy records such as journals, daily logs, etc., will be copied when possible and transferred to electronic media for storage. All records will be maintained with at least one backup copy.

4.5.2 Logs and Records

4.5.2.1 For all site work, bound or digital log books with will be used by field personnel. The field log books will be used to record the daily activities of the field team, provide sketch maps and other pertinent items, and to note any observations which might affect the quality of data. Bound field logbooks with consecutively numbered pages will be used. Field logbooks will be maintained on-site for the duration of the fieldwork.

4.5.2.2 The field log books and site records will be used to record the data as follows.

- **Daily Log:** The SUXOS will maintain the daily log. The log will provide a summary of all operations conducted to include information on weather conditions, problem areas, WP modifications/deviations, injuries, start/stop times, tailgate safety briefs, equipment discrepancies, training conducted, visitors, and any additional items deemed appropriate. The log will be signed by the SUXOS or the PM.

- **Safety Log:** The UXOSO will maintain a safety log. The log will be used to record all safety-related matters associated with the project such as: safety briefings/meetings, including items covered and attendees; safety audits; near-misses/accidents/incidents; work stoppage due to safety hazards or deficiencies. It will also include cause and corrective action taken; weather conditions; and any other matters encompassing safety. The log will be signed by the UXOSO or the PM.

- **QC Log:** The UXOQCS will maintain a QC log and will record the three-phase QC inspections; performance and results of QC checks and audits: equipment calibration, testing, monitoring results; and non-conformance items and resolutions. The log will be signed by the UXOQCS or the PQCM.

- **Photographic Log:** The SUXOS will maintain a photographic log that lists all video recordings and photographs taken documenting work activities, ordnance items, and/or site conditions to supplement the Daily/Safety/QC Logs. Digital photographic and video files will be marked with a unique identifying number relating back to the photographic log, and will be maintained on file until the end of the project. All digital photographs taken will have a white board next to the item with the identification of the item as well as a reference scale showing the size. Photographs will be checked in the field by the UXOQCS to ensure proper lighting, sharp focus, and no shadows are visible on the photograph. Photographs will also be maintained in the project GIS.

- **Site Maps:** The SUXOS/UXOQCS will maintain working maps of the operating areas. These maps will be used to document task progression and other pertinent activities and locations.

- **Training Records:** The SUXOS will maintain training records for all site personnel. These records will contain nature of training, training certificates, licenses, and other qualifying data for an individual's duty position. Logs of visitor training will also be maintained. Training logs will be signed by the SUXOS or the PQCM.

- **Visitors Sign-in Sheet:** The SUXOS/UXOSO will maintain this log for all personnel that are not directly involved in the site activities. This log will identify visitors by name, company, date, time in/out, and a contact phone number.

4.5.2.3 Log books and records will be inspected by the UXOQCS on a weekly basis. These inspections will focus on the completeness, accuracy, and legibility of the entries and records. Results of these inspections will be forwarded to the SUXOS.

4.5.2.4 The log books are utilized to formulate the final report and serve as an "Official Document" in the event of any problem area addressed after the completion of the project. All log books will be maintained on file for a period of seven years after project completion. These logs may be digitally archived.

4.5.3 Reporting

4.5.3.1 Status Reports

Periodic status reports will be prepared and submitted as described in Section 2.3.2.

4.5.3.2 Geophysics Reports

Results of QC tests, numerical and pass/fail, will be submitted in an Access database or spreadsheet table IAW DID WERS 004-01.

4.5.3.3 Analytical Testing and Data Reports

Analytical testing may be conducted to identify areas above project action limits and to determine the extent of contamination. Electronic laboratory data reports will be submitted to USAESCH for QA evaluation. All analytical testing and reporting will be conducted IAW the UFP-QAPP, (Appendix E).

4.5.4 QC Meetings

QC meetings will be conducted as needed during field activities. Participants will include the USAESCH and CEPOH PMs, CEPOH OESS, and Huikala PM, SUXOS, UXOQCS, and UXOSO. The objectives of the QC meetings are to review QC documents, review QC procedures, discuss the effectiveness of the QCP implementation, discuss any non-conformance items and resolution, and identify lessons learned to prevent future non-conformance issues. Changes to QC metrics, WP procedures, and technical approach may also be discussed. Meeting minutes will be generated and distributed to all relevant parties.

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5.0 Explosives Management Plan

5.1 Introduction

5.1.1 This plan addresses procedures associated with removed MEC, the requisition, receipt, transportation, and storage of explosives, and related materials in support of removal actions and demolition activities at the MRS. The plan incorporates local, state, and federal laws, and regulations to include Bureau of Alcohol, Tobacco, Firearms and Explosives (BATFE) Pamphlet ATF P5400-7, which is an excerpt from 27 CFR Part 55; DoD 6055.09-Manual, Department of Transportation (DOT) Regulations, Army Regulation 190-11 and Huikala policies and procedures. A copy of the Huikala BATFE license will be available on-site.

5.1.2 The procedures outlined herein are applicable to all Huikala employees, clients, and visitors entering a MEC-contaminated work site where explosives, MEC, or related material and demolition materials are being stored on-site.

5.1.3 During explosive operations, safety is the primary concern. Requirements are to protect personnel, the general public, and the environment from fire, blast, noise, fragmentation, and toxic releases. Proper inspection, handling, packaging, and inventory controls are all tasks that must be considered to conduct a safe and efficient operation.

5.1.4 All transactions relating to explosive material acquisition and expenditures of explosive materials will be maintained for a period of five (5) years. Records will be maintained at the project office while working on-site and subsequently moved to the business unit of the BATFE license holder.

5.2 Licenses/Permits

5.2.1 Explosives are purchased under a "User of High Explosives License" issued by the BATFE. The license holder must provide written authorization designating the individuals authorized to purchase, store, or use explosives. A copy of the letter will be maintained in the project office and will reflect:

- Name of Individual;
- Home Address;
- Date and Place of Birth; and
- Social Security Number.

5.2.2 Individuals authorized to purchase explosives will have a State of Hawaii blasters license. The SUXOS will be responsible for identifying the need to obtain the license and scheduling personnel resources to complete the required actions to become properly licensed.

5.2.3 Each individual authorized to receive, issue, transport, and use explosives will be identified by name and will assume accountability when signing receipt or transfer documents. At each site, any licenses or permits required to purchase, use, transport, or store explosives will be on hand and made available to federal, state, or local agencies upon request.

5.3 Acquisition

5.3.1 Explosives will be acquired from licensed explosive manufacturers who provide the best value to the government. Jet perforators and/or boosters both with detonation cord used along with electric detonators are used for demolition shots to control the operation and reduce the net explosive weight to be used (when and if needed). Huikala uses DOT Class 1.4 explosives whenever possible, which are safer to handle, easier and less expensive to ship, and more readily available for use.

5.3.2 The SUXOS will be responsible for initiating requisitions for demolition materials. This will be accomplished by submitting a purchase order request through the PM who reviews and approves the request before forwarding it to procurement.

5.3.3 Procurement of explosive materials will be limited to the amount needed to complete the specified operations. The requisition of explosives will be IAW Huikala procurement policy to ensure the best possible price for acquiring the explosive materials.

5.3.4 The seller of materials will provide a certified statement of the intended use of the explosive material. The seller will be licensed by the BATFE and the State of Hawaii to sell and transport initiators/high explosives and will be capable of re-supply within a 24-hour period.

5.4 Initial Receipt and Issuing Procedures

Initial receipt of demolition explosives and materials will be conducted IAW HSP-206 - Huikala Explosives Acquisition, Storage, and Accountability, provided in the APP.

5.4.1 Responsibilities

5.4.1.1 SUXOS

The SUXOS maintains overall responsibility to process and requisition for the required demolition materials. The SUXOS is also ultimately responsible for maintaining accountability of demolition materials and immediately reporting any losses or discrepancies to the BATFE, USAESCH PM, and the Huikala PM. The SUXOS will also ensure that all deliveries are coordinated with the CEPOH OESS and that all explosives ordered for operations are either consumed or returned to the Seller for storage in their explosive storage magazines.

5.4.1.2 Authorized Personnel

Only the Huikala SUXOS, UXOSO, and UXO DS will be permitted to receive and issue explosives.

5.4.1.3 Individual Personnel

All Huikala employees are responsible for ensuring the proper and safe handling, use, and control of demolition explosives/materials.

5.5 Explosive Storage Magazine

No explosives are planned to be stored on-site, as daily deliveries will be used for operations at hand. Day boxes will be used for temporary storage during MEC operations. Demolition explosives will be purchased from and stored with an on-island vendor. The vendor will transport explosives to the site on an as-needed basis. Huikala has a licensed Hawaii Blaster for on-site transportation and use of explosives.

5.6 Transportation

5.6.1 Procedures for Transporting Explosives

Transportation to the MRS will primarily be on public roads and performed by the explosives vendor. On-site transportation of explosives will be conducted IAW HSP-203 - Huikala Explosives Transport, provided in the APP. Private and restricted-access roads will be both paved and unpaved.

5.6.2 Requirements for Explosives Transport Vehicle

5.6.2.1 The vehicles used by Huikala to transport explosives on-site will be inspected prior to use each day by following the Huikala vehicle checklist. The requirements for the vehicle used to transport explosives are included in HSP-203.

5.7 Inventory

HSP-206 - Huikala Explosives Acquisition, Storage, and Accountability, lists the procedures to be followed for the inventory, notification of loss/theft, return of unused materials/storage of unused materials at the end of each day, and the disposition of demolition material/explosives at the conclusion of the project.

5.7.1 Reconciliation of Discrepancies

In the event there is a discrepancy in the inventory, the item(s) will be recounted a minimum of two (2) additional times. If a discrepancy still exists, the SUXOS will notify the Huikala PM, CEPOH OESS, USAESCH/CEPOH PMs, and BATFE.

5.7.2 Lost, Stolen, or Unauthorized Use

If it is discovered that explosive items have been lost, stolen, or used without proper authorization, the SUXOS will notify the Huikala PM, CEPOH OESS, USAESCH PM, and BATFE.

5.7.3 Return to Storage

No explosives will be stored at the site. Any unused explosives will be returned the same day to the on-island vendor or consumed.

5.7.4 Tracking

All forms associated with the receipt, inventory, and use of demolition explosives/materials will be kept by the SUXOS with a copy at the site office. During the issue and/or return of explosives, the SUXOS will conduct a joint inventory in conjunction with the UXO Technician III who was assigned as the demolition supervisor for the day.

5.8 MEC

5.8.1 Site Control During MEC Operations

To control site access, Huikala will post warning signs at the entrance to the work site and at appropriate locations around the perimeter when fencing is not available or practical. The signs will warn individuals that hazardous operations are being conducted. Project personnel will maintain a sharp vigilance to ensure non-project personnel do not encroach into the project area during MEC operations around posted signage. If a MEC item cannot be destroyed on the day of discovery, then the item will be secured and guarded until destruction can be accomplished. Under no circumstances will MEC be left unsecured.

5.8.2 MEC Handling During On-site Disposal

5.8.2.1 Demolition operations will be coordinated by the SUXOS and will be conducted IAW the procedures outlined in TechnicalManual 60A-1-1-31, EM 385-1-97, the ESP (Appendix J), and HSP-207. Pre- and post-MEC disposal notification will be coordinated with stakeholders and emergency response personnel.

5.8.2.2 During disposal of MEC, safety is the primary concern. The most immediate requirements are to protect personnel, the general public, and the environment from fire, blast, noise, and fragmentation.

5.8.2.3 Physical control of the on-site disposal operations will be accomplished by blocking access roads to the site at the point of the exclusion zone. Control of the disposal operations must be maintained to ensure no unauthorized access of the site by non-essential personnel.

During disposal preparation, all non-essential personnel must evacuate to locations outside the exclusion zone, and all essential personnel will be evacuated to a location outside the exclusion zone just prior to demolition. The MFD for the MGFD during disposal operations is presented in the ESP.

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6.0 Explosives Siting Plan

The Explosive Siting Plan is provided in Appendix J.

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7.0 Environmental Protection Plan

7.0.1 Based on the nature of the site work to be conducted, Huikala anticipates little, if any, pollution-related impacts to land, air, or water. The majority of soil disturbance will be limited to walking or shallow digging by hand and would not require runoff controls. In the event that MEC disposal operations are conducted on-site, engineering controls, such as sand bags, will be used to minimize the impact to the ground surface. Craters formed from demolition activities will be backfilled to the extent practicable to minimize ponding. If demolition activities are conducted on sloped areas, these areas will be backfilled and erosion control measures, such as jute netting or straw wattles may be deployed to minimize potential erosion.

7.0.2 No storm water impacts are anticipated. Other than during the possible disposal of a UXO item by detonation, noise is not anticipated to be a concern. If Huikala personnel anticipate any potential for pollution, the work will be stopped temporarily, and appropriate steps to avoid or mitigate the potential pollution will be taken.

7.0.3 This Environmental Protection Plan has been developed to minimize impacts to the project area during RI activities. Additionally, it identifies the methodology to assess cultural and biological resources in and around the MRS and outlines possible mitigation measures that can be used to avoid or lessen the impacts from surface visual surveys, geophysical investigations, MEC intrusive investigations and disposal, and MC sampling.

7.0.4 In accordance with the EM 1110-1-4009 guidance, this plan will discuss multiple topics of environmental protection including:

- ARARs
- Threatened and Endangered Species Protection
- Cultural Resource Protection
- Tree and Shrub Removal
- Dust and Emissions Control
- Spill Control and Prevention
- Storage and Temporary Facilities
- Access Routes
- Decontamination and Disposal of Equipment
- Minimizing Areas of Disturbance
- Post-activity Cleanup Procedures

7.1 Assessment of Applicable or Relevant and Appropriate Requirements

7.1.0.1 CERCLA Section 121 requires that site cleanups comply with federal ARARs, or state ARARs in cases where these requirements are more stringent than federal requirements. The potential ARARs presented herein are a compilation of the promulgated, substantive requirements of federal and state laws or regulations that may be legally applicable or may be relevant and appropriate based upon the circumstances present at the site as related to the release of MEC or MC contamination to the environment. Identification and evaluation of ARARs is an iterative process that occurs throughout the life of the project. The potential ARARs are presented in Table 7-1. The final ARARs are selected and become enforceable when the Record of Decision or DD for the site is signed.

7.1.0.2 Under CERCLA Section 121(d)(2), the federal ARARs for remedial action could include requirements under any of the federal environmental laws (e.g., Clean Air Act, Clean Water Act, Safe Drinking Water Act). State ARARs include promulgated requirements under state environmental or facility siting laws that are more stringent than federal ARARs and that have been identified in a timely manner, according to 40 CFR Part 300.400(g)(4). A requirement may be either "applicable," or "relevant and appropriate."

7.1.0.3 Applicable requirements are defined as those cleanup or control standards, or other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state laws. Applicable requirements are identified on a site-specific basis by determination of whether the jurisdictional prerequisites of a requirement fully address the circumstances at the site or the proposed remedial activity. All pertinent jurisdictional prerequisites must be met for the requirement to be applicable. These jurisdictional prerequisites are as follows:

- The party must be subject to the law.
- The substances or activities must fall under the authority of the law.
- The law must be in effect at the time the activities occur.
- The statute or regulation requires, limits, or protects the types of activities.

7.1.0.4 A requirement is applicable if the specific terms (or jurisdictional prerequisites) of the statute or regulation directly address the circumstances at the site.

7.1.0.5 If not applicable, a requirement may be relevant and appropriate if circumstances at the site are sufficiently similar to the problems or situations regulated by the requirement. "Relevant and appropriate" refers to those cleanup standards, or other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law, that, while not necessarily applicable, address problems or situations sufficiently similar to those encountered at

the CERCLA site, and whose use is well-suited to the particular site. The relevance and appropriateness of a requirement can be judged by comparing a number of factors, including the characteristics of the remedial action, the items in question, or the physical circumstances of the site, with those addressed in the requirement. If there is sufficient similarity between the requirements and circumstances at the site, determination of the requirement as relevant and appropriate may be made.

7.1.0.6 Determining whether a requirement is both relevant and appropriate is a two-step process. First, to determine relevance, a comparison is made between the response action, location, or chemicals covered by the requirement and related conditions at the site, release, or potential remedy. A requirement is relevant if it generally pertains to these conditions. Second, to determine whether the requirement is appropriate, the comparison is further refined by focusing on the nature of the items, the characteristics of the site, the circumstances of the release, and the proposed response action. The requirement is appropriate if, based on such comparison, its use is well-suited to the particular site. USACE must comply with requirements that are determined to be both relevant and appropriate.

7.1.0.7 Federal or state agencies may develop criteria, advisories, guidance, and proposed standards that are not legally enforceable but may be helpful in carrying out, or in determining protectiveness of, selected remedies. These materials are "to be considered" (TBC) and are meant to complement the use of ARARs, not compete or replace them. TBC materials are not ARARs and their identification and use are not mandatory.

7.1.0.8 There are certain circumstances under which ARARs may be waived. CERCLA Section 121(d) allows the selection of alternatives that will not attain ARAR status if any of six conditions for a waiver of ARARs exists. However, the selected alternative must be protective even if an ARAR is waived. Only five of the conditions for a waiver may apply to a DoD site. The conditions for a waiver are as follows:

- The alternative selected is only part of a total response action that will attain such level or standard of control when completed.
- Compliance with such a requirement at a particular site will result in greater risk to human safety and the environment (e.g., worker safety) than alternative options.
- Compliance is technically impracticable from an engineering perspective.
- The alternative selected will result in a standard of performance that is equivalent to an applicable requirement through the use of another method or approach.
- A state requirement has not been equitably applied in similar circumstances on other alternatives within the state.

- A fund-financed alternative does not provide a balance between available monies and the need for protection of public safety and the environment at sites where the need is more immediate (not applicable to DoD sites).

7.1.0.9 ARARs that govern actions at CERCLA sites fall into three broad categories based upon the chemical contaminants present, site characteristics, and alternatives proposed for cleanup. These three categories (chemical-specific, location-specific, and action-specific) are described in the following subsections.

7.1.1 Chemical-Specific ARARs

Chemical-specific ARARs include those environmental laws and regulations that regulate the release to the environment of materials with certain chemical or physical characteristics or that contain specified chemical compounds. These requirements generally set health- or risk-based concentration limits or discharge limits for specific hazardous substances by media. Chemical-specific ARARs are triggered by the specific chemical contaminants found at a particular site.

7.1.2 Location-Specific ARARs

Location-specific ARARs govern activities in certain environmentally sensitive areas. These requirements are triggered by the particular location and the proposed activity at the site.

7.1.3 Action-Specific ARARs

Action-specific ARARs are restrictions that define acceptable treatment and disposal procedures for hazardous substances. These ARARs generally set performance, design, or other similar action-specific controls or restrictions on particular kinds of activities.

Table 7-1: Potential ARARs

Type of ARAR	Requirement	Citation	Description	Comments
Action-Specific	Resource Conservation and Recovery Act (RCRA)	40 CFR 264.601 (RCRA, Subpart X)	Requires miscellaneous units for the management of hazardous waste, such as open burning/open detonation units, to be located, designed, constructed, operated, maintained, and closed in a manner that will ensure protection of human health and the environment.	Permits are not required for CERCLA actions and only the substantive requirements of Subpart X are considered ARARs.
Location-Specific	Native American Graves Protection and Repatriation Act (NAGPRA) Regulations	43 CFR 10.4 (c)	Requires persons who make an inadvertent discovery in connection with an on-going activity on Federal or tribal lands to stop the activity in the area of the inadvertent discovery and make a reasonable effort to protect the human remains, funerary objects, sacred objects, or objects of cultural patrimony discovered inadvertently.	NAGPRA is not applicable but may be relevant and appropriate. Burial sites may be present within PJCTC. The Archaeological Monitoring Plan will provide instructions for reporting unintentional discoveries.
Location-Specific	Archaeological Resources Protection Act (ARPA)	16 United States Code (USC) 470ee(a)	Prohibits excavating, removing, damaging, or otherwise altering or defacing, or attempting to excavate, remove, damage, or otherwise alter or deface any archaeological resource located on public lands.	ARPA is not applicable but may be relevant and appropriate. Archaeological sites may be present within PJCTC.
Location-Specific	Endangered Species Act	16 USC 1538(a)(1)(B)	Prohibits the "taking" of any federally listed threatened or endangered species of fish or wildlife. In addition, federal agencies must ensure that their actions will not jeopardize the continued existence of any listed species or result in the destruction	Rare, threatened, and endangered (RTE) species may be present on the site. A Biological Monitoring Plan will be prepared in advance of beginning fieldwork to identify species and define appropriate mitigative measures to implement throughout the course of the investigation.

Type of ARAR	Requirement	Citation	Description	Comments
			or adverse modification of the designated critical habitat of a listed species.	
Location-Specific	Migratory Bird Treaty Act	16 USC 703(a)	Prohibits the taking, possessing, buying, selling, or bartering of any native migratory bird species, including feathers or other parts, nest eggs, or products, except as allowed by regulations.	Migratory birds may be present on the site. A Biological Monitoring Plan will be prepared in advance of beginning fieldwork to identify species and define appropriate mitigative measures to implement throughout the course of the investigation.
Location-Specific	Endangered Species	Hawaii Revised Statutes Title 12, Chapter 195D-4 Hawaii Administrative Rules Title 13, Chapter 124	Prohibits any taking, transport or commerce in designated species. Further outlines conservation programs that mandate continued research on listed species.	RTE species may be present on the site. A Biological Monitoring Plan will be prepared in advance of beginning fieldwork to identify species and define appropriate mitigative measures to implement throughout the course of the investigation.

7.2 Threatened and Endangered Species Protection

7.2.1 A Biological Monitoring Plan (Appendix K) will be prepared in advance of beginning fieldwork to identify species and define appropriate mitigative measures to implement throughout the course of the investigation where field activities may cause a disturbance. The Biological Monitoring Plan will be developed to insure that any action taken is not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of designated critical habitat, and the prohibition against any action that results in a "take" of a threatened or endangered species without a determination that any "take" is not likely to jeopardize the continued existence of any threatened or endangered species. At a minimum, these protective measures include:

- Perform review of existing literature and reference material at the start of the project to determine whether endangered and sensitive ecological receptors are present.
- Adhere to buffer zones or timing restrictions that have been established during the TPP process.
- Avoid or minimize adverse impacts to biological resources during project activities.
- Evaluate the potential for route or site realignment when sensitive environments are encountered.
- In the event of unexpected discovery during RI activities, avoid working in the immediate area and notify the Government of the discovery. Continue RI activities away from the discovery. The project biologist will advise the SUXOS and field teams on the acceptable distance away from the sensitive area to resume fieldwork.

7.2.2 Environmental sensitivity will be an ongoing part of the daily safety and operational briefs. All personnel will be briefed daily by the biologist and archaeologist on environmental and cultural concerns particular to the areas that the sweep teams will be accessing that day. Personnel will be shown photographs of the known resources of concern that could be encountered while in the field. The sweep teams will be reminded to stay within the transect boundaries. They will also be instructed to remove from the transects all trash and debris and, upon completion of all necessary work in a given transect, flagging material.

7.3 Cultural Resource Protection

An Archaeological Monitoring Plan will be provided separately and will define the requirements for protection of the cultural resources throughout this investigation.

7.4 Tree and Shrub Removal

7.4.1 Brush clearing will be conducted to allow access for surveying, investigation, and sample collection. Only vegetation of less than four inches in diameter, chest-high, will be cut. Rare or threatened and endangered species identified by the project biologist will be avoided rather than cleared. Extensive site restoration is not anticipated.

7.4.2 Transects will meander along parallel paths, avoiding heavily vegetated area or large trees to prevent the necessity for removal of existing foliage. However, incidental, non-obtrusive vegetation (i.e., saplings, small branches, vines, leaves, and flowers) cleared during survey activities will be left on the ground near where it was cut. However, vegetation cut in areas near publically accessible foot paths and roads will be moved to less visible areas to maintain a pleasing aesthetic.

7.4.3 Huikala will take all actions necessary to protect and prevent damage to all trees, shrubs, and vegetation not identified for removal. No ropes, cables, or wires will be attached to trees for anchorages. Where trees may be defaced or otherwise damaged by site equipment or operations, Huikala will implement protective measures, including placement of boards, planks, poles, or fencing around the tree(s) or shrub(s), as directed and approved by CEOPH environmental protection specialist and the project biologist.

7.5 Dust and Emissions Control

Dust and emission controls are not anticipated to be necessary during the investigation fieldwork because activities will be performed in relatively damp areas and are not expected to generate dust. Additionally, emissions from project vehicles will be minimized by not leaving vehicles idling for prolonged periods of time and by limiting the number of vehicles accessing non-public areas within the MRSs. Team members will carpool to/from the work area. Additionally, there will be limited use, if any, motorized equipment during investigation or sampling activities.

7.6 Spill Control and Prevention

7.6.0.1 Any release caused by the Huikala or its subcontractors during the course of the field activities will be mitigated by Huikala. With the exception of the fuel in project vehicles, minimal chemicals, fuel, oil, rubbish, sewage, or other pollutants will be stored on-site. Therefore, there is little potential for spills or release into the environment. Huikala will take all necessary precautions to prevent spills and will implement contingency measures for cleanup should any occur.

7.6.0.2 Discharges or spills of petroleum-based products or hazardous substances can occur as a result of equipment failure or human error. It is important to document those areas at which the potential for such spills exists and to determine the maximum possible impact such an occurrence would have. In addition, contact between storm water and discharged materials can

adversely affect the quality of storm water. Therefore, sites where a potential for such contact exists must also be identified. The only potential spill or discharge areas identified for this project are equipment and material storage areas. While no fuel storage is anticipated on the site; hand-held equipment (i.e., weed whackers) may be fueled from temporary storage tanks maintained in support vehicles. Other products, such as hydraulic fluid, are found in equipment to be used on-site.

7.6.1 Control of Spills

In general, site controls will include a combination of containment structures and spill response procedures to prevent spills and accidental discharges of petroleum-based products or hazardous materials from reaching navigable waters and adjoining shorelines, or from coming into contact with stormwater runoff.

7.6.1.1 Spill Response Kits

7.6.1.1.1 Spill kits will be readily available in areas where there is a potential for a release. Spill kits contain buckets, bags of granular absorbent, absorbent booms and pads, personal protective equipment, and hazardous materials release response guidelines. Personnel will maintain the spill kits, refilling them when necessary.

7.6.1.1.2 The following general response procedures apply to minor release events, such as spills involving the release of a type or quantity of a chemical that does not pose an immediate risk to human health and where additional complications (such as injury, contamination to personnel, fire, toxic atmosphere, etc.) are not identified.

- Upon discovery of a release or spill, immediately alert area occupants of the discovery.
- Control access to the area, evacuate personnel, and isolate the area.
- If release is actively occurring and if the source of the release can be stopped without risk of exposure, stop the source of the release.
- Remove combustibles and ignition sources and unplug any nearby electrical or mechanical equipment.
- If trained to the appropriate response level, don appropriate PPE and use spill kit to confine and contain the spill in the area. Cover spill with the appropriate absorbent material. Loose spill control materials should be distributed over the entire spill area, working from the outside and circling to the inside. This approach reduces the chance of splash or spread of the spilled chemical.
- If possible, without risk of exposure, clean up spill using spill response materials.
- Properly containerize materials and properly mark containers.

- Perform appropriate contract notifications (i.e., USAESCH KO and PM) and within 24 hours) and facility notifications (i.e., CEPOH PM).

- Complete the appropriate release reporting forms.

7.6.1.1.3 The UXO Team Leader is responsible for ensuring that incidents of spills or significant leaks are recorded on the appropriate release reporting forms. The forms document the date of the incident, specific location, materials released, quantity released, personnel accounts of the incident, agencies to whom the spill was reported, a description of the incident, response procedures implemented to mitigate adverse effects, and corrective measures taken or proposed to prevent recurring releases. Completed release reporting forms will be reviewed and signed by USAESCH KO and PM and will be maintained in project records.

7.6.2 Inspections, Tests, and Records

Vehicles and oil-filled equipment at the site will be inspected on a regular basis to ensure proper functioning. Any sign of deterioration or leakage that could lead to an unanticipated release of petroleum-based products or hazardous substances will be reported and mitigated.

7.7 Manifesting, Storage, Transportation, and Disposal of Wastes

7.7.1 Wastes generated during field activities will be handled IAW all applicable Federal, State, DoD, and DA requirements. Wastes that may be generated and require management are:

- Munitions – MEC encountered on-site that pose an imminent threat to human health, the environment, and public safety will be disposed of as soon as possible. Prior to any disposal action, and only to the extent such investigations can be conducted safely, the project biologist and archaeologist will assess environmental and cultural resources within the area established by the MSD calculated for the particular MEC item found. Coordination with Stakeholders, USAESCH PM and technical lead, CEPOH PM, CEPOH OESS, and Huikala SUXOS and UXOSO will occur in order to assess how best to avoid and/or minimize impacts to cultural resources, endangered or threatened species, critical habitat, or any other species or habitat of particular concern to the landowner within the MSD. Avoidance and minimization strategies may include the use of engineering controls, such as sand bags, timing the MEC disposal action based on natural resource considerations, or other appropriate strategies. Following the disposal action, any engineering controls employed will be removed to the extent practicable. Refer to Section 3.7.10 for additional details concerning MEC disposal actions.

- Scrap metal – The only scrap metal that will be generated is MPPEH/MD that is found during investigation of metallic geophysical anomalies and certified as MDAS. These items will be inspected when found and if determined to be MDAS, will be transported and stored at a designated secured area in sealed/locked containers for later disposal at an

authorized recycling/salvage facility. Disposal of scrap metal is covered in Section 3.7.11.

- Investigation-derived Waste – Environmental sampling may generate several waste streams requiring disposal. IDW may include PPE solid waste, and decontamination water. In addition, scrap metal may be generated as a result of investigation of metallic geophysical anomalies. Based on the nature of the site and existing data, it is expected that only non-hazardous IDW will be generated during the field sampling event. Non-hazardous IDW such as decontamination fluids from the washing and rinsing of sampling equipment will be disposed to the ground at the site. It is expected that solid IDW (e.g., Tyvek suits, PPE, and other plastics) will be collected separately in trash bags and disposed of as municipal solid waste.

- Solid waste – Wastes, such as PPE, lunch wrappers, used water bottles, etc. may be generated during project field activities. These items will be placed in appropriate containers, which will be emptied regularly. All handling and disposal will be conducted to prevent further contamination and/or contaminant migration. Huikala will dispose of all solid waste in compliance with all applicable federal, state, and DoD, and DA environmental regulations.

7.7.2 Hazardous waste is not anticipated to be generated during RI activities. However, if hazardous waste is generated, hazardous waste will be removed from the site and will be manifested, transported, and disposed of IAW all applicable federal, state, and DoD/DA environmental regulations. All paperwork associated with disposal of hazardous waste (if required), such as manifests, disposal documents, and Temporary Storage and Disposal Facility receipts, will be included in an appendix in the RI report.

7.8 Storage Areas and Temporary Facilities

Huikala will locate on-site storage areas in such a manner as to minimally affect site resources whenever possible. Site storage requirements may include the use of storage trailers or sheds for equipment storage. No 90-day hazardous, toxic, and radioactive waste (HTRW) temporary storage sites will be established. All storage locations will be approved by USAESCH and CEPOH prior to their use. When the project is completed, areas used for storage will be restored to the condition found before use.

7.8.1 Donor Explosives

Explosives will be provided on an as-needed basis by an on-island seller, as described in Section 5.0 Explosive Management Plan. Please also refer to the ESP (Appendix J).

7.8.2 Vehicles and Equipment

Vehicles will be used to transport personnel on a daily basis to and from the job site, and will be locked during non-work hours.

7.8.3 Temporary Facilities

Huikala will establish a temporary office facility and portable toilets to support operations required during this project. Upon project completion, Huikala will remove all temporary facilities, portable toilets, and debris from the site.

7.9 Access Routes

To the maximum extent possible, existing roads and trails will be used to access and traverse the MRS. Field teams will have maps of existing trails and instructed to use them as much as possible to access transects. Existing trails will not be the focus of the investigation.

7.10 Decontamination and Disposal of Equipment

Disposable PPE and equipment will be used to the maximum extent possible to minimize decontamination procedures. However, in the event that non-disposable PPE and/or equipment are used, it will be decontaminated prior to reuse as indicated in Appendix E. The disposition of disposable PPE and disposable equipment is addressed in Section 7.7.1

7.11 Minimizing Areas of Disturbance

Huikala will conduct field activities in a manner that produces the fewest number of impacts to the smallest area possible.

7.12 Post-Investigation Cleanup Activities

Prior to departing the location, Huikala will restore the site to its approximate pre-fieldwork condition. Huikala will remove all signs of temporary facilities such as work areas, temporary structures, fencing, markers, or any other signs of construction within the work, storage, and access areas. The areas will be restored to near natural conditions. Any damage to roads, bridges, gates, etc., as determined by USAESCH/CEPOH, will be restored to pre-fieldwork conditions.

8.0 Property Management Plan (Not Applicable – No Government-Furnished Equipment Expected)

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9.0 Interim Holding Facility Siting Plan for RCWM Projects (Not Applicable – No RCWM Expected)

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10.0 Physical Security Plan for RCWM Project Sites (Not Applicable – No RCWM Expected)

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12.0 Appendices

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Appendix B Figures

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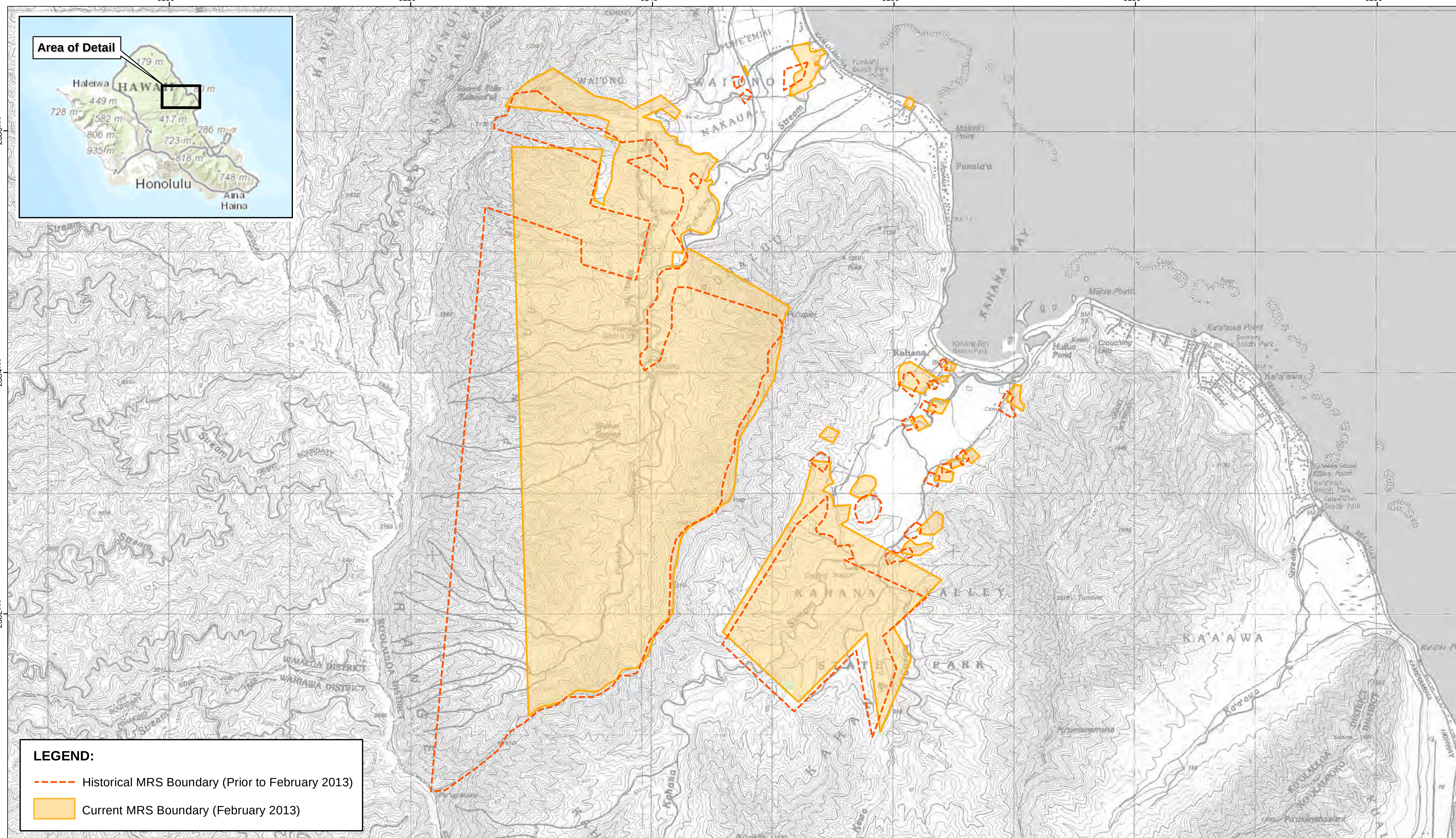

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Coordinate System: Universal Transverse Mercator NAD83, Zone 4 North
Sources: U.S. Geological Survey; U.S. Army Corps of Engineers
References:

1. "Final Site Inspection Report, Pacific Jungle Combat Training Center," prepared by Parsons, December 2008.
2. "DERP-FUDS Inventory Project Report Pacific Jungle Combat Training Center, Kahana and Punaluu Valleys, Island of Oahu, Hawaii, Site No. H09HI027400," prepared by Wil Chee Planning, December 1993.

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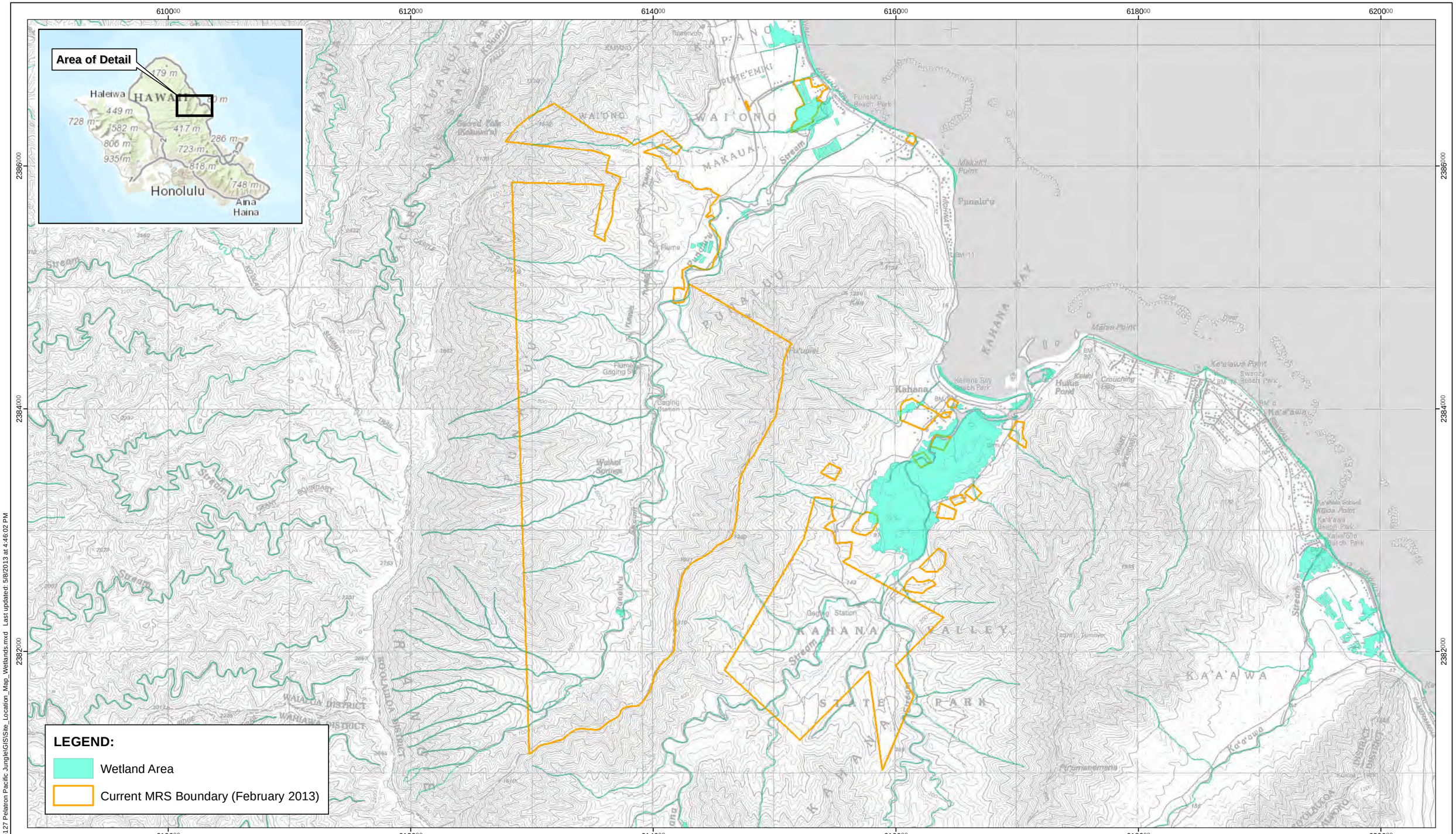
SCALE: 1" = 2,500'

PROJECT:	SITE LOCATION MAP			
Pacific Jungle Combat Training Center FUDS Project No. H09HI027401				
LOCATION: City and County of Honolulu, Hawaii	DRAWN BY: JJC 8/14/2012	CHECKED BY: CAL 8/14/2012	PROJECT NO. 2012-127	FIG NO. B1-1



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2. "DERP-FUDS Inventory Project Report Pacific Jungle Combat Training Center, Kahana and Punaluu Valleys, Island of Oahu, Hawaii, Site No. H09HI027400," prepared by Wil Chee Planning, December 1993.

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0 2,400

SCALE: 1" = 2,400'

PROJECT: Pacific Jungle Combat Training Center FUDS Project No. H09HI027401		**WETLAND AREAS**		
LOCATION: City and County of Honolulu, Hawaii	DRAWN BY: JJC 8/14/2012	CHECKED BY: CAL 8/14/2012	PROJECT NO. 2012-127	FIG NO. **B1-2**

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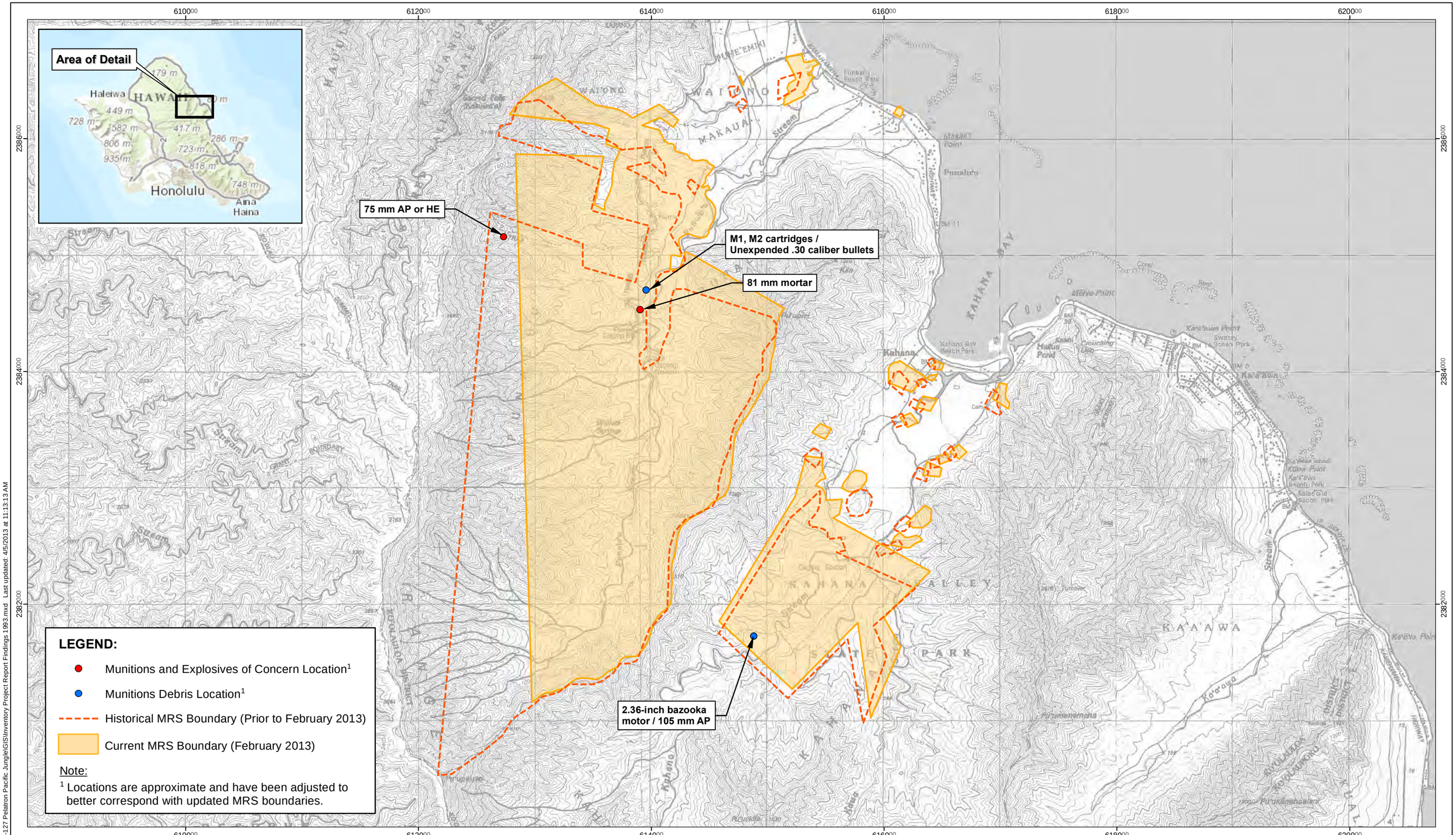

LEGEND:

- Munitions and Explosives of Concern Location[1]
- Munitions Debris Location[1]
- Historical MRS Boundary (Prior to February 2013)
- Current MRS Boundary (February 2013)

Note:

[1] Locations are approximate and have been adjusted to better correspond with updated MRS boundaries.

Coordinate System: Universal Transverse Mercator NAD83, Zone 4 North
Sources: U.S. Geological Survey; U.S. Army Corps of Engineers
References:
1. "Final Site Inspection Report, Pacific Jungle Combat Training Center," prepared by Parsons, December 2008.
2. "DERP-FUDS Inventory Project Report Pacific Jungle Combat Training Center, Kahana and Punaluu Valleys, Island of Oahu, Hawaii, Site No. H09HI027400," prepared by Wil Chee Planning, December 1993.

N

0 2,500

SCALE: 1" = 2,500'

PROJECT: Pacific Jungle Combat Training Center FUDS Project No. H09HI027401	**1993 INVENTORY PROJECT REPORT FINDINGS**			
LOCATION: City and County of Honolulu, Hawaii	DRAWN BY: JJC 8/14/2012	CHECKED BY: CAL 8/14/2012	PROJECT NO. 2012-127	FIG NO. **B1-3**

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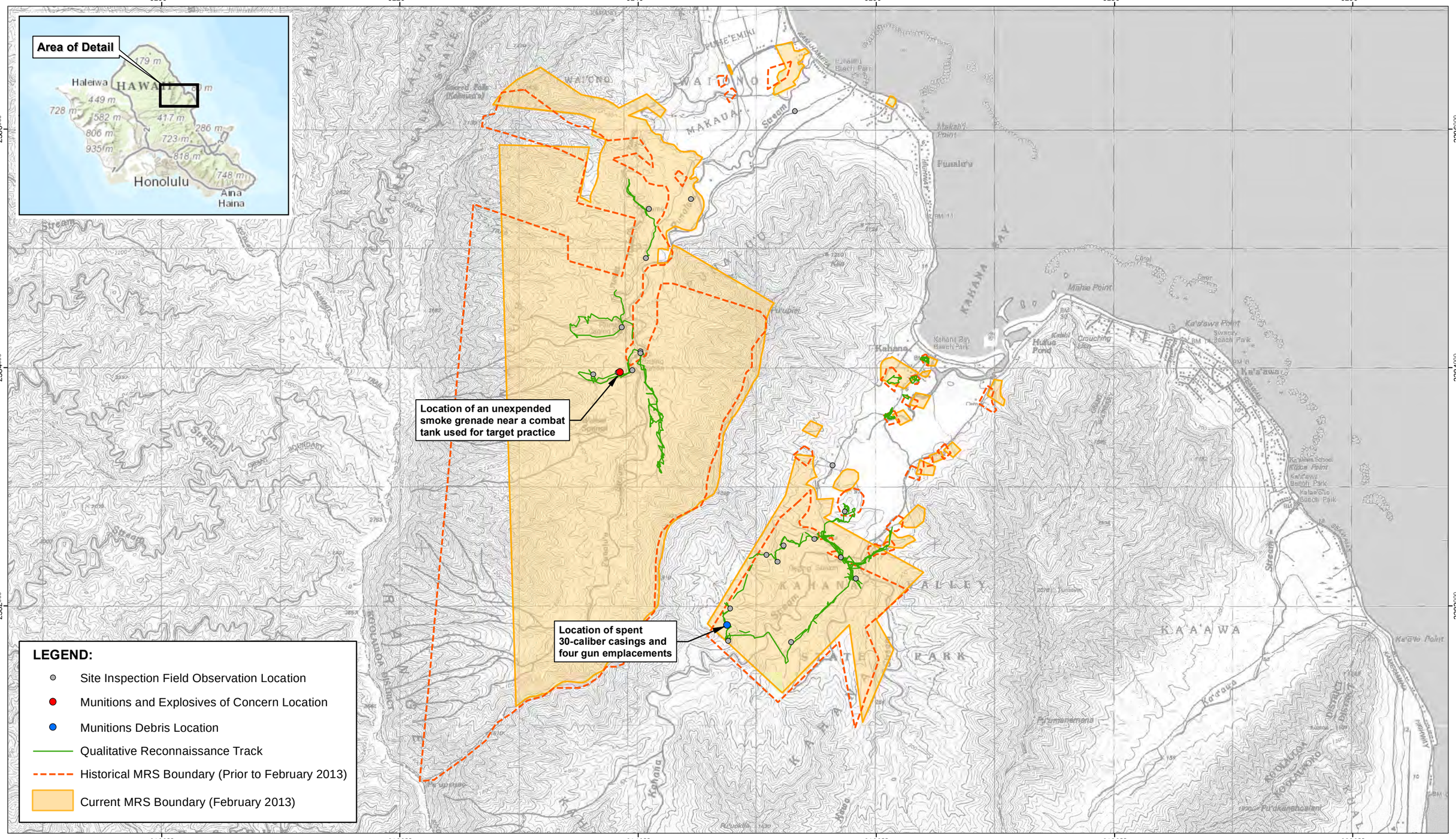

LEGEND:

- Site Inspection Field Observation Location
- Munitions and Explosives of Concern Location
- Munitions Debris Location
- Qualitative Reconnaissance Track
- Historical MRS Boundary (Prior to February 2013)
- Current MRS Boundary (February 2013)

Coordinate System: Universal Transverse Mercator NAD83, Zone 4 North
Sources: U.S. Geological Survey; U.S. Army Corps of Engineers
References:
1. "Final Site Inspection Report, Pacific Jungle Combat Training Center," prepared by Parsons, December 2008.
2. "DERP-FUDS Inventory Project Report Pacific Jungle Combat Training Center, Kahana and Punaluu Valleys, Island of Oahu, Hawaii, Site No. H09HI027400," prepared by Wil Chee Planning, December 1993.

0 2,500
SCALE: 1" = 2,500'

PROJECT: Pacific Jungle Combat Training Center FUDS Project No. H09HI027401	**2008 SITE INSPECTION QUALITATIVE RECONAISSANCE AND FINDINGS**			
LOCATION: City and County of Honolulu, Hawaii	DRAWN BY: JJC 8/14/2012	CHECKED BY: CAL 8/14/2012	PROJECT NO. 2012-127	FIG NO. **B1-4**

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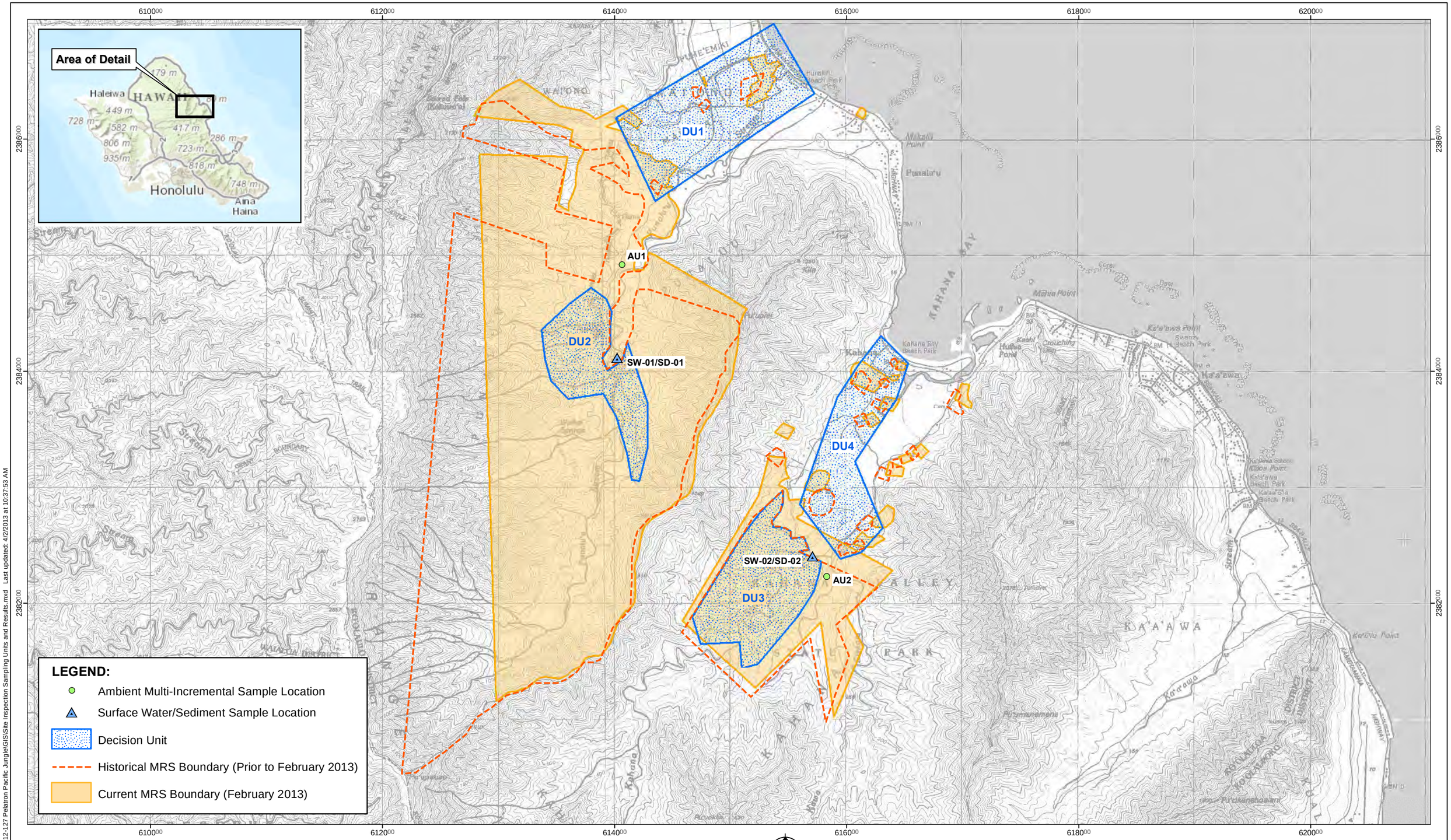
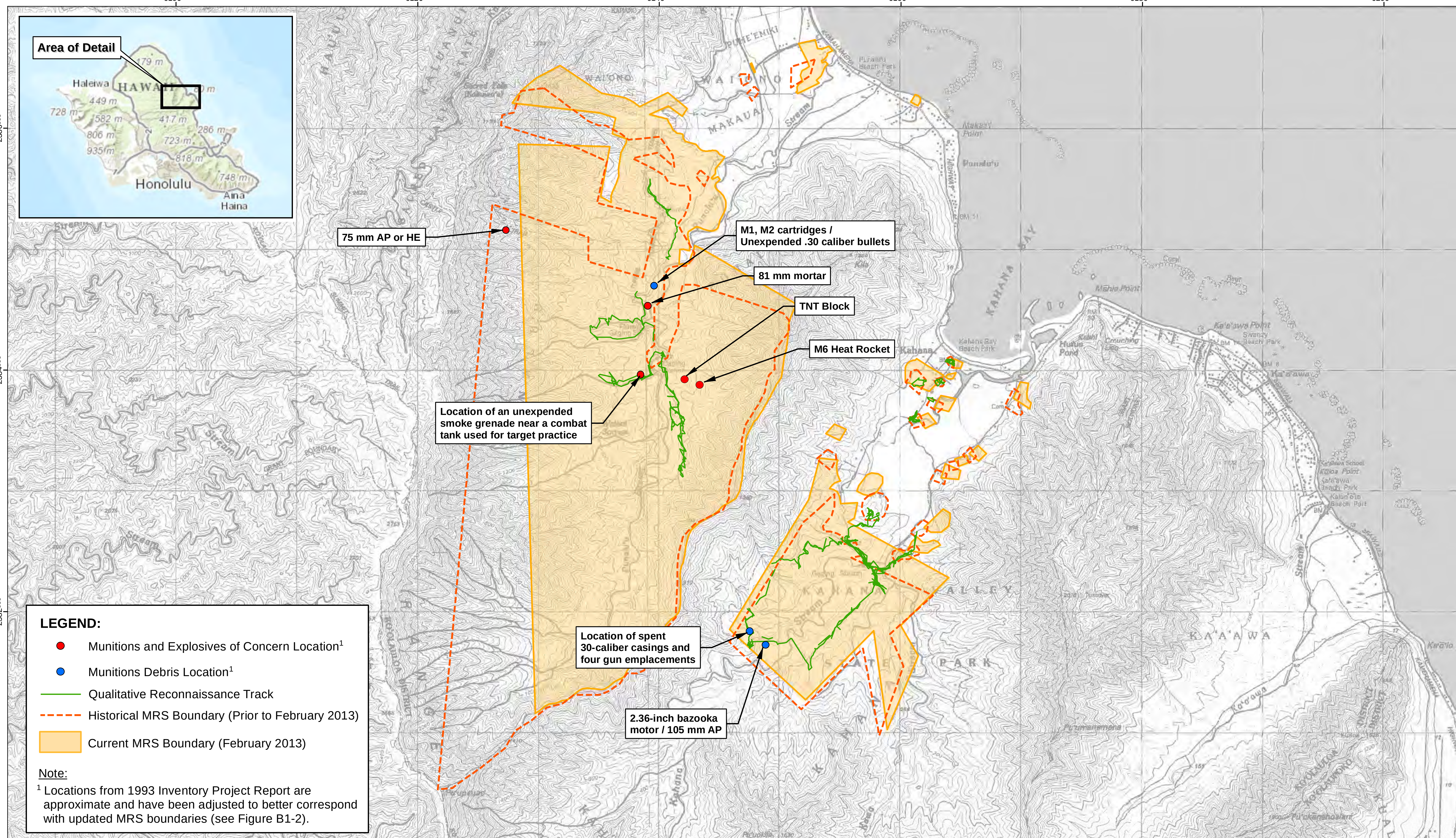


N:\Graphics\2012\2012-127 Pelatron Pacific Jungle\GIS\Site Inspection Sampling Units and Results.mxd Last updated: 4/2/2013 at 10:37:53 AM

Coordinate System: Universal Transverse Mercator NAD83, Zone 4 North
Sources: U.S. Geological Survey; U.S. Army Corps of Engineers
References:
1. "Final Site Inspection Report, Pacific Jungle Combat Training Center," prepared by Parsons, December 2008.
2. "DERP-FUDS Inventory Project Report Pacific Jungle Combat Training Center, Kahana and Punaluu Valleys, Island of Oahu, Hawaii, Site No. H09HI027400," prepared by Wil Chee Planning, December 1993.

PROJECT: Pacific Jungle Combat Training Center FUDS Project No. H09HI027401	**2008 SITE INSPECTION SAMPLING UNITS AND RESULTS**			
LOCATION: City and County of Honolulu, Hawaii	DRAWN BY: JJC 8/14/2012	CHECKED BY: CAL 8/14/2012	PROJECT NO. 2012-127	FIG NO. **B1-5**



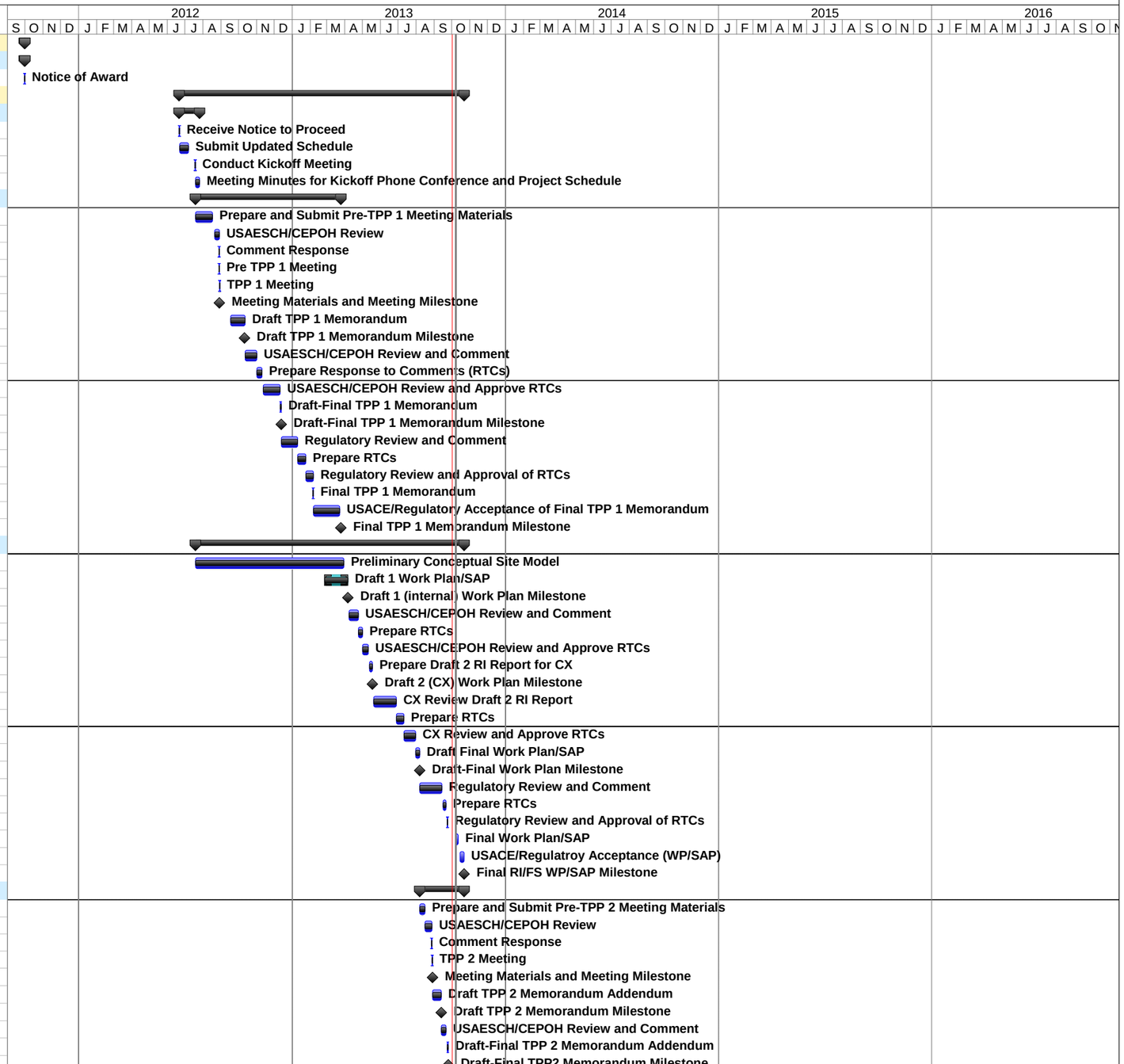
N:\Graphics\2012\2012-127 Pelatron Pacific Jungle\GIS\Previous Locations of Munitions.mxd Last updated: 10/9/2013 at 1:16:17 PM

Coordinate System: Universal Transverse Mercator NAD83, Zone 4 North
Sources: U.S. Geological Survey; U.S. Army Corps of Engineers
References:
1. "Final Site Inspection Report, Pacific Jungle Combat Training Center," prepared by Parsons, December 2008.
2. "DERP-FUDS Inventory Project Report Pacific Jungle Combat Training Center, Kahana and Punaluu Valleys, Island of Oahu, Hawaii, Site No. H09HI027400," prepared by Wil Chee Planning, December 1993.

PROJECT: Pacific Jungle Combat Training Center FUDS Project No. H09HI027401	PREVIOUS LOCATIONS OF MUNITIONS AND EXPLOSIVES OF CONCERN AND MUNITIONS DEBRIS			
LOCATION: City and County of Honolulu, Hawaii	DRAWN BY: JJC 8/14/2012	CHECKED BY: CAL 8/14/2012	PROJECT NO. 2012-127	FIG NO. B1-6

Remedial Investigation/Feasibility Study at Pacific Jungle Combat Training Center, Property No.: H09HI027401

ID	Task Name	Duration	Start	Finish
	Project Award	**1d**	**Fri 9/30/11**	**Fri 9/30/11**
		1d	**Fri 9/30/11**	**Fri 9/30/11**
1	Notice of Award	1 day	Fri 9/30/11	Fri 9/30/11
	Pre-Field Work	**174d**	**Thu 6/21/12**	**Mon 10/21/13**
		10d	**Thu 6/21/12**	**Wed 7/25/12**
15	Receive Notice to Proceed	1 day	Thu 6/21/12	Thu 6/21/12
2	Submit Updated Schedule	10 days	Fri 6/22/12	Fri 7/6/12
4	Conduct Kickoff Meeting	1 day	Wed 7/18/12	Wed 7/18/12
5	Meeting Minutes for Kickoff Phone Conference and Project Schedule	5 days	Thu 7/19/12	Wed 7/25/12
	TPP 1	**32d**	**Thu 7/19/12**	**Mon 3/25/13**
18	**Prepare and Submit Pre-TPP 1 Meeting Materials**	21 days	Thu 7/19/12	Thu 8/16/12
19	USAESCH/CEPOH Review	6 days	Tue 8/21/12	Tue 8/28/12
20	Comment Response	1 day	Tue 8/28/12	Tue 8/28/12
21	Pre TPP 1 Meeting	1 day	Tue 8/28/12	Tue 8/28/12
22	TPP 1 Meeting	1 day	Wed 8/29/12	Wed 8/29/12
34	***Meeting Materials and Meeting Milestone***	***0 days***	***Wed 8/29/12***	***Wed 8/29/12***
23	**Draft TPP 1 Memorandum**	18 days	Mon 9/17/12	Thu 10/11/12
35	***Draft TPP 1 Memorandum Milestone***	***0 days***	***Thu 10/11/12***	***Thu 10/11/12***
24	USAESCH/CEPOH Review and Comment	14 days	Fri 10/12/12	Wed 10/31/12
25	Prepare Response to Comments (RTCs)	7 days	Thu 11/1/12	Fri 11/9/12
26	USAESCH/CEPOH Review and Approve RTCs	20 days	Mon 11/12/12	Mon 12/10/12
27	**Draft-Final TPP 1 Memorandum**	2 days	Tue 12/11/12	Wed 12/12/12
36	***Draft-Final TPP 1 Memorandum Milestone***	***0 days***	***Wed 12/12/12***	***Wed 12/12/12***
28	Regulatory Review and Comment	18 days	Thu 12/13/12	Wed 1/9/13
29	Prepare RTCs	9 days	Thu 1/10/13	Wed 1/23/13
30	Regulatory Review and Approval of RTCs	9 days	Thu 1/24/13	Tue 2/5/13
31	**Final TPP 1 Memorandum**	1 day	Tue 2/5/13	Tue 2/5/13
32	USACE/Regulatory Acceptance of Final TPP 1 Memorandum	32 days	Wed 2/6/13	Fri 3/22/13
33	***Final TPP 1 Memorandum Milestone***	***0 days***	***Mon 3/25/13***	***Mon 3/25/13***
	RI/FS Work Plans	**174d**	**Thu 7/19/12**	**Mon 10/21/13**
74	Preliminary Conceptual Site Model	174 days	Thu 7/19/12	Fri 3/29/13
75	**Draft 1 Work Plan/SAP**	29 days	Mon 2/25/13	Fri 4/5/13
90	***Draft 1 (internal) Work Plan Milestone***	***0 days***	***Fri 4/5/13***	***Fri 4/5/13***
76	USAESCH/CEPOH Review and Comment	12 days	Mon 4/8/13	Tue 4/23/13
77	Prepare RTCs	5 days	Wed 4/24/13	Tue 4/30/13
78	USAESCH/CEPOH Review and Approve RTCs	8 days	Wed 5/1/13	Fri 5/10/13
79	**Prepare Draft 2 RI Report for CX**	5 days	Mon 5/13/13	Fri 5/17/13
91	***Draft 2 (CX) Work Plan Milestone***	***0 days***	***Fri 5/17/13***	***Fri 5/17/13***
80	CX Review Draft 2 RI Report	27 days	Mon 5/20/13	Thu 6/27/13
81	Prepare RTCs	8 days	Fri 6/28/13	Wed 7/10/13
82	CX Review and Approve RTCs	14 days	Thu 7/11/13	Tue 7/30/13
83	**Draft Final Work Plan/SAP**	5 days	Wed 7/31/13	Tue 8/6/13
92	***Draft-Final Work Plan Milestone***	***0 days***	***Tue 8/6/13***	***Tue 8/6/13***
84	Regulatory Review and Comment	27 days	Wed 8/7/13	Fri 9/13/13
85	Prepare RTCs	5 days	Mon 9/16/13	Fri 9/20/13
86	Regulatory Review and Approval of RTCs	1 day	Mon 9/23/13	Mon 9/23/13
87	**Final Work Plan/SAP**	5 days	Mon 10/7/13	Fri 10/11/13
88	USACE/Regulatroy Acceptance (WP/SAP)	5 days	Tue 10/15/13	Mon 10/21/13
89	***Final RI/FS WP/SAP Milestone***	***0 days***	***Mon 10/21/13***	***Mon 10/21/13***
	TPP 2	**10d**	**Wed 8/7/13**	**Mon 10/21/13**
38	Prepare and Submit Pre-TPP 2 Meeting Materials	7 days	Wed 8/7/13	Thu 8/15/13
39	USAESCH/CEPOH Review	8 days	Fri 8/16/13	Tue 8/27/13
40	Comment Response	1 day	Tue 8/27/13	Tue 8/27/13
41	TPP 2 Meeting	1 day	Wed 8/28/13	Wed 8/28/13
51	***Meeting Materials and Meeting Milestone***	***0 days***	***Wed 8/28/13***	***Wed 8/28/13***
42	**Draft TPP 2 Memorandum Addendum**	10 days	Thu 8/29/13	Thu 9/12/13
52	***Draft TPP 2 Memorandum Milestone***	***0 days***	***Thu 9/12/13***	***Thu 9/12/13***
43	USAESCH/CEPOH Review and Comment	6 days	Fri 9/13/13	Fri 9/20/13
44	**Draft-Final TPP 2 Memorandum Addendum**	2 days	Mon 9/23/13	Tue 9/24/13
53	***Draft-Final TPP2 Memorandum Milestone***	***0 days***	***Tue 9/24/13***	***Tue 9/24/13***



Task — Summary — Manual Task — Manual Summary — Progress
Milestone — Project Summary — Duration-only — Critical — Deadline

Figure B2-1 Schedule

Remedial Investigation/Feasibility Study at Pacific Jungle Combat Training Center, Property No.: H09HI027401

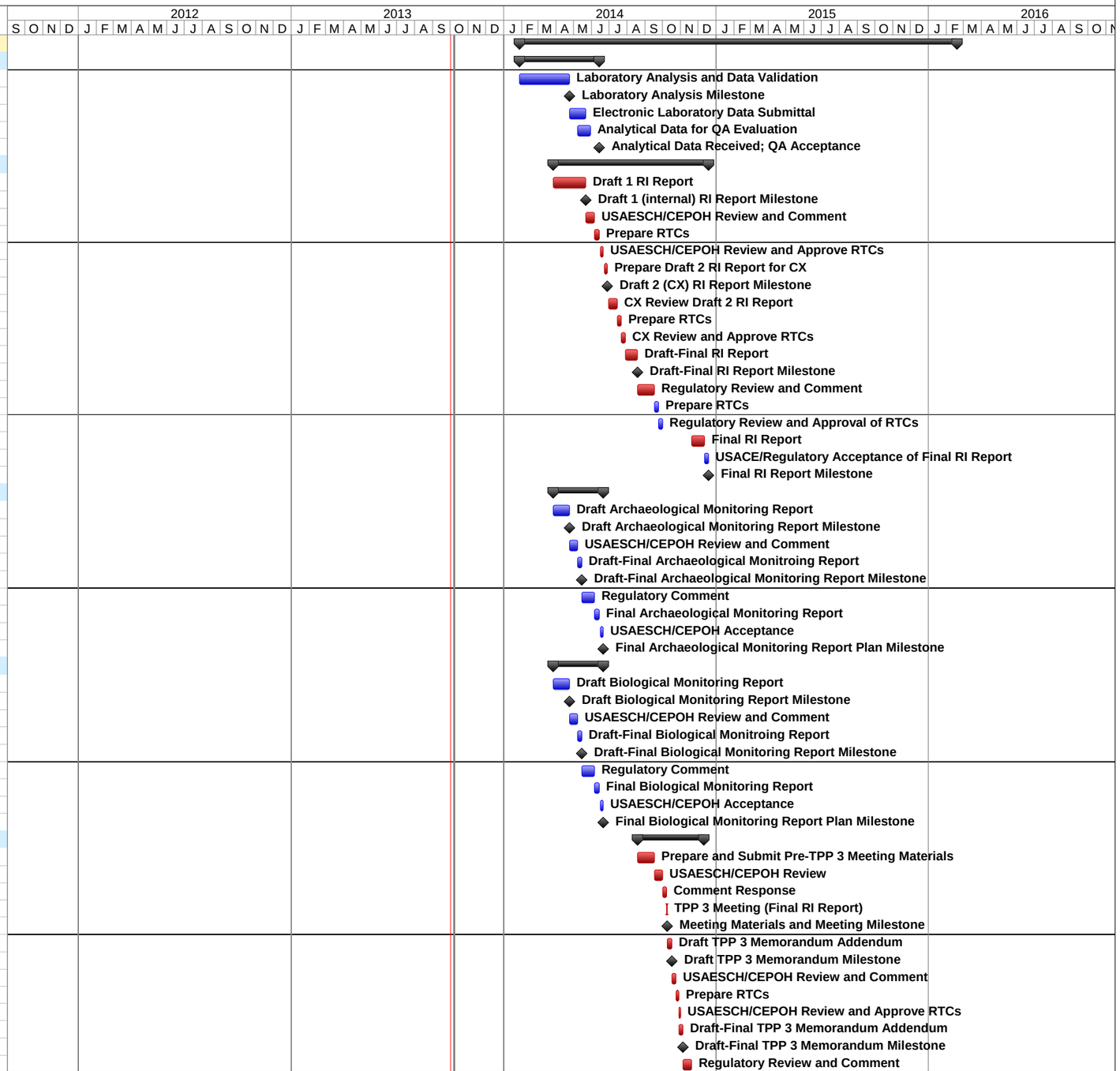
ID	Task Name	Duration	Start	Finish
45	Regulatory Review and Comment	8 days	Wed 9/25/13	Fri 10/4/13
46	Prepare RTCs	2 days	Mon 10/7/13	Tue 10/8/13
47	Regulatory Review and Approval of RTCs	1 day	Wed 10/9/13	Wed 10/9/13
48	**Final TPP 2 Memorandum Addendum**	2 days	Thu 10/10/13	Fri 10/11/13
49	USACE/Regulatory Acceptancel of Final TPP 2 Memorandum Addendum	5 days	Tue 10/15/13	Mon 10/21/13
50	***Final TPP 2 Memorandum Milestone***	***0 days***	***Mon 10/21/13***	***Mon 10/21/13***
	Public Meetings	**29d**	**Mon 8/6/12**	**Tue 10/1/13**
221	Public Meeting 1 Site Selection	3 days	Mon 8/6/12	Wed 8/8/12
222	Prepare & Submit Public Meeting 1 Materials	10 days	Tue 8/7/12	Mon 8/20/12
223	Public Meeting 1 Notice	12 days	Tue 8/7/12	Wed 8/22/12
224	Public Meeting 1 (Concurrent with TPP 1)	1 day	Wed 8/29/12	Wed 8/29/12
225	Public Meeting 1 Minutes	15 days	Thu 8/30/12	Thu 9/20/12
227	USAESCH/CEPOH Review PM Minutes	6 days	Fri 9/21/12	Fri 9/28/12
228	Distribute Final PM Minutes	3 days	Mon 10/1/12	Wed 10/3/12
226	***Public Meeting 1 Milestone***	***0 days***	***Wed 10/3/12***	***Wed 10/3/12***
231	Public Meeting 2 Site Selection	5 days	Thu 7/25/13	Wed 7/31/13
232	Public Meeting 2 Notice	29 days	Thu 8/1/13	Thu 8/29/13
230	Prepare & Submit Public Meeting 2 Materials	7 days	Wed 8/7/13	Thu 8/15/13
233	Public Meeting 2 (Concurrent with TPP 2)	1 day	Thu 8/29/13	Thu 8/29/13
234	Public Meeting 2 Minutes	22 days	Fri 8/30/13	Tue 10/1/13
235	***Public Meeting 2 Milestone***	***0 days***	***Tue 10/1/13***	***Tue 10/1/13***
	Public Involvement Plan	**32d**	**Thu 5/2/13**	**Mon 10/21/13**
252	**Draft Public Involvement Plan**	21 days	Thu 5/2/13	Fri 5/31/13
253	***Draft Public Involvement Plan Milestone***	***0 days***	***Fri 5/31/13***	***Fri 5/31/13***
254	USAESCH/CEPOH Review and Comment	16 days	Mon 6/3/13	Tue 6/25/13
255	Prepare RTCs	10 days	Wed 6/26/13	Wed 7/10/13
256	**Draft-Final Public Involvement Plan**	20 days	Thu 7/11/13	Wed 8/7/13
257	***Draft-Final Public Involvement Plan Milestone***	***0 days***	***Wed 8/7/13***	***Wed 8/7/13***
258	USAESCH/CEPOH Review and Comment	32 days	Thu 8/8/13	Mon 9/23/13
259	Prepare RTCs	9 days	Tue 9/24/13	Fri 10/4/13
260	USAESCH/CEPOH Review and Approve RTCs	3 days	Mon 10/7/13	Wed 10/9/13
261	**Final Public Involvement Plan**	3 days	Thu 10/10/13	Tue 10/15/13
262	USACE Acceptance (PIP)	4 days	Wed 10/16/13	Mon 10/21/13
263	***Final Public Involvement Plan Milestone***	***0 days***	***Mon 10/21/13***	***Mon 10/21/13***
	Field Work	**44d**	**Mon 10/21/13**	**Tue 3/25/14**
		44d	**Mon 10/21/13**	**Tue 3/25/14**
117	Mobilization and Setup	4 days	Mon 10/21/13	Thu 10/24/13
119	Land Survey - Control Points	4 days	Wed 10/23/13	Tue 10/29/13
126	***Mobilization/Setup Milestone***	***0 days***	***Thu 10/24/13***	***Thu 10/24/13***
127	***Land Survey Milestone***	***0 days***	***Tue 10/29/13***	***Tue 10/29/13***
118	Field work (MEC)	42 days	Mon 10/28/13	Tue 1/14/14
120	***Kahana Transects 25% Complete Milestone***	***0 days***	***Wed 11/6/13***	***Wed 11/6/13***
121	***Kahana Transects 50% Complete Milestone***	***0 days***	***Tue 11/12/13***	***Tue 11/12/13***
122	***Kahana Transects 75% Complete Milestone***	***0 days***	***Mon 11/18/13***	***Mon 11/18/13***
123	***Kahana Transects 100% Complete Milestone***	***0 days***	***Wed 11/20/13***	***Wed 11/20/13***
124	***Kahana Grids 100% Complete Milestone***	***0 days***	***Tue 11/26/13***	***Tue 11/26/13***
128	***Punaluu Transects 25% Complete Milestone***	***0 days***	***Thu 12/5/13***	***Thu 12/5/13***
129	***Punaluu Transects 50% Complete Milestone***	***0 days***	***Tue 12/17/13***	***Tue 12/17/13***
130	***Punaluu Transects 75% Complete Milestone***	***0 days***	***Mon 12/30/13***	***Mon 12/30/13***
131	***Punaluu Transects 100% Complete Milestone***	***0 days***	***Thu 1/9/14***	***Thu 1/9/14***
132	***Punaluu Grids 100% Complete Milestone***	***0 days***	***Thu 1/23/14***	***Thu 1/23/14***
134	***Field Work Complete: QA Acceptance***	***0 days***	***Wed 1/29/14***	***Wed 1/29/14***
277	MC Sampling	32 days	Mon 1/27/14	Mon 3/24/14
278	***Field Sampling Milestone***	***0 days***	***Mon 3/24/14***	***Mon 3/24/14***
125	Demobilization	2 days	Mon 3/24/14	Tue 3/25/14
136	***Demobilization Milestone***	***0 days***	***Tue 3/25/14***	***Tue 3/25/14***
133	Disposal	44 days	Wed 1/15/14	Wed 3/19/14
135	***Disposal Milestone***	***0 days***	***Tue 3/25/14***	***Tue 3/25/14***

Task — Summary — Manual Task — Manual Summary — Progress
Milestone — Project Summary — Duration-only — Critical — Deadline

Figure B2-1 Schedule

Remedial Investigation/Feasibility Study at Pacific Jungle Combat Training Center, Property No.: H09HI027401

ID	Task Name	Duration	Start	Finish
	Post-Field Work	**60d**	**Tue 1/28/14**	**Thu 2/18/16**
		60d	**Tue 1/28/14**	**Fri 6/13/14**
279	Laboratory Analysis and Data Validation	60 days	Tue 1/28/14	Wed 4/23/14
280	***Laboratory Analysis Milestone***	***0 days***	***Wed 4/23/14***	***Wed 4/23/14***
275	Electronic Laboratory Data Submittal	20 days	Thu 4/24/14	Wed 5/21/14
274	Analytical Data for QA Evaluation	15 days	Thu 5/8/14	Thu 5/29/14
273	***Analytical Data Received; QA Acceptance***	***0 days***	***Fri 6/13/14***	***Fri 6/13/14***
	RI Report	**40d**	**Thu 3/27/14**	**Thu 12/18/14**
301	**Draft 1 RI Report**	**40 days**	**Thu 3/27/14**	**Wed 5/21/14**
152	***Draft 1 (internal) RI Report Milestone***	***0 days***	***Wed 5/21/14***	***Wed 5/21/14***
138	USAESCH/CEPOH Review and Comment	10 days	Thu 5/22/14	Thu 6/5/14
139	Prepare RTCs	5 days	Fri 6/6/14	Fri 6/13/14
140	USAESCH/CEPOH Review and Approve RTCs	5 days	Mon 6/16/14	Fri 6/20/14
141	**Prepare Draft 2 RI Report for CX**	5 days	Mon 6/23/14	Fri 6/27/14
153	***Draft 2 (CX) RI Report Milestone***	***0 days***	***Fri 6/27/14***	***Fri 6/27/14***
142	CX Review Draft 2 RI Report	10 days	Mon 6/30/14	Mon 7/14/14
143	Prepare RTCs	5 days	Tue 7/15/14	Mon 7/21/14
144	CX Review and Approve RTCs	5 days	Tue 7/22/14	Mon 7/28/14
145	**Draft-Final RI Report**	15 days	Tue 7/29/14	Mon 8/18/14
154	***Draft-Final RI Report Milestone***	***0 days***	***Mon 8/18/14***	***Mon 8/18/14***
146	Regulatory Review and Comment	20 days	Tue 8/19/14	Tue 9/16/14
147	Prepare RTCs	5 days	Wed 9/17/14	Tue 9/23/14
148	Regulatory Review and Approval of RTCs	5 days	Wed 9/24/14	Tue 9/30/14
149	**Final RI Report**	15 days	Thu 11/20/14	Thu 12/11/14
150	USACE/Regulatory Acceptance of Final RI Report	5 days	Fri 12/12/14	Thu 12/18/14
151	***Final RI Report Milestone***	***0 days***	***Thu 12/18/14***	***Thu 12/18/14***
	Archaeological Monitoring Report	**20d**	**Thu 3/27/14**	**Fri 6/20/14**
282	**Draft Archaeological Monitoring Report**	20 days	Thu 3/27/14	Wed 4/23/14
283	***Draft Archaeological Monitoring Report Milestone***	***0 days***	***Wed 4/23/14***	***Wed 4/23/14***
284	USAESCH/CEPOH Review and Comment	10 days	Thu 4/24/14	Wed 5/7/14
285	**Draft-Final Archaeological Monitroing Report**	5 days	Thu 5/8/14	Wed 5/14/14
286	***Draft-Final Archaeological Monitoring Report Milestone***	***0 days***	***Wed 5/14/14***	***Wed 5/14/14***
287	Regulatory Comment	15 days	Thu 5/15/14	Thu 6/5/14
288	**Final Archaeological Monitoring Report**	5 days	Fri 6/6/14	Fri 6/13/14
289	USAESCH/CEPOH Acceptance	5 days	Mon 6/16/14	Fri 6/20/14
290	***Final Archaeological Monitoring Report Plan Milestone***	***0 days***	***Fri 6/20/14***	***Fri 6/20/14***
	Biological Monitoring Report	**20d**	**Thu 3/27/14**	**Fri 6/20/14**
292	**Draft Biological Monitoring Report**	20 days	Thu 3/27/14	Wed 4/23/14
293	***Draft Biological Monitoring Report Milestone***	***0 days***	***Wed 4/23/14***	***Wed 4/23/14***
294	USAESCH/CEPOH Review and Comment	10 days	Thu 4/24/14	Wed 5/7/14
295	**Draft-Final Biological Monitroing Report**	5 days	Thu 5/8/14	Wed 5/14/14
296	***Draft-Final Biological Monitoring Report Milestone***	***0 days***	***Wed 5/14/14***	***Wed 5/14/14***
297	Regulatory Comment	15 days	Thu 5/15/14	Thu 6/5/14
298	**Final Biological Monitoring Report**	5 days	Fri 6/6/14	Fri 6/13/14
299	USAESCH/CEPOH Acceptance	5 days	Mon 6/16/14	Fri 6/20/14
300	***Final Biological Monitoring Report Plan Milestone***	***0 days***	***Fri 6/20/14***	***Fri 6/20/14***
	TPP 3	**20d**	**Tue 8/19/14**	**Wed 12/10/14**
55	**Prepare and Submit Pre-TPP 3 Meeting Materials**	20 days	Tue 8/19/14	Tue 9/16/14
56	USAESCH/CEPOH Review	10 days	Wed 9/17/14	Tue 9/30/14
57	Comment Response	5 days	Wed 10/1/14	Tue 10/7/14
58	TPP 3 Meeting (Final RI Report)	1 day	Wed 10/8/14	Wed 10/8/14
70	***Meeting Materials and Meeting Milestone***	***0 days***	***Wed 10/8/14***	***Wed 10/8/14***
59	**Draft TPP 3 Memorandum Addendum**	5 days	Thu 10/9/14	Thu 10/16/14
71	***Draft TPP 3 Memorandum Milestone***	***0 days***	***Thu 10/16/14***	***Thu 10/16/14***
60	USAESCH/CEPOH Review and Comment	5 days	Fri 10/17/14	Thu 10/23/14
61	Prepare RTCs	3 days	Fri 10/24/14	Tue 10/28/14
62	USAESCH/CEPOH Review and Approve RTCs	3 days	Wed 10/29/14	Fri 10/31/14
63	**Draft-Final TPP 3 Memorandum Addendum**	5 days	Wed 10/29/14	Tue 11/4/14
72	***Draft-Final TPP 3 Memorandum Milestone***	***0 days***	***Tue 11/4/14***	***Tue 11/4/14***
64	Regulatory Review and Comment	10 days	Wed 11/5/14	Wed 11/19/14

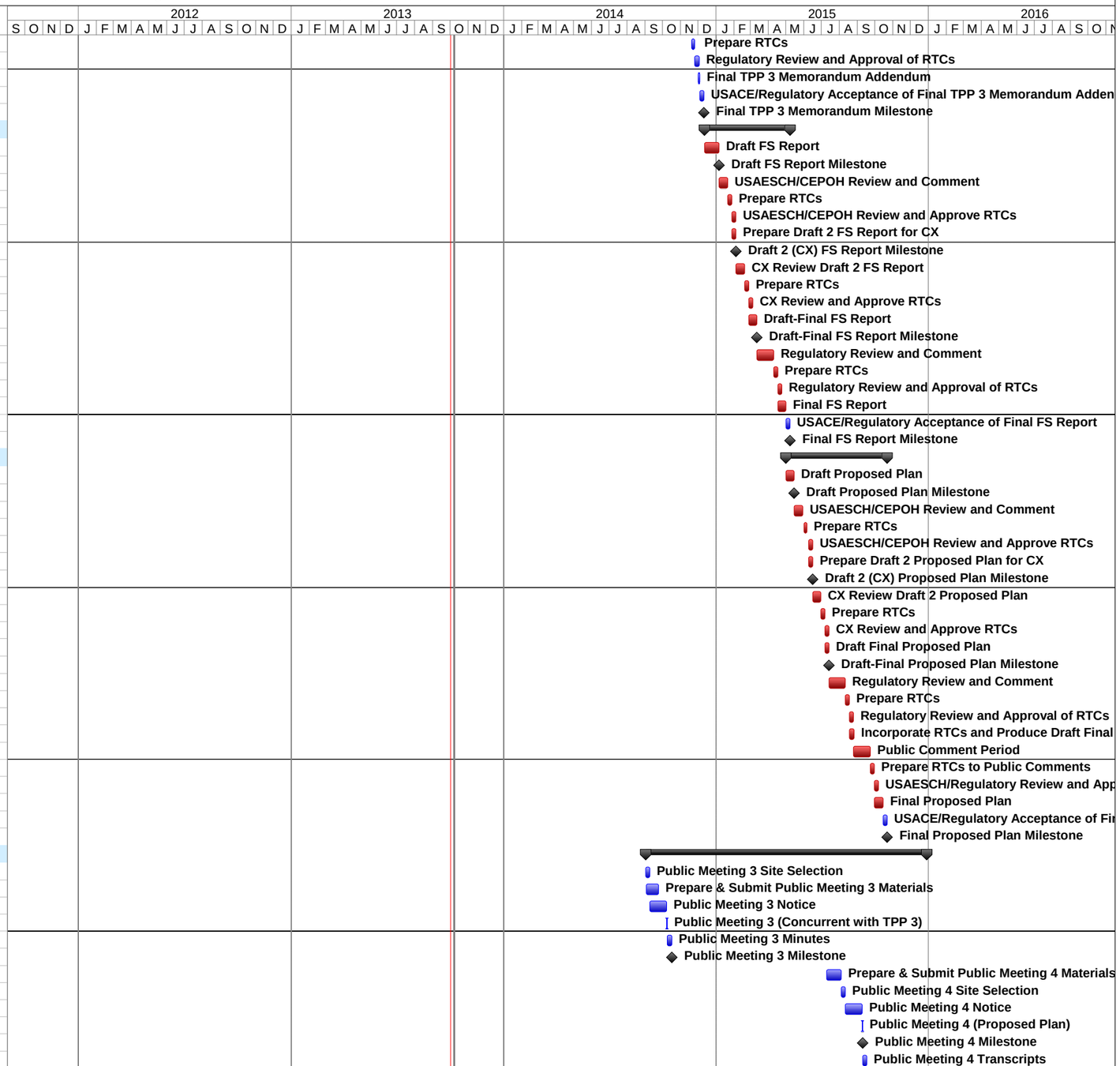


Task | Summary | Manual Task | Manual Summary | Progress
Milestone | Project Summary | Duration-only | Critical | Deadline

Figure B2-1 Schedule

Remedial Investigation/Feasibility Study at Pacific Jungle Combat Training Center, Property No.: H09HI027401

ID	Task Name	Duration	Start	Finish
65	Prepare RTCs	3 days	Thu 11/20/14	Mon 11/24/14
66	Regulatory Review and Approval of RTCs	5 days	Tue 11/25/14	Tue 12/2/14
67	**Final TPP 3 Memorandum Addendum**	3 days	Mon 12/1/14	Wed 12/3/14
68	USACE/Regulatory Acceptance of Final TPP 3 Memorandum Addendum	5 days	Thu 12/4/14	Wed 12/10/14
69	***Final TPP 3 Memorandum Milestone***	***0 days***	***Wed 12/10/14***	***Wed 12/10/14***
	FS Report	**20d**	**Fri 12/12/14**	**Thu 5/7/15**
156	**Draft FS Report**	15 days	Fri 12/12/14	Mon 1/5/15
172	***Draft FS Report Milestone***	***0 days***	***Mon 1/5/15***	***Mon 1/5/15***
157	USAESCH/CEPOH Review and Comment	10 days	Tue 1/6/15	Tue 1/20/15
158	Prepare RTCs	5 days	Wed 1/21/15	Tue 1/27/15
159	USAESCH/CEPOH Review and Approve RTCs	5 days	Wed 1/28/15	Tue 2/3/15
160	**Prepare Draft 2 FS Report for CX**	5 days	Wed 1/28/15	Tue 2/3/15
161	***Draft 2 (CX) FS Report Milestone***	***0 days***	***Tue 2/3/15***	***Tue 2/3/15***
162	CX Review Draft 2 FS Report	10 days	Wed 2/4/15	Wed 2/18/15
163	Prepare RTCs	5 days	Thu 2/19/15	Wed 2/25/15
164	CX Review and Approve RTCs	5 days	Thu 2/26/15	Wed 3/4/15
165	**Draft-Final FS Report**	10 days	Thu 2/26/15	Wed 3/11/15
173	***Draft-Final FS Report Milestone***	***0 days***	***Wed 3/11/15***	***Wed 3/11/15***
166	Regulatory Review and Comment	20 days	Thu 3/12/15	Thu 4/9/15
167	Prepare RTCs	5 days	Fri 4/10/15	Thu 4/16/15
168	Regulatory Review and Approval of RTCs	5 days	Fri 4/17/15	Thu 4/23/15
169	**Final FS Report**	10 days	Fri 4/17/15	Thu 4/30/15
170	USACE/Regulatory Acceptance of Final FS Report	5 days	Fri 5/1/15	Thu 5/7/15
171	***Final FS Report Milestone***	***0 days***	***Thu 5/7/15***	***Thu 5/7/15***
	Proposed Plans	**30d**	**Fri 5/1/15**	**Wed 10/21/15**
175	**Draft Proposed Plan**	10 days	Fri 5/1/15	Thu 5/14/15
195	***Draft Proposed Plan Milestone***	***0 days***	***Thu 5/14/15***	***Thu 5/14/15***
176	USAESCH/CEPOH Review and Comment	10 days	Fri 5/15/15	Fri 5/29/15
177	Prepare RTCs	5 days	Mon 6/1/15	Fri 6/5/15
178	USAESCH/CEPOH Review and Approve RTCs	5 days	Tue 6/9/15	Mon 6/15/15
179	**Prepare Draft 2 Proposed Plan for CX**	5 days	Tue 6/9/15	Mon 6/15/15
180	***Draft 2 (CX) Proposed Plan Milestone***	***0 days***	***Mon 6/15/15***	***Mon 6/15/15***
181	CX Review Draft 2 Proposed Plan	10 days	Tue 6/16/15	Mon 6/29/15
182	Prepare RTCs	5 days	Tue 6/30/15	Mon 7/6/15
183	CX Review and Approve RTCs	5 days	Tue 7/7/15	Mon 7/13/15
184	**Draft Final Proposed Plan**	5 days	Tue 7/7/15	Mon 7/13/15
196	***Draft-Final Proposed Plan Milestone***	***0 days***	***Mon 7/13/15***	***Mon 7/13/15***
185	Regulatory Review and Comment	20 days	Tue 7/14/15	Mon 8/10/15
186	Prepare RTCs	5 days	Tue 8/11/15	Mon 8/17/15
187	Regulatory Review and Approval of RTCs	5 days	Tue 8/18/15	Mon 8/24/15
188	**Incorporate RTCs and Produce Draft Final for Public Review**	6 days	Tue 8/18/15	Tue 8/25/15
189	Public Comment Period	30 days	Tue 8/25/15	Tue 9/22/15
190	Prepare RTCs to Public Comments	5 days	Wed 9/23/15	Tue 9/29/15
191	USAESCH/Regulatory Review and Approval of RTCs	5 days	Wed 9/30/15	Tue 10/6/15
192	**Final Proposed Plan**	10 days	Wed 9/30/15	Wed 10/14/15
193	USACE/Regulatory Acceptance of Final Proposed Plan	5 days	Thu 10/15/15	Wed 10/21/15
194	***Final Proposed Plan Milestone***	***0 days***	***Wed 10/21/15***	***Wed 10/21/15***
	Public Meetings	**30d**	**Tue 9/2/14**	**Mon 12/28/15**
238	Public Meeting 3 Site Selection	5 days	Tue 9/2/14	Tue 9/9/14
237	Prepare & Submit Public Meeting 3 Materials	15 days	Wed 9/3/14	Wed 9/24/14
239	Public Meeting 3 Notice	30 days	Tue 9/9/14	Wed 10/8/14
240	Public Meeting 3 (Concurrent with TPP 3)	1 day	Wed 10/8/14	Wed 10/8/14
241	Public Meeting 3 Minutes	5 days	Thu 10/9/14	Thu 10/16/14
242	***Public Meeting 3 Milestone***	***0 days***	***Thu 10/16/14***	***Thu 10/16/14***
244	Prepare & Submit Public Meeting 4 Materials	17 days	Fri 7/10/15	Tue 8/4/15
245	Public Meeting 4 Site Selection	5 days	Tue 8/4/15	Tue 8/11/15
246	Public Meeting 4 Notice	30 days	Tue 8/11/15	Wed 9/9/15
247	Public Meeting 4 (Proposed Plan)	1 day	Wed 9/9/15	Wed 9/9/15
250	***Public Meeting 4 Milestone***	***0 days***	***Wed 9/9/15***	***Wed 9/9/15***
248	Public Meeting 4 Transcripts	5 days	Thu 9/10/15	Wed 9/16/15

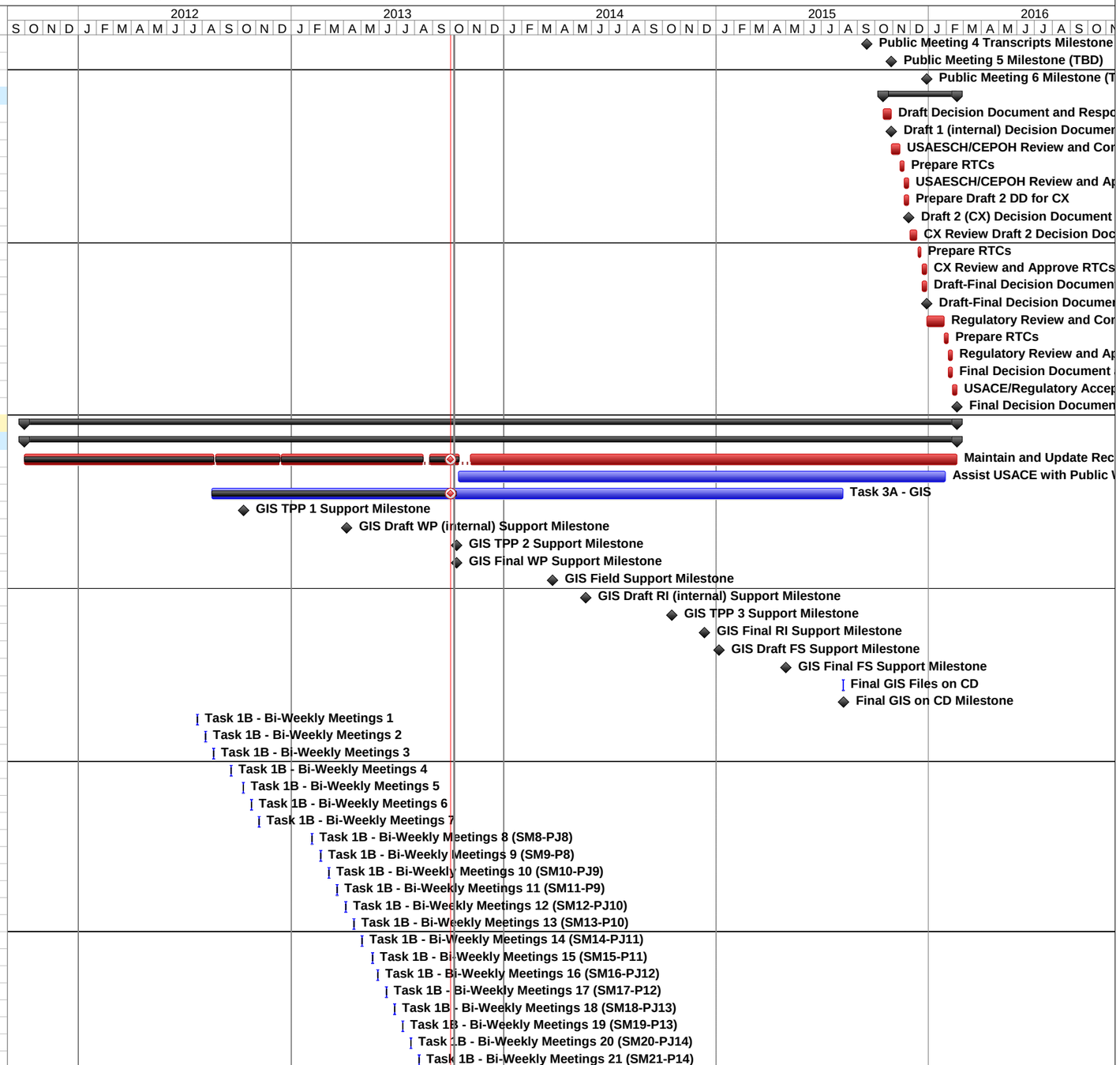


Task — Summary — Manual Task — Manual Summary — Progress
Milestone — Project Summary — Duration-only — Critical — Deadline

Figure B2-1 Schedule

Remedial Investigation/Feasibility Study at Pacific Jungle Combat Training Center, Property No.: H09HI027401

ID	Task Name	Duration	Start	Finish
249	***Public Meeting 4 Transcripts Milestone***	***0 days***	***Wed 9/16/15***	***Wed 9/16/15***
217	***Public Meeting 5 Milestone (TBD)***	***0 days***	***Wed 10/28/15***	***Wed 10/28/15***
218	***Public Meeting 6 Milestone (TBD)***	***0 days***	***Mon 12/28/15***	***Mon 12/28/15***
	Decision Documents	**20d**	**Thu 10/15/15**	**Thu 2/18/16**
198	**Draft Decision Document and Responsiveness Summary**	10 days	Thu 10/15/15	Wed 10/28/15
214	***Draft 1 (internal) Decision Document Milestone***	***0 days***	***Wed 10/28/15***	***Wed 10/28/15***
199	USAESCH/CEPOH Review and Comment	10 days	Thu 10/29/15	Thu 11/12/15
200	Prepare RTCs	5 days	Fri 11/13/15	Thu 11/19/15
201	USAESCH/CEPOH Review and Approve RTCs	5 days	Fri 11/20/15	Fri 11/27/15
202	**Prepare Draft 2 DD for CX**	**5 days**	**Fri 11/20/15**	**Fri 11/27/15**
203	***Draft 2 (CX) Decision Document Milestone***	***0 days***	***Fri 11/27/15***	***Fri 11/27/15***
204	CX Review Draft 2 Decision Document	10 days	Mon 11/30/15	Fri 12/11/15
205	Prepare RTCs	5 days	Mon 12/14/15	Fri 12/18/15
206	CX Review and Approve RTCs	5 days	Mon 12/21/15	Mon 12/28/15
207	**Draft-Final Decision Document**	**5 days**	Mon 12/21/15	Mon 12/28/15
215	***Draft-Final Decision Document Milestone***	***0 days***	***Mon 12/28/15***	***Mon 12/28/15***
208	Regulatory Review and Comment	20 days	Tue 12/29/15	Wed 1/27/16
209	Prepare RTCs	5 days	Thu 1/28/16	Wed 2/3/16
210	Regulatory Review and Approval of RTCs	5 days	Thu 2/4/16	Wed 2/10/16
211	**Final Decision Document and Responsive Summary**	5 days	Thu 2/4/16	Wed 2/10/16
212	USACE/Regulatory Acceptance of Final Decision Document	5 days	Thu 2/11/16	Thu 2/18/16
213	***Final Decision Document Milestone***	***0 days***	***Thu 2/18/16***	***Thu 2/18/16***
	General	**1075d**	**Fri 9/30/11**	**Thu 2/18/16**
		1075d	**Fri 9/30/11**	**Thu 2/18/16**
265	Maintain and Update Records	1075 days	Fri 9/30/11	Thu 2/18/16
219	Assist USACE with Public Website	571 days	Tue 10/15/13	Fri 1/29/16
103	Task 3A - GIS	741 days	Fri 8/17/12	Thu 8/6/15
111	***GIS TPP 1 Support Milestone***	***0 days***	***Wed 10/10/12***	***Wed 10/10/12***
112	***GIS Draft WP (internal) Support Milestone***	***0 days***	***Fri 4/5/13***	***Fri 4/5/13***
106	***GIS TPP 2 Support Milestone***	***0 days***	***Fri 10/11/13***	***Fri 10/11/13***
113	***GIS Final WP Support Milestone***	***0 days***	***Fri 10/11/13***	***Fri 10/11/13***
114	***GIS Field Support Milestone***	***0 days***	***Tue 3/25/14***	***Tue 3/25/14***
115	***GIS Draft RI (internal) Support Milestone***	***0 days***	***Wed 5/21/14***	***Wed 5/21/14***
107	***GIS TPP 3 Support Milestone***	***0 days***	***Thu 10/16/14***	***Thu 10/16/14***
108	***GIS Final RI Support Milestone***	***0 days***	***Thu 12/11/14***	***Thu 12/11/14***
109	***GIS Draft FS Support Milestone***	***0 days***	***Mon 1/5/15***	***Mon 1/5/15***
110	***GIS Final FS Support Milestone***	***0 days***	***Thu 4/30/15***	***Thu 4/30/15***
104	Final GIS Files on CD	1 day	Fri 8/7/15	Fri 8/7/15
105	***Final GIS on CD Milestone***	***0 days***	***Fri 8/7/15***	***Fri 8/7/15***
303	Task 1B - Bi-Weekly Meetings 1	1 day	Mon 7/23/12	Mon 7/23/12
304	Task 1B - Bi-Weekly Meetings 2	1 day	Mon 8/6/12	Mon 8/6/12
305	Task 1B - Bi-Weekly Meetings 3	1 day	Mon 8/20/12	Mon 8/20/12
306	Task 1B - Bi-Weekly Meetings 4	1 day	Wed 9/19/12	Wed 9/19/12
307	Task 1B - Bi-Weekly Meetings 5	1 day	Wed 10/10/12	Wed 10/10/12
308	Task 1B - Bi-Weekly Meetings 6	1 day	Wed 10/24/12	Wed 10/24/12
309	Task 1B - Bi-Weekly Meetings 7	1 day	Tue 11/6/12	Tue 11/6/12
310	Task 1B - Bi-Weekly Meetings 8 (SM8-PJ8)	1 day	Tue 2/5/13	Tue 2/5/13
311	Task 1B - Bi-Weekly Meetings 9 (SM9-P8)	1 day	Wed 2/20/13	Wed 2/20/13
312	Task 1B - Bi-Weekly Meetings 10 (SM10-PJ9)	1 day	Wed 3/6/13	Wed 3/6/13
313	Task 1B - Bi-Weekly Meetings 11 (SM11-P9)	1 day	Wed 3/20/13	Wed 3/20/13
314	Task 1B - Bi-Weekly Meetings 12 (SM12-PJ10)	1 day	Thu 4/4/13	Thu 4/4/13
315	Task 1B - Bi-Weekly Meetings 13 (SM13-P10)	1 day	Thu 4/18/13	Thu 4/18/13
316	Task 1B - Bi-Weekly Meetings 14 (SM14-PJ11)	1 day	Thu 5/2/13	Thu 5/2/13
317	Task 1B - Bi-Weekly Meetings 15 (SM15-P11)	1 day	Mon 5/20/13	Mon 5/20/13
318	Task 1B - Bi-Weekly Meetings 16 (SM16-PJ12)	1 day	Wed 5/29/13	Wed 5/29/13
319	Task 1B - Bi-Weekly Meetings 17 (SM17-P12)	1 day	Thu 6/13/13	Thu 6/13/13
320	Task 1B - Bi-Weekly Meetings 18 (SM18-PJ13)	1 day	Thu 6/27/13	Thu 6/27/13
321	Task 1B - Bi-Weekly Meetings 19 (SM19-P13)	1 day	Thu 7/11/13	Thu 7/11/13
322	Task 1B - Bi-Weekly Meetings 20 (SM20-PJ14)	1 day	Thu 7/25/13	Thu 7/25/13
323	Task 1B - Bi-Weekly Meetings 21 (SM21-P14)	1 day	Thu 8/8/13	Thu 8/8/13

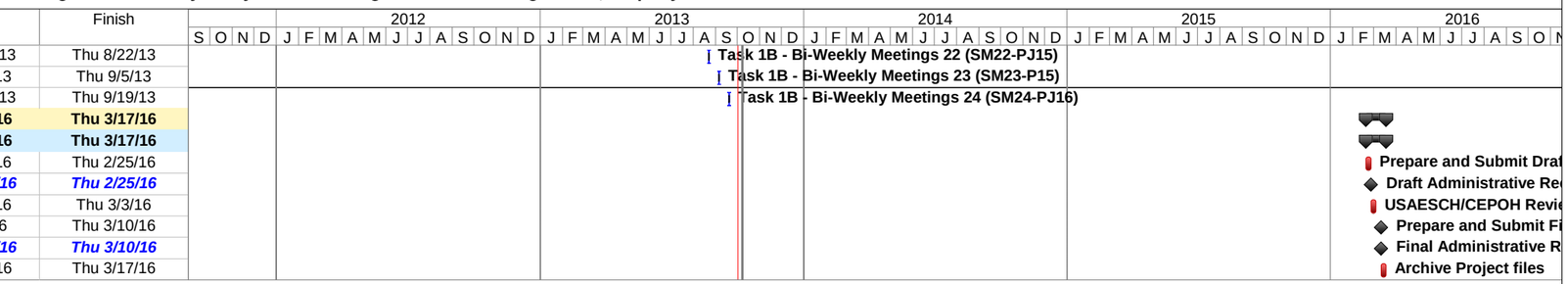


Task — Summary — Manual Task — Manual Summary — Progress
Milestone — Project Summary — Duration-only — Critical — Deadline

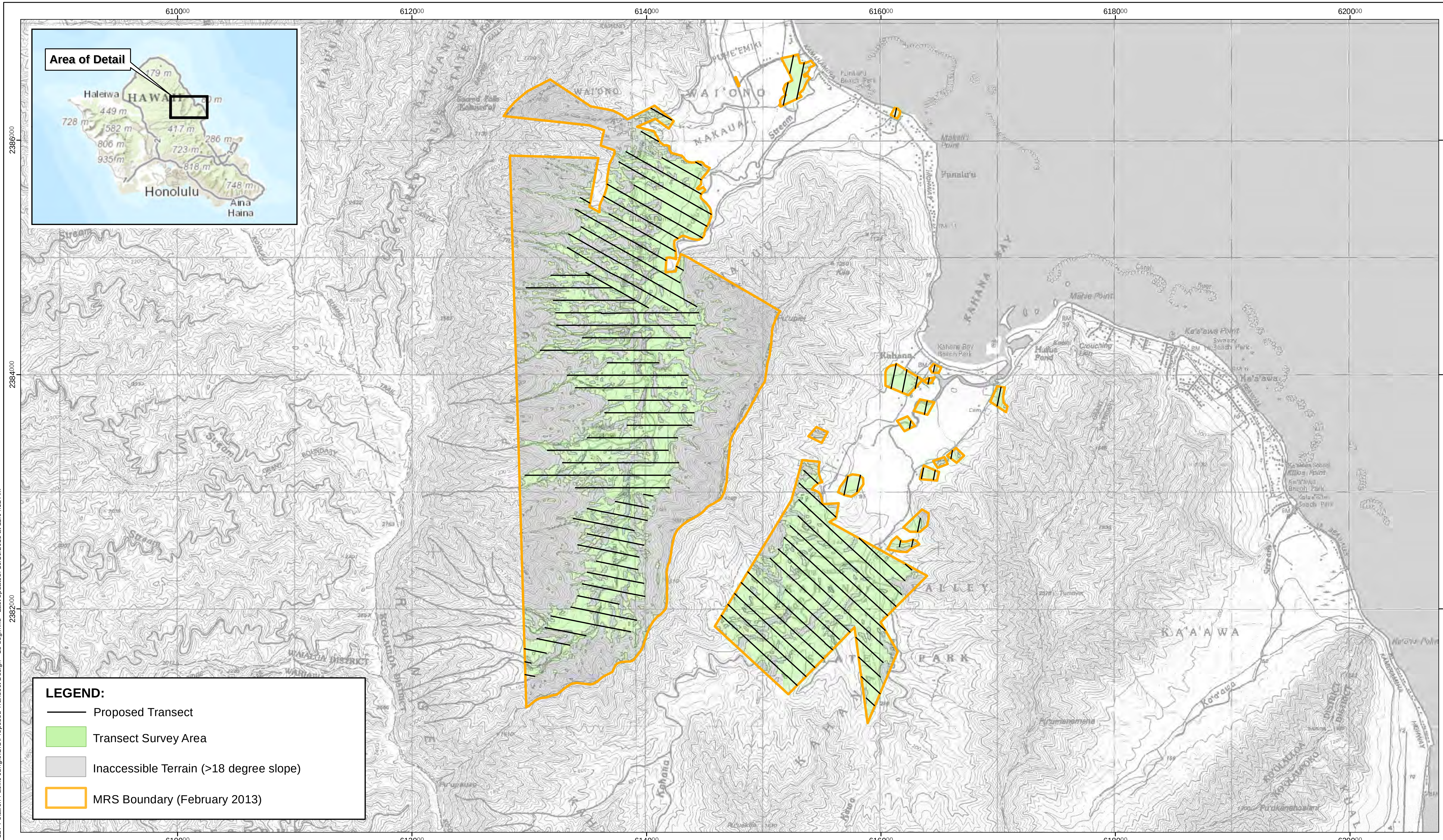
Figure B2-1 Schedule

Remedial Investigation/Feasibility Study at Pacific Jungle Combat Training Center, Property No.: H09HI027401

ID	Task Name	Duration	Start	Finish
324	Task 1B - Bi-Weekly Meetings 22 (SM22-PJ15)	1 day	Thu 8/22/13	Thu 8/22/13
325	Task 1B - Bi-Weekly Meetings 23 (SM23-P15)	1 day	Thu 9/5/13	Thu 9/5/13
326	Task 1B - Bi-Weekly Meetings 24 (SM24-PJ16)	1 day	Thu 9/19/13	Thu 9/19/13
	Project Closeout	**5d**	**Fri 2/19/16**	**Thu 3/17/16**
		5d	**Fri 2/19/16**	**Thu 3/17/16**
266	Prepare and Submit Draft Administrative Record	5 days	Fri 2/19/16	Thu 2/25/16
271	***Draft Administrative Record Milestone***	***0 days***	***Thu 2/25/16***	***Thu 2/25/16***
267	USAESCH/CEPOH Review of Administrative Record	5 days	Fri 2/26/16	Thu 3/3/16
268	Prepare and Submit Final Administrative Record	5 days	Fri 3/4/16	Thu 3/10/16
269	***Final Administrative Record Milestone***	***0 days***	***Thu 3/10/16***	***Thu 3/10/16***
270	Archive Project files	5 days	Fri 3/11/16	Thu 3/17/16



Task	Summary	Manual Task	Manual Summary	Progress			
Milestone	Project Summary	Duration-only	Critical	Deadline			



Coordinate System: Universal Transverse Mercator NAD83, Zone 4 North
Sources: U.S. Geological Survey; U.S. Army Corps of Engineers
References:

1. "Final Site Inspection Report, Pacific Jungle Combat Training Center," prepared by Parsons, December 2008.
2. "DERP-FUDS Inventory Project Report Pacific Jungle Combat Training Center, Kahana and Punaluu Valleys, Island of Oahu, Hawaii, Site No. H09HI027400," prepared by Wil Chee Planning, December 1993.

PROJECT:				
Pacific Jungle Combat Training Center FUDS Project No. H09HI027401	PROPOSED TRANSECT DESIGN			
LOCATION: City and County of Honolulu, Hawaii	DRAWN BY: JJC 8/5/2013	CHECKED BY: CAL 8/5/2013	PROJECT NO. 2012-127	FIG NO. B3-1

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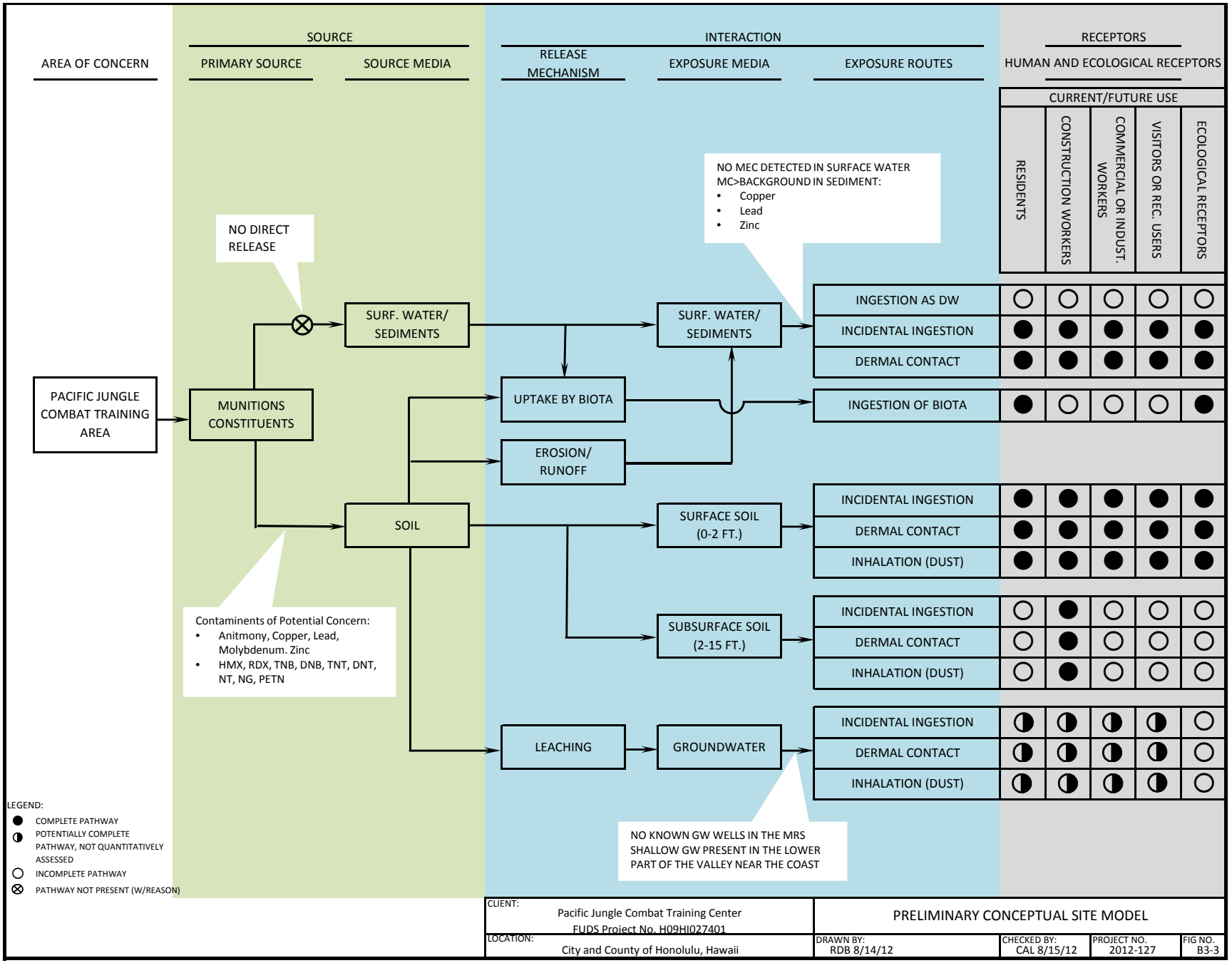
FIGURE B3-2
PRELIMINARY CONCEPTUAL SITE MODEL
PACIFIC JUNGLE COMBAT TRAINING CENTER, OAHU, HAWAII
FUDS PROJECT NO. H0HI027401

MRS	Acreage	Suspected Past DoD Activities	Potential MEC/MD Presence	MEC/MD Found Since Closure	Previous Investigation/Clearance Actions	Post-DoD Land Use and Current Land Use	Potential Receptors	Potential Source and Receptor Interaction	MEC/MC Field Investigation
Pacific Jungle Combat Training Center	2,545	Maneuver Area	**Kahana Valley** 105-mm AP Projectile 2.36-inch Bazooka Round, Tail Section Small Arms (.30-caliber casings) **Punaluu Valley** Small Arms (unexpended .30-caliber bullets) 75-mm AP or HE Projectile 81-mm Mortar M1 and M2 Cartridges, Expended Smoke Grenade, Unexpended MK28 Sea Marker, Expended	**Kahana Valley** 105-mm AP Projectile 2.36-inch Bazooka Round, Tail Section Small Arms (.30-caliber casings) **Punaluu Valley** Small Arms (unexpended .30-caliber bullets) 75-mm AP or HE Projectile 81-mm Mortar M1 and M2 Cartridges, Expended Smoke Grenade, Unexpended MK28 Sea Marker, Expended	EOD removal of 75-mm round and 81-mm mortar in the 1990s. **1993 INPR** – observed tail section of 2.36-inch bazooka round, expended 105-mm AP projectile, live 81-mm mortar. Also observed unexpended .30-caliber bullets, expended M1 and M2 cartridges expended MK28 Sea Marker, and a 75-mm AP or HE projectile in the possession of area resident. **2008 SI** – Punaluu – MEC (unexpended smoke grenade); subsurface anomalies detected with metal detector. Kahana - MD (.30-caliber casings)	State Park/Nature Reserve Agricultural Recreational (hiking trails, hunting, camping) Residential	Commercial/Industrial Workers Construction Workers Visitors/Recreational Users Residents	MEC is possibly at surface and subsurface. Potential for receptors to interact during intrusive and non-intrusive activities.	**2013/2014 RI** – • Investigate transects covering 30.42 miles (11.06 acres) • Investigate perpendicular transects and grids to define and bound potential target areas • Collect incremental surface soil samples in potential target area and analyze for munitions constituents associated with MEC/MD find • Collect subsurface soil, sediment, surface water samples if surface soil concentrations exceed Tier 2 thresholds

ACRONYMS

AP	armor piercing
HE	high explosive
mm	millimeter


AREA OF CONCERN
SOURCE
PRIMARY SOURCE
SOURCE MEDIA
INTERACTION
RELEASE MECHANISM
EXPOSURE MEDIA
EXPOSURE ROUTES
RECEPTORS
HUMAN AND ECOLOGICAL RECEPTORS
CURRENT/FUTURE USE
RESIDENTS
CONSTRUCTION WORKERS
COMMERCIAL OR INDUST. WORKERS
VISITORS OR REC. USERS
ECOLOGICAL RECEPTORS
PACIFIC JUNGLE COMBAT TRAINING AREA
MUNITIONS CONSTITUENTS
NO DIRECT RELEASE
SURF. WATER/ SEDIMENTS
SOIL
UPTAKE BY BIOTA
EROSION/ RUNOFF
LEACHING
SURF. WATER/ SEDIMENTS
SURFACE SOIL (0-2 FT.)
SUBSURFACE SOIL (2-15 FT.)
GROUNDWATER
NO MEC DETECTED IN SURFACE WATER
MC>BACKGROUND IN SEDIMENT:
• Copper
• Lead
• Zinc
Contaminents of Potential Concern:
• Anitmony, Copper, Lead, Molybdenum. Zinc
• HMX, RDX, TNB, DNB, TNT, DNT, NT, NG, PETN
NO KNOWN GW WELLS IN THE MRS
SHALLOW GW PRESENT IN THE LOWER
PART OF THE VALLEY NEAR THE COAST
INGESTION AS DW
INCIDENTAL INGESTION
DERMAL CONTACT
INGESTION OF BIOTA
INCIDENTAL INGESTION
DERMAL CONTACT
INHALATION (DUST)
INCIDENTAL INGESTION
DERMAL CONTACT
INHALATION (DUST)
INCIDENTAL INGESTION
DERMAL CONTACT
INHALATION (DUST)
LEGEND:
COMPLETE PATHWAY
POTENTIALLY COMPLETE PATHWAY, NOT QUANTITATIVELY ASSESSED
INCOMPLETE PATHWAY
PATHWAY NOT PRESENT (W/REASON)
CLIENT:
Pacific Jungle Combat Training Center
FUDS Project No. H09HI027401
LOCATION:
City and County of Honolulu, Hawaii
PRELIMINARY CONCEPTUAL SITE MODEL
DRAWN BY: RDB 8/14/12
CHECKED BY: CAL 8/15/12
PROJECT NO. 2012-127
FIG NO. B3-3

Appendix C Points of Contact

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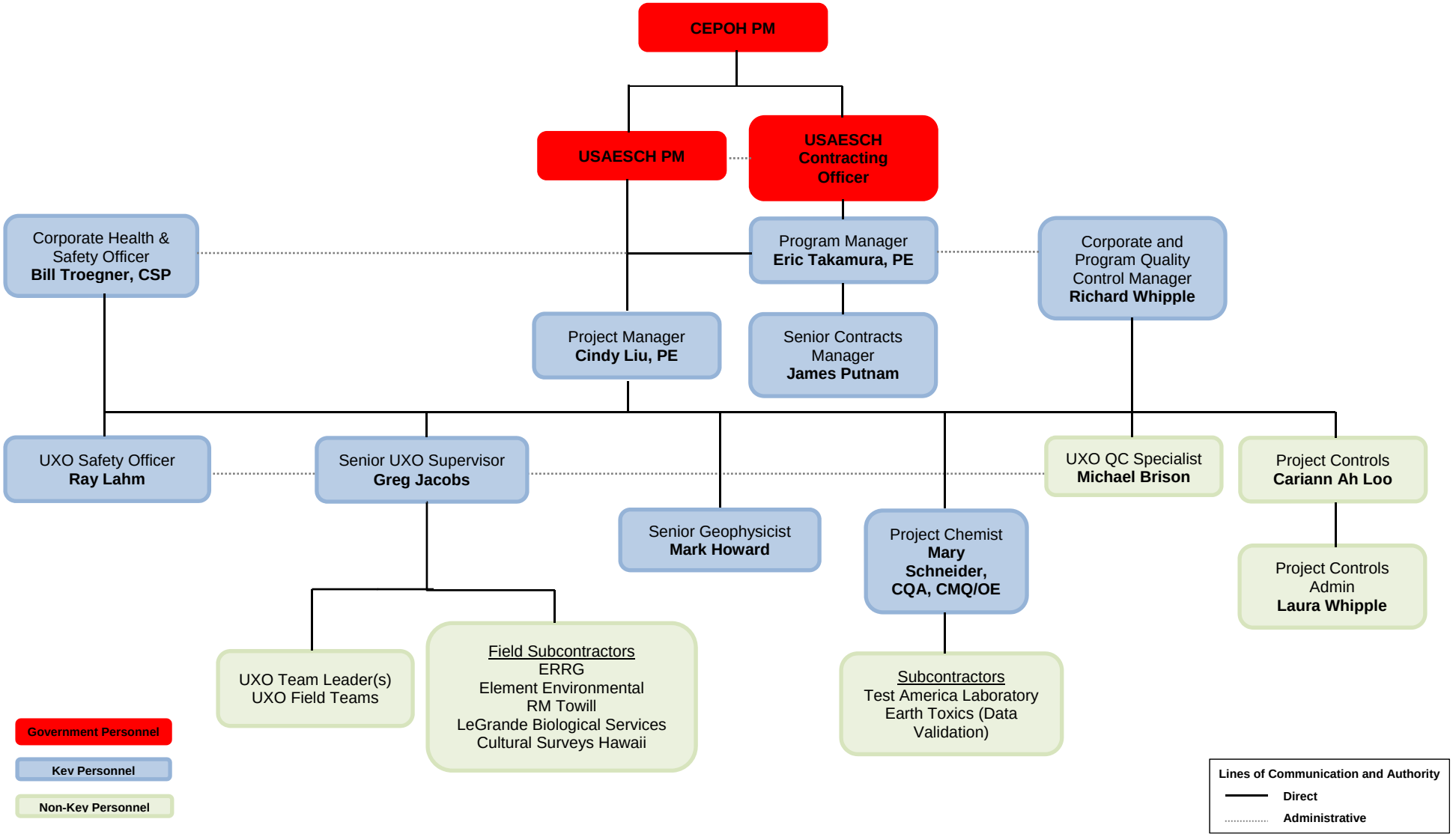
Project Personnel and Contact Information			
Organization	**Name**	**Project Role/Title**	**Contact Information**
CEPOH	Kevin Pien	Geographical Project Manager	(808) 835-4091 office (808) 271-0387 mobile Kevin.C.Pien@usace.army.mil
	Gary Wolover	OESS	(808) 315-6449 mobile Gary.J.Wolover@usace.army.mil
	Kanalei Shun	Archaeologist	(808) 835-4097 office Kanalei.Shun@usace.army.mil
	Kevin Nishimura	Environmental Protection Specialist	(808) 835-4086 office Kevin.H.Nishimura@usace.army.mil
USAESCH	Janice Jamar	Contracting Officer	(256) 895-1343 office janice.a.jamar@usace.army.mil
	Dorothy Richards	Project Manager	(256) 895-1419 office (256) 653-9759 mobile dorothy.d.richards@usace.army.mil
	Kimberly Meacham	Technical Manager	(256) 895-1667 office (256) 307-2227 mobile kim.k.meacham@usace.army.mil
	Debra Edwards	Geophysicist	(256) 895-1626 office debra.l.edwards@usace.army.mil
Huikala	Eric Takamura, PE	Program Manager	(808) 382-6964 mobile etakamura@huikala.com
	Cindy Liu, PE	Project Manager	(808) 533-6000 office (925) 250-3967 mobile cliu@huikala.com
	James Putnam	Senior Contracts Manager	(808) 629-7040 office jputnam@pelatron.com
	Richard Whipple	Corporate/Program Quality Manager	(808) 226-4816 mobile rwhipple@pelatron.com
	William Troegner, CSP	Corporate/Program Health & Safety Officer	(808) 533-6000 office (808) 391-3980 mobile wtroegner@huikala.com
	Greg Jacobs	Senior UXO Supervisor	(443) 643-7742 mobile gjacobs@huikala.com

Project Personnel and Contact Information			
Organization	**Name**	**Project Role/Title**	**Contact Information**
Huikala	Michael Brison	UXO Quality Control Specialist	(530) 249-3308 mobile mbrison@huikala.com
	Raymond Lahm	UXO Safety Officer Site Safety and Health Officer Competent Person	(808) 264-9774 mobile rlahm@huikala.com
	Mark Howard	Senior Geophysicist	(434) 978-3187 ext 225 office (434) 825-4405 mobile MHoward@naevageophysics.com
	Mary Schneider, CQA, CMQ/OE	Project Chemist	(909) 782-8545 mobile mschneider@huikala.com

Task Order 0002 Organizational Chart



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Appendix I Visual Sample Plan Report

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Transect Sampling for Unexploded Ordnance (UXO) Target Detection
Pacific Jungle Combat Training Center
Investigate Areas <18 Degree Slope
August 1, 2013

Summary

This report summarizes the probability of traversing and detecting a target area of specific size and shape for different target area densities above background. Simulation details and a power curve estimate how well the specified design would detect the target. The selected design statement is:

If 1 meter wide transects with a parallel pattern are spaced 100 meters between transects (101 meters on centers) over the entire site, these transects have an approximately 92% chance of traversing and detecting any 1000 foot diameter (500 foot radius) circular target area having a bivariate normal distribution with an average density of 49.8886 anomalies per acre above the background density of 50 anomalies per acre. This assumes the instrument false negative rate is 0% and flagged windows have at least 95% confidence they have density greater than background.

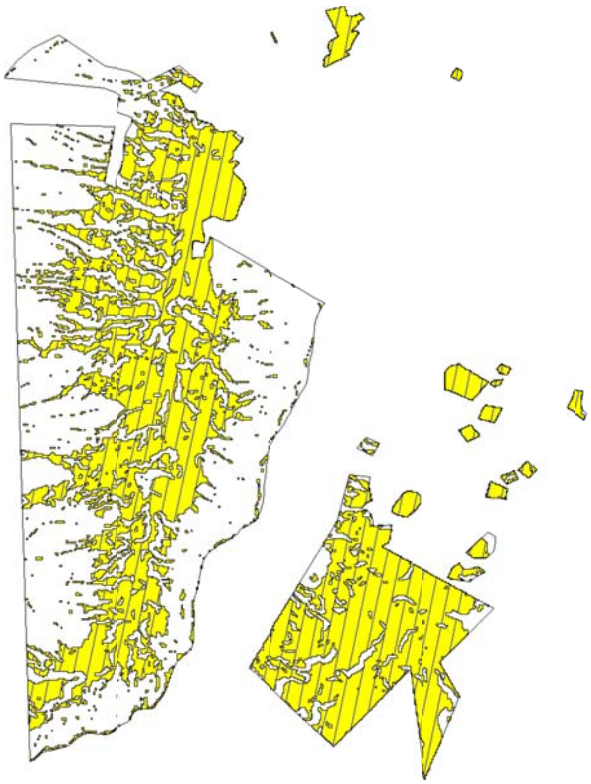
The following table summarizes the sampling design developed. A figure that shows the transect placement in the field is also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Ensure high probability of traversing and detecting a target area that has a specified size and shape
Required Probability of Traversing the Target	100%
TARGET AREA AND TRANSECT INPUTS	
Type of Sampling Design	**Transects**
Transect Pattern	**Parallel**
Transect Width	**1 meters**
Area of target area	**785398.16 ft^2**
Shape of target area of concern	**Circular**
Radius of target area of concern	**500 feet**
SIMULATION PARAMETERS FOR PROBABILITY OF DETECTION	
Formula for calculating the probability of traversing and detecting target area	Monte Carlo Simulation (method described below)
Decision Rule	Flag if at least 95% confident an area has density greater than background density
Background Density of the Site	50 anomalies / acre
Proposed Evaluation Transect Spacing	100 meters
Distribution of target area density above background	Bivariate Normal
Target Area density above background evaluation range	1 to 200 anomalies / acres Target average
Instrument false negative rate	0%
Minimum precision	0.01
Maximum error	0.01
Search Window Diameter	274.32 meters
PROPOSED TRANSECT DESIGN AND COST INFORMATION	
Number of selected sample areas [a]	584
Specified sampling area [b]	1116.32 acres
Computed spacing between transects	100 meters
Computed spacing between transect centers	101 meters

Number of transects to be surveyed	559
Transect Coverage	1.00% of total site area
Linear transect coverage	27.94 miles
Area of transect coverage	11.1103 acres

[a] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[b] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[c] See the Cost of Sampling section for an explanation of the costs presented here.

Site Map With Proposed Transect Design



Primary Sampling Objective
The primary purpose of sampling at this site is to traverse and detect target areas of a given size and shape with required high probability. The transect design tools provide a statistically defensible method to use transect survey data that covers only a small proportion of the total study area.

Selected Sampling Approach
The specified sampling approach was random parallel transect sampling. If parameters change from those specified in the table above, then the probability of detecting the target area will be different from those computed by VSP and reported here.

Simulation Details
To generate an estimated probability on a graph, VSP runs a Monte Carlo simulation based on the entered parameters. For each iteration, VSP creates a square site with the target area centered at the origin and rotated at a random angle. A parallel transect pattern is placed randomly so that 1 meters wide transects are parallel to the x axis.

VSP calculates the total area of the site traversed by transects, A_b, which can vary for each iteration. The expected number of detected background anomalies, λ_b, is calculated as $\lambda_b = D_b A_b (1 - P_{fn})$ where D_b is the background density of 50 anomalies / acres and P_{fn} is the instrument false negative rate of 0. A random number of detected background anomalies is generated using a Poisson distribution with parameter λ_b. VSP randomly places these anomalies within the traversed areas of the site.

To simulate the number of additional anomalies in the target area, VSP uses an approximation technique to randomly place additional detected anomalies in the traversed areas of the target area. Portions of transects overlapping the target area are divided into small sections. For each section, the quantile of the target area in which it lies is determined, the expected number of additional anomalies is determined, and a random number of detected anomalies is determined using a Poisson distribution and placed within the section.

VSP uses a moving window along each transect to determine which areas have density significantly greater than background density. The window moves 1/6 of the search window diameter for each iteration. Where D_a is the actual density for the current window, the null and alternative hypotheses for determining if the area inside the window has density significantly greater than background density, D_b, are as follows:

Null Hypothesis: $H_o : D_a \leq D_b$

Alternative Hypothesis: $H_a : D_a > D_b$

VSP checks each window to see if the actual number of detected anomalies is significantly greater than the expected number of anomalies for a Poisson distribution. If any windows intersecting the target area are flagged as significant, then we determine the target area has been detected.

250 iterations are run to begin the simulation to estimate a probability of detection. If the specified Maximum Error has not been achieved, additional iterations are run until the Maximum Error is met. If the total number of iterations is *n* and the proportion of target areas detected is *p*, then another iteration is run if

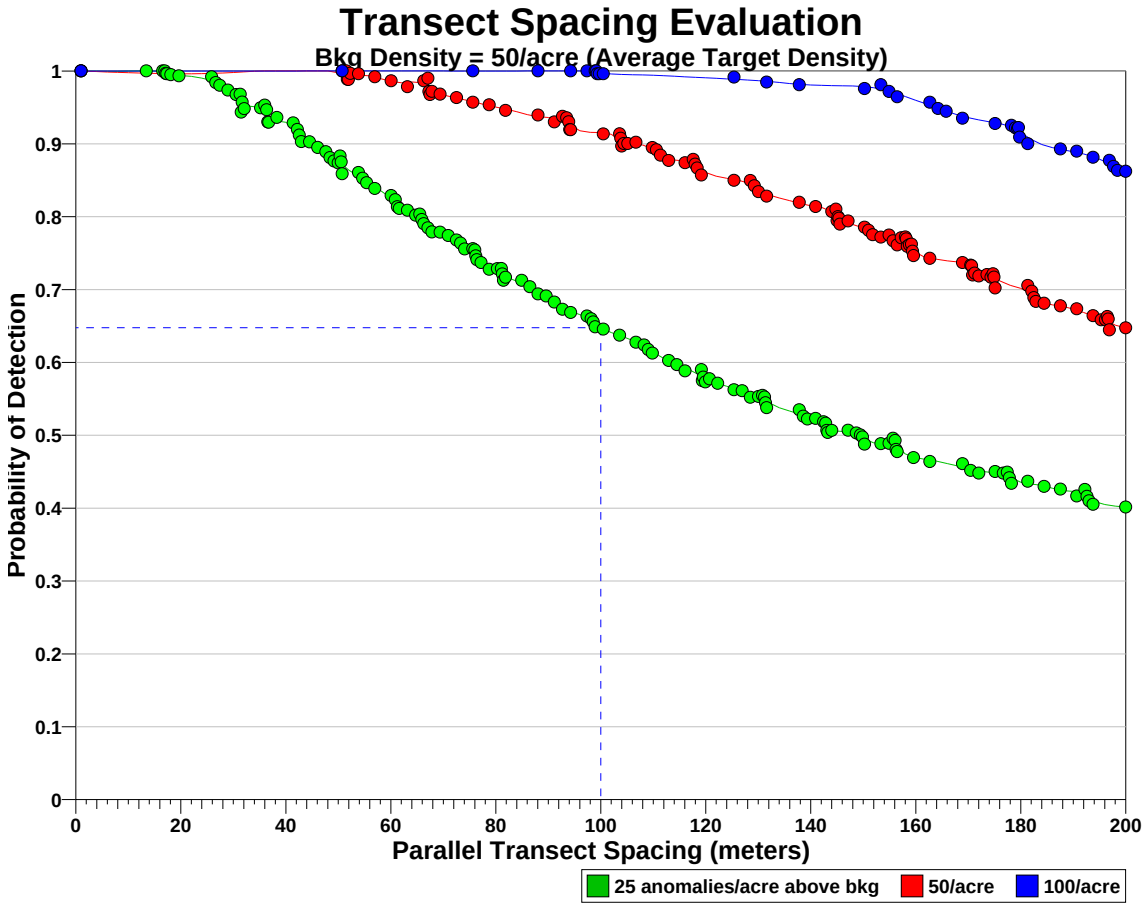
Maximum Error < $1.96 * \sqrt{\frac{p(1-p)}{n}}$

The quantity $1.96 * \sqrt{\frac{p(1-p)}{n}}$ is the 95th percentile of the standard error of the mean for a binomial distribution. We are 95% certain that the estimated probability is close to the true probability (within the maximum error). When all iterations are completed, VSP tabulates the estimated probability the target area has been detected, *p* / *n*. VSP repeats this process for a number of densities above background determined by simulation results and the minimum precision specified. The results are plotted in the power curve below.

Target Detection Power Curve

The following figure is a target detection performance diagram. It shows the probability of detecting the specified target area for a range of transect spacings. The estimated probability of detecting the target area is on the vertical axis, and a range of possible transect spacings are shown on the horizontal axis.

The legend at the bottom of the graph indicates the color of the line representing the target area densities above background used. Lines are fit by first smoothing the points using a moving average, then fitting the line using a cubic spline.



The transect spacings and the simulated probabilities of detecting the target area are shown in the table below:

Curve	Transect Spacing	Estimated Probability of Detecting the Target Area
1	1	1
1	13.4375	1
1	16.5469	1
1	16.9355	1
1	17.1299	0.996711
1	17.3242	0.996094
1	18.1016	0.994932
1	19.6563	0.993421
1	25.875	0.992021
1	26.6523	0.984091
1	27.4297	0.980308
1	28.9844	0.973757
1	30.5391	0.967541
1	31.3164	0.968023
1	31.5107	0.94358
1	31.7051	0.957329
1	32.0938	0.948312

1	35.2031	0.949443
1	35.9805	0.953054
1	36.3691	0.946777
1	36.5635	0.930112
1	36.7578	0.929762
1	38.3125	0.936219
1	41.4219	0.928686
1	42.1992	0.919769
1	42.5879	0.91199
1	42.9766	0.903007
1	44.5313	0.902712
1	46.0859	0.895081
1	47.6406	0.889175
1	48.418	0.881024
1	49.1953	0.876517
1	49.9727	0.87397
1	50.3613	0.883348
1	50.5557	0.875237
1	50.75	0.858871
1	53.8594	0.860699
1	54.6367	0.852815
1	55.4141	0.846609
1	56.9688	0.838654
1	60.0781	0.829112
1	60.8555	0.823231
1	61.2441	0.81375
1	61.6328	0.811206
1	63.1875	0.808896
1	64.7422	0.80196
1	65.5195	0.803524
1	65.9082	0.796202
1	66.2969	0.790363
1	67.0742	0.784637
1	67.8516	0.779172
1	69.4063	0.778835
1	70.9609	0.774235
1	72.5156	0.767981
1	73.293	0.763747
1	74.0703	0.755637
1	75.625	0.756121
1	76.0137	0.754353
1	76.208	0.746316
1	76.4023	0.741024
1	77.1797	0.73706
1	78.7344	0.727837
1	80.2891	0.728684
1	81.0664	0.72885
1	81.2607	0.721536
1	81.4551	0.712652
1	81.8438	0.716863
1	84.9531	0.712815
1	86.5078	0.70393

1	88.0625	0.694118
1	89.6172	0.691277
1	91.1719	0.682702
1	92.7266	0.672923
1	94.2813	0.668549
1	97.3906	0.663757
1	98.168	0.660019
1	98.5566	0.655539
1	98.9453	0.648858
1	100.5	0.645815
1	103.609	0.637387
1	106.719	0.627715
1	108.273	0.624002
1	109.051	0.617731
1	109.828	0.612719
1	112.938	0.602806
1	114.492	0.596994
1	116.047	0.588457
1	119.156	0.590254
1	119.351	0.575084
1	119.545	0.579846
1	119.934	0.573129
1	120.711	0.577538
1	122.266	0.571383
1	125.375	0.5625
1	126.93	0.561074
1	128.484	0.55204
1	130.039	0.553241
1	130.816	0.554865
1	131.205	0.552504
1	131.399	0.544605
1	131.594	0.537917
1	137.813	0.535042
1	138.59	0.526332
1	139.367	0.522415
1	140.922	0.523059
1	142.477	0.518557
1	142.865	0.516667
1	143.06	0.506661
1	143.254	0.503851
1	144.031	0.506661
1	147.141	0.506869
1	148.695	0.503226
1	149.473	0.500416
1	149.861	0.49771
1	150.25	0.487812
1	153.359	0.488438
1	154.914	0.489063
1	155.691	0.496045
1	156.08	0.492923
1	156.274	0.480641
1	156.469	0.477585

1	159.578	0.469296
1	162.688	0.464062
1	168.906	0.461146
1	170.461	0.451891
1	172.016	0.448056
1	175.125	0.450168
1	176.68	0.448168
1	177.457	0.449479
1	177.846	0.441772
1	178.234	0.434004
1	181.344	0.436865
1	184.453	0.42987
1	187.563	0.426064
1	190.672	0.416738
1	192.227	0.425833
1	192.615	0.416349
1	193.004	0.410069
1	193.781	0.405332
1	200	0.401639
2	1	1
2	50.75	1
2	51.5273	1
2	51.7217	0.988782
2	51.916	0.988176
2	52.3047	0.996711
2	53.8594	0.996094
2	56.9688	0.992021
2	60.0781	0.986538
2	63.1875	0.978409
2	66.2969	0.986486
2	67.0742	0.990079
2	67.2686	0.971831
2	67.4629	0.967541
2	67.8516	0.972028
2	69.4063	0.968137
2	72.5156	0.963398
2	75.625	0.957004
2	78.7344	0.953638
2	81.8438	0.945817
2	88.0625	0.939636
2	91.1719	0.930031
2	92.7266	0.937721
2	93.5039	0.935908
2	93.8926	0.930225
2	94.0869	0.919449
2	94.2813	0.919312
2	100.5	0.913487
2	103.609	0.913724
2	103.804	0.907716
2	103.998	0.896959
2	104.387	0.900463
2	105.164	0.900496

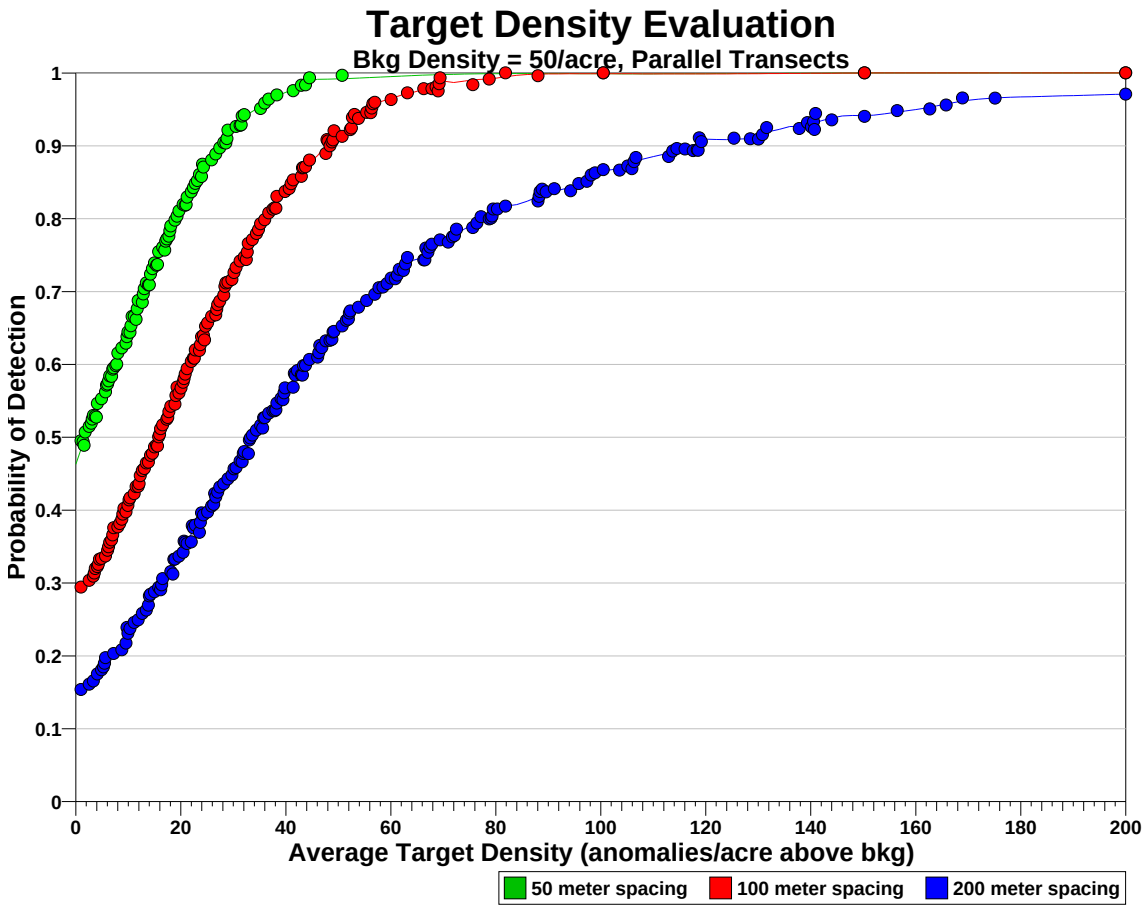
2	106.719	0.902136
2	109.828	0.894962
2	110.605	0.891913
2	111.383	0.884473
2	112.938	0.877031
2	116.047	0.874057
2	117.602	0.878707
2	117.99	0.872201
2	118.379	0.866906
2	119.156	0.857166
2	125.375	0.849878
2	128.484	0.849635
2	129.262	0.842458
2	130.039	0.834437
2	131.594	0.828146
2	137.813	0.819728
2	140.922	0.813907
2	144.031	0.807167
2	144.809	0.810316
2	145.003	0.794755
2	145.197	0.800065
2	145.392	0.797906
2	145.586	0.789738
2	147.141	0.794206
2	150.25	0.785538
2	151.027	0.781354
2	151.805	0.775209
2	153.359	0.772012
2	154.914	0.774761
2	155.691	0.766841
2	156.469	0.761299
2	157.246	0.771172
2	158.023	0.772206
2	158.218	0.769467
2	158.412	0.759321
2	158.801	0.761518
2	159.189	0.762435
2	159.384	0.752665
2	159.578	0.7466
2	162.688	0.742919
2	168.906	0.73706
2	170.461	0.733384
2	170.655	0.732598
2	170.85	0.720019
2	171.238	0.72264
2	172.016	0.718612
2	173.57	0.720616
2	174.348	0.716933
2	174.736	0.721678
2	174.931	0.71702
2	175.125	0.702316
2	181.344	0.705696

2	182.121	0.697835
2	182.51	0.688835
2	182.898	0.683782
2	184.453	0.681171
2	187.563	0.677644
2	190.672	0.673623
2	193.781	0.664105
2	195.336	0.658534
2	196.113	0.658748
2	196.502	0.66301
2	196.696	0.659523
2	196.891	0.644777
2	200	0.647577
3	1	1
3	50.75	1
3	75.625	1
3	88.0625	1
3	94.2813	1
3	97.3906	1
3	98.9453	1
3	99.1396	1
3	99.334	0.996094
3	99.7227	0.996094
3	100.5	0.996094
3	125.375	0.991554
3	131.594	0.984797
3	137.813	0.981183
3	150.25	0.975829
3	153.359	0.981164
3	154.914	0.971888
3	156.469	0.964595
3	162.688	0.957006
3	164.242	0.948582
3	165.797	0.944649
3	168.906	0.935154
3	175.125	0.927843
3	178.234	0.925373
3	179.012	0.922055
3	179.4	0.920956
3	179.595	0.922327
3	179.789	0.90932
3	181.344	0.900174
3	187.563	0.892974
3	190.672	0.89
3	193.781	0.88159
3	196.891	0.877265
3	197.668	0.86904
3	198.445	0.863565
3	200	0.862369

The following figure is a target detection performance diagram. It shows the probability of detecting the specified target area for a range of target area densities above background. The estimated probability of

detecting the target area is on the vertical axis, and a range of possible target area densities above background are shown on the horizontal axis.

The legend at the bottom of the graph indicates the color of the line representing the transect spacing used. Lines are fit by first smoothing the points using a moving average, then fitting the line using a cubic spline.



The target area densities above background and the simulated probabilities of detecting the target area are shown in the table below:

Curve	Target Density	Estimated Probability of Detecting the Target Area
1	1	0.495316
1	1.38867	0.494067
1	1.58301	0.488968
1	1.77734	0.507182
1	2.55469	0.514883
1	2.94336	0.519151
1	3.1377	0.524937
1	3.33203	0.529975
1	3.7207	0.529167
1	3.91504	0.527569
1	4.10938	0.54639

1	4.88672	0.552925
1	5.66406	0.562342
1	5.8584	0.571641
1	6.05273	0.573038
1	6.24707	0.577538
1	6.44141	0.584225
1	6.83008	0.583681
1	7.02441	0.593486
1	7.21875	0.595182
1	7.60742	0.598413
1	7.80176	0.600325
1	7.99609	0.615442
1	8.77344	0.622642
1	9.55078	0.629014
1	9.74512	0.63795
1	9.93945	0.644379
1	10.3281	0.644056
1	10.5225	0.653007
1	10.7168	0.665771
1	11.1055	0.666043
1	11.4941	0.661844
1	11.6885	0.676212
1	11.8828	0.687742
1	12.6602	0.685087
1	12.8545	0.696675
1	13.0488	0.703842
1	13.4375	0.711753
1	13.8262	0.70906
1	14.0205	0.709173
1	14.2148	0.723985
1	14.6035	0.731467
1	14.9922	0.739398
1	15.3809	0.735899
1	15.5752	0.73706
1	15.7695	0.754578
1	16.5469	0.760864
1	16.9355	0.756904
1	17.1299	0.769178
1	17.3242	0.772171
1	17.7129	0.775867
1	17.9072	0.783343
1	18.1016	0.790023
1	18.8789	0.797854
1	19.2676	0.803289
1	19.6563	0.810733
1	20.4336	0.819503
1	20.8223	0.818438
1	21.0166	0.819087
1	21.2109	0.829577
1	21.9883	0.836816
1	22.377	0.842564
1	22.7656	0.848301

1	23.1543	0.852339
1	23.543	0.860677
1	23.9316	0.857969
1	24.126	0.874774
1	24.3203	0.870713
1	25.875	0.88056
1	26.6523	0.88886
1	27.4297	0.89716
1	28.207	0.904481
1	28.5957	0.903672
1	28.79	0.909989
1	28.9844	0.921412
1	30.5391	0.926538
1	31.3164	0.928191
1	31.5107	0.928683
1	31.7051	0.940884
1	32.0938	0.942745
1	35.2031	0.951241
1	35.9805	0.958763
1	36.7578	0.964088
1	38.3125	0.969828
1	41.4219	0.975636
1	42.9766	0.983073
1	43.7539	0.983696
1	44.5313	0.993421
1	50.75	0.996711
1	100.5	1
1	150.25	1
1	200	1
2	1	0.294339
2	2.55469	0.303659
2	3.33203	0.30923
2	3.52637	0.313666
2	3.7207	0.319909
2	4.10938	0.322489
2	4.30371	0.325592
2	4.49805	0.332556
2	4.88672	0.333669
2	5.66406	0.337115
2	6.05273	0.344923
2	6.24707	0.3498
2	6.44141	0.355769
2	6.83008	0.359253
2	7.02441	0.366031
2	7.21875	0.375887
2	7.99609	0.376993
2	8.38477	0.381504
2	8.77344	0.387489
2	8.96777	0.394599
2	9.16211	0.402357
2	9.55078	0.397611
2	9.93945	0.406493

2	10.1338	0.414036
2	10.3281	0.416806
2	11.1055	0.422529
2	11.4941	0.432358
2	11.8828	0.43257
2	12.0771	0.436141
2	12.2715	0.447285
2	12.6602	0.454345
2	13.0488	0.457005
2	13.4375	0.464749
2	13.8262	0.465928
2	14.2148	0.475271
2	14.6035	0.478003
2	14.9922	0.486771
2	15.3809	0.489488
2	15.5752	0.488125
2	15.7695	0.500624
2	15.9639	0.503851
2	16.1582	0.511771
2	16.5469	0.516965
2	17.3242	0.524771
2	17.5186	0.527151
2	17.7129	0.535058
2	18.1016	0.54254
2	18.8789	0.545302
2	19.0732	0.55717
2	19.2676	0.568781
2	19.6563	0.560726
2	20.0449	0.567691
2	20.4336	0.575596
2	20.6279	0.58056
2	20.8223	0.586604
2	21.2109	0.594047
2	21.9883	0.604003
2	22.377	0.608938
2	22.5713	0.608493
2	22.7656	0.619961
2	23.543	0.619153
2	23.7373	0.626998
2	23.9316	0.637725
2	24.3203	0.640018
2	24.5146	0.633744
2	24.709	0.652294
2	25.0977	0.657015
2	25.875	0.665926
2	26.6523	0.667877
2	26.8467	0.675451
2	27.041	0.681927
2	27.4297	0.686654
2	28.207	0.694877
2	28.4014	0.70691
2	28.5957	0.711967

2	28.9844	0.712996
2	29.7617	0.716522
2	30.1504	0.726042
2	30.5391	0.733115
2	31.3164	0.741874
2	32.0938	0.747425
2	32.4824	0.74395
2	32.6768	0.754248
2	32.8711	0.766009
2	33.6484	0.771374
2	34.4258	0.779788
2	34.8145	0.784961
2	35.2031	0.793093
2	35.9805	0.798611
2	36.7578	0.808054
2	37.5352	0.81309
2	37.9238	0.815012
2	38.1182	0.814295
2	38.3125	0.830601
2	39.8672	0.837252
2	40.6445	0.841459
2	41.0332	0.848019
2	41.4219	0.853311
2	42.9766	0.858022
2	43.1709	0.869754
2	43.3652	0.87043
2	43.7539	0.871164
2	44.5313	0.88035
2	47.6406	0.889433
2	47.835	0.908443
2	48.0293	0.906479
2	48.418	0.9
2	48.8066	0.905181
2	49.001	0.908088
2	49.1953	0.920551
2	50.75	0.912859
2	52.3047	0.922276
2	52.499	0.92437
2	52.6934	0.938945
2	53.082	0.94305
2	53.8594	0.9375
2	55.4141	0.945809
2	56.1914	0.945462
2	56.3857	0.951794
2	56.5801	0.957692
2	56.9688	0.959677
2	60.0781	0.963398
2	63.1875	0.972711
2	66.2969	0.978346
2	67.8516	0.978409
2	68.6289	0.980814
2	69.0176	0.975352

2	69.2119	0.985227
2	69.4063	0.993421
2	75.625	0.983974
2	78.7344	0.991554
2	81.8437	1
2	88.0625	0.996094
2	100.5	1
2	150.25	1
2	200	1
3	1	0.1538
3	2.55469	0.161017
3	3.33203	0.165642
3	4.10938	0.175072
3	4.88672	0.180829
3	5.27539	0.184835
3	5.46973	0.189953
3	5.66406	0.197644
3	7.21875	0.203246
3	8.77344	0.208283
3	9.55078	0.217497
3	9.74512	0.238978
3	9.93945	0.230826
3	10.3281	0.237529
3	11.1055	0.245791
3	11.8828	0.249305
3	12.6602	0.258271
3	13.4375	0.262862
3	13.8262	0.269567
3	14.0205	0.282341
3	14.2148	0.284509
3	14.9922	0.287944
3	15.7695	0.293935
3	16.1582	0.290785
3	16.3525	0.297465
3	16.5469	0.306068
3	18.1016	0.315648
3	18.4902	0.312225
3	18.6846	0.332334
3	18.8789	0.332704
3	19.6563	0.336713
3	20.4336	0.34207
3	20.6279	0.357434
3	20.8223	0.35591
3	21.2109	0.354072
3	21.9883	0.356407
3	22.1826	0.378758
3	22.377	0.375743
3	22.7656	0.37931
3	23.543	0.36943
3	23.7373	0.383249
3	23.9316	0.396218
3	24.3203	0.393373

3	25.0977	0.397461
3	25.875	0.405414
3	26.2637	0.407946
3	26.458	0.422739
3	26.6523	0.417956
3	27.041	0.42451
3	27.4297	0.431568
3	28.207	0.436231
3	28.9844	0.442926
3	29.7617	0.448143
3	30.1504	0.456626
3	30.5391	0.458472
3	31.3164	0.467446
3	31.7051	0.466451
3	31.8994	0.477708
3	32.0938	0.480433
3	32.8711	0.477481
3	33.0654	0.496253
3	33.2598	0.499063
3	33.6484	0.502914
3	34.4258	0.509784
3	35.2031	0.516354
3	35.5918	0.512604
3	35.7861	0.526711
3	35.9805	0.526816
3	36.7578	0.533021
3	37.5352	0.536402
3	37.9238	0.536371
3	38.1182	0.53773
3	38.3125	0.546849
3	39.0898	0.553318
3	39.4785	0.551508
3	39.6729	0.561029
3	39.8672	0.567756
3	41.4219	0.56875
3	41.6162	0.587736
3	41.8105	0.585227
3	42.1992	0.591516
3	42.9766	0.585729
3	43.1709	0.585448
3	43.3652	0.59816
3	43.7539	0.598735
3	44.5313	0.606887
3	46.0859	0.609921
3	46.2803	0.616048
3	46.4746	0.625991
3	46.8633	0.623007
3	47.6406	0.632269
3	48.418	0.63304
3	48.8066	0.634317
3	49.001	0.644404
3	49.1953	0.645265

3	50.75	0.652752
3	51.5273	0.660517
3	51.916	0.66214
3	52.1104	0.670594
3	52.3047	0.673349
3	53.8594	0.678384
3	55.4141	0.687733
3	56.9688	0.696256
3	57.7461	0.70533
3	58.5234	0.706261
3	59.3008	0.710953
3	60.0781	0.718493
3	60.8555	0.717436
3	61.2441	0.722582
3	61.6328	0.730576
3	62.4102	0.728814
3	62.7988	0.73805
3	63.1875	0.746703
3	66.2969	0.74345
3	66.4912	0.743457
3	66.6855	0.759735
3	67.0742	0.753784
3	67.4629	0.761054
3	67.8516	0.764933
3	69.4063	0.770811
3	70.9609	0.767818
3	71.7383	0.775119
3	72.127	0.776871
3	72.5156	0.785604
3	75.625	0.787708
3	76.4023	0.793996
3	77.1797	0.802709
3	78.7344	0.799611
3	79.123	0.800771
3	79.3174	0.803524
3	79.5117	0.813185
3	80.2891	0.813181
3	81.8437	0.817201
3	88.0625	0.824353
3	88.2568	0.830592
3	88.4512	0.837187
3	88.8398	0.840397
3	89.6172	0.836874
3	91.1719	0.841102
3	94.2813	0.838313
3	95.8359	0.848131
3	97.3906	0.851357
3	98.168	0.859967
3	98.9453	0.862917
3	100.5	0.867342
3	103.609	0.866711
3	105.164	0.872323

3	105.941	0.868625
3	106.33	0.878352
3	106.719	0.884025
3	112.938	0.885333
3	113.715	0.892896
3	114.492	0.896205
3	116.047	0.895556
3	117.602	0.893536
3	118.379	0.894487
3	118.573	0.893774
3	118.768	0.910897
3	119.156	0.905643
3	125.375	0.910463
3	128.484	0.909708
3	130.039	0.909289
3	130.816	0.915433
3	131.594	0.92493
3	137.813	0.923713
3	139.367	0.931878
3	140.145	0.925982
3	140.533	0.933211
3	140.728	0.922488
3	140.922	0.944392
3	144.031	0.93551
3	150.25	0.940455
3	156.469	0.948222
3	162.688	0.950644
3	165.797	0.956064
3	168.906	0.965625
3	175.125	0.965361
3	200	0.971014

UXO ESTIMATOR
4/4/2013

Develop a Sampling Plan

Inputs

Total number of acres in Area Of Interest (AOI):	84
Specify the UXO Target Density per acre in the AOI:	0.1
Specify the desired confidence level (e.g., 0.95):	0.90

Result

Minimum number of acres to be investigated:	18.250

Transects

Select unit of measure:	Feet
Specify width:	3
The length is:	264,988.8

Grids

Select unit of measure:	Feet
Specify Dimensions:	100 x 100
Number of grids:	79.50

UXO ESTIMATOR
4/4/2013

Develop a Sampling Plan

Inputs

Total number of acres in Area Of Interest (AOI):	506
Specify the UXO Target Density per acre in the AOI:	0.5
Specify the desired confidence level (e.g., 0.95):	0.90

Result

Minimum number of acres to be investigated:	4.567

Transects

Select unit of measure:	Feet
Specify width:	3
The length is:	66,302.8

Grids

Select unit of measure:	Feet
Specify Dimensions:	100 x 100
Number of grids:	19.91

UXO ESTIMATOR
4/4/2013

Develop a Sampling Plan

Inputs

Total number of acres in Area Of Interest (AOI):	1097
Specify the UXO Target Density per acre in the AOI:	1.0
Specify the desired confidence level (e.g., 0.95):	0.90

Result

Minimum number of acres to be investigated:	2.299

Transects

Select unit of measure:	Feet
Specify width:	3
The length is:	33,368.1

Grids

Select unit of measure:	Feet
Specify Dimensions:	100 x 100
Number of grids:	10.02

Appendix J Explosives Siting Plan

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DEPARTMENT OF THE ARMY
US ARMY DEFENSE AMMUNITION CENTER
1 C TREE ROAD MCALESTER
OK 74501-9053

REPLY TO ATTENTION OF

JMAC-ESM 02 May 2013

MEMORANDUM FOR US Army Corps of Engineers, Environmental and Munitions Center of Expertise, CEHNC-CX-MM, P.O. Box 1600, Huntsville, AL 35807-4301

SUBJECT: DDESB Approval, Explosives Site Plan (ESP), Remedial Investigation/Feasibility Study (RI/FS), Pacific Jungle Combat Training Center (Maneuver Area) Oahu, Hawaii.

1. References:

a. Memorandum, CEHNC-CX-EMM, dated 26 March 2013, subject: Explosives Site Plan (ESP), Remedial Investigation/Feasibility Study (RI/FS), Pacific Jungle Combat Training Center (Maneuver Area) Island of Oahu, Hawaii, FUDS Project H09HI027401, dated 25 March 2013.

b. DoD 6055.09-M, Ammunition and Explosives Safety Standards, 29 Feb 08, administratively reissued August 4, 2010.

c. Memorandum, DDESB-PE, dated 24 April 2013, subject: DDESB Approval of Explosives Site Plan, Remedial Investigation/Feasibility Study, Former Pacific Jungle Combat Training Center (Maneuver Are), Oahu, HI

2. The subject Explosive Safety Plan, Remedial Investigation, transmitted by reference 1.a, has been reviewed in accordance with reference 1.b. Reference 1.c provides Department of Defense Explosives Safety Board (DDESB) final approval. This approval and all other stipulation and requirements will be made part of the administrative record for the site.

3. The POC is Jorge L. Villafane, JMAC-ESM, DSN 956-8966, commercial (918) 420-8966, email jorge.l.villafane.civ@mail.mil.

Jimmy L. Langley Ph.D., CSHM
Toxic Chemical Agent Team Leader
Explosives Safety Knowledge, MEC
And Chemical Division

CF (w/encl):
Office of the Director of Army Safety, DACS-SF/Mr. Patton and Mr. Walker, 223 23rd Street, Crystal Plaza 5, Suite 980, Arlington, VA 22202
Office of the Deputy Assistant Secretary of the Army for Environment, Safety, and Occupational Health, Special Assistant for Munitions, DASA-DESOH/Mr. King, 110 Army Pentagon, Washington, DC 20310-0110
U.S. Army Corps of Engineers (CESO/Ms. Roberts), 20 Massachusetts Avenue, NW, Washington, DC 20314-100

DEPARTMENT OF DEFENSE EXPLOSIVES SAFETY BOARD
4800 MARK CENTER DRIVE, SUITE 16E12
ALEXANDRIA, VIRGINIA 22350.3606

APR 2 4 *2013*

DDESB-PE

MEMORANDUM FOR DIRECTOR, U.S. ARMY DEFENSE AMMUNITION CENTER
ATTENTION: JMAC-ESM

SUBJECT: DDESB Approval of Explosives Site Plan, Remedial Investigation/Feasibility Study, Former Pacific Jungle Combat Training Center (Maneuver Area), Oahu, HI

References: (a) DAC JMAC-EST Memorandum of27 March 2013, Subject: Request DDESB Approval, Explosives Siting Plan (ESP), Remedial Investigation/Feasibility Study (RI/FS), Pacific Jungle Combat Training Center (Maneuver Area) Oahu, Hawaii.

(b) DoD 6055.09-M, DoD Ammunition and Explosives Safety Standards, date varies by volume

(c) DDESB TP-15, Approved Protective Construction, Revision 3, May 2010

(d) DDESB-PD Memorandum of2 May 2011, Subject: DDESB Approval for Use of Sandbags for Mitigation of Fragmentation and Blast Effects Resulting from the Intentional Detonation of Munitions

The Department of Defense Explosives Safety Board (DDESB) Staffhas reviewed the subject explosives site plan (ESP) forwarded by reference (a) against the requirements of reference (b). Based on the information provided, approval is granted for removal and treatment of material potentially presenting an explosive hazard (MPPEH) and munitions and explosives of concern (MEC) at Former Pacific Jungle Combat Training Center (Maneuver Area), Oahu, HI. This approval is based on the following:

a. The efforts addressed in this ESP involve manual unintentional detonation operations (to include mechanized unintentional detonation operations employing anomaly avoidance) and intentional detonations supporting munitions response actions within Munitions Response Area (MRA) Pacific Jungle Combat Training Center (Maneuver Area).

b. The results of this ESP will be used to prepare an explosives safety submission per reference (a).

c. The munition with the greatest fragmentation distance (MGFD) for the MRA Pacific Jungle Combat Training Center (Maneuver Area) is the 105mm Ml (TNT filled) Projectile; the minimum separation distance (MSD) for teams for manual unintentional

detonation operations is 72 feet (ft) based on K40 of the 105mm M1 (Composition B filled) Projectile; the MSD for nonessential personnel from manual unintentional detonation operations is 335ft based on the hazardous fragment distance of the 105mm M1 (Composition B filled) Projectile; and the MSD for all personnel from intentional detonations is 2,111 ft based on the maximum fragment distance of the MGFD.

d. Collection points and consolidated shots are authorized provided the Army ensures usage of reference (c), paragraph C6.2.7.5.

e. The use of sandbags, water mitigation systems and earth tamping is authorized as an engineering control for intentional detonations involving the MEC identified in reference (a) provided the Army ensures usage per reference (c), paragraph C6.2.7.5.

f. The use of double sandbags is authorized as an engineering control for intentional detonations involving the MEC identified in reference (a) provided the Army ensures usage per reference (d).

g. The use of the Open Front Barricade is authorized as an engineering control for unintentional detonation operations involving the MEC identified in reference (a) provided the Army ensures usage per reference (c), paragraph C6.2.7.5.

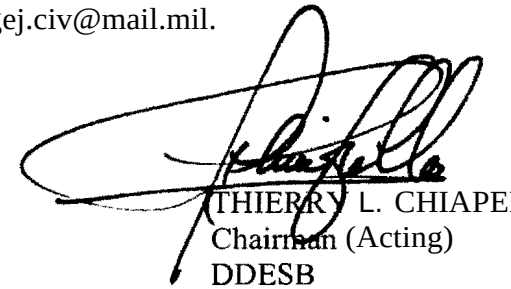
h. Demolition materials, per reference (a), will be delivered as needed.

i. Prior to initiation and through completion of on-site explosives operations, all nonessential personnel will be evacuated and prevented from entering any area/facility encumbered by the MSD required for the operation being conducted, or explosives operations will be suspended if nonessential personnel enter the MSD.

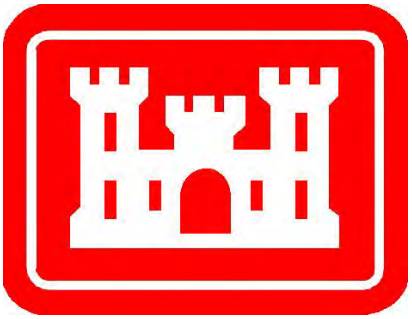
j. MPPEH will be inspected and classified as material documented as safe prior to release to the public.

If changes occur during or after completion of this effort that could increase explosive hazards to site workers or the public due to the presence of military munitions at the site, an amendment to this ESP must be submitted to DDESB for review and approval.

The point of contact for this action is Ms. Kristene Bigej, (571) 372-6705, DSN 372-6705, E-mail address: kristene.a.bigej.civ@mail.mil.



THIERRY L. CHIAPELLO
Chairman (Acting)
DDESB



Explosives Site Plan

Remedial Investigation/Feasibility Study

Pacific Jungle Combat Training Center (Maneuver Area)
Island of Oahu, Hawaii

FUDS Project H09HI027401

25 March 2013

Prepared by
US ARMY CORPS OF ENGINEERS
Engineering and Support Center, Huntsville

TABLE OF CONTENTS

Section Page

1. Site:

a. Name: Pacific Jungle Combat Training Center (Maneuver Area) (See Figure 1-1)

b. State: Hawaii

c. This Remedial Investigation/Feasibility Study (RI/FS) is being performed under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and is part of the overall Remedial Action Process. Subsequent removal responses may be dictated in the future during the remainder of the remedial response process, as determined by action memoranda or other decision documents. Based on the results of this characterization and subsequent decision document, an Explosives Safety Submission (ESS) will be submitted in accordance with DoD 6055.09-M.

2. Anticipated Dates:

a. Start: May 2013

3. Purpose:

a. RI/FS and characterization to collect the information needed to design the required munitions response and to prepare, as appropriate, an ESS for the selected response.

b. Clarifies that Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP) 18 qualified Unexploded Ordnance (UXO) personnel will perform all MEC related activities at the site.

4. Site Background and Current Conditions

a. The Pacific Jungle Combat Training Center (Maneuver Area) consists of approximately 2545 acres in the Punaluu and Kahana Valleys on the northeast coast of the island of Oahu, HI. It was utilized between 1943 and 1950 as a unit level basic and advanced jungle combat training center, and also included instructor training. Munitions and Explosives of Concern (MEC) used during training or that have been discovered include 75 mm armor piercing rounds, 105

mm high explosive (HE) rounds, 81 mm HE and practice mortar rounds, and small arms. The entire Formerly Used Defense Site (FUDS) property is considered one Munitions Response Site (MRS).

b. During the 1993 Site Visits for the Inventory Project Report (INPR), Munitions Debris (MD) in the form of the tail section of a 2.36-inch bazooka round, and a portion of a 105 mm Armor Piercing (AP) projectile. During an interview, a valley resident claimed that his son frequently found MEC/MD items while hiking. In the son's possession were unexpended .30 caliber bullets, expended M1 and M2 cartridges, and a 75 mm AP or HE projectile. The Honolulu Police Department was contacted for proper disposal of the 75 mm projectile. The site visit team was then directed to the location of a live 81 mm mortar, which was removed by an Explosives Ordnance Disposal (EOD) team.

c. The 29 October 2003 INPR Supplement Risk Assessment reports that 105mm, 75 mm projectiles and an 81 mm mortar have been found in the area.

d. During the July 2008 Site Inspection (SI), an unexpended smoke grenade was found near a combat tank used for target practice in Punaluu Valley. Historically, unexpended .30 caliber bullets and a live 81 mm mortar were found in the Punaluu Valley. Munitions Debris (MD) found during the SI included an expended 105 mm armor piercing round, expended M1 and M2 cartridges, and a 75 mm HE or armor piercing round were discovered in the Punaluu Valley, and .30 caliber casings were found in Kahana Valley.

e. Dense vegetation and rocky cliffs make access to many areas difficult. Dense vegetation with less than a diameter of 4 inches will be cut using hand-held or mechanical cutting equipment, and will be cut within 6 inches of the ground surface. No vegetation will be burned. Only areas less than 30 degrees slope will be included in this investigation. Access to the site is unrestricted and accessible to the public.

5. Executing Agencies:

a. US Army Corps of Engineers (USACE), Honolulu District

b. US Army Corps of Engineers (USACE), Huntsville Center

c. Contractor, Huikala LLC

6. Scope of Investigative/Characterization Action:

a. A surface and subsurface (to depth of detection) investigative action is required to fully characterize the site to determine the extent and boundaries of contamination, and identify possible future remedial actions.

b. Munitions Constituents (MC) soil borings will be performed using anomaly avoidance.

c. No Mechanized MEC Activities will be performed during this RI/FS.

d. Table 6-1 identifies the different Areas to be investigated within this project location.

Table 6-1

Sector	Type of Investigation	Total acreage of Site	Acreage to be Investigated
Pacific Jungle Combat Training Center (Maneuver Area)	Surface and Subsurface Remedial Investigation	2545	25

7. Safety Criteria:

a. The munitions with the greatest fragmentation distances (MGFDs) at the site are identified in Table 7-1. The MGFDs were chosen due to the potential of 105 mm HE projectiles being discovered during past investigations or removal actions. (NOTE: The 105 mm M393A3 projectile was not considered, because it was introduced after this FUDS property closed.) During the course of this investigation, if a MEC item with a greater fragmentation distance is encountered, the Minimum Separation Distance (MSD) will be adjusted in accordance with DDESB Technical Paper 16 (Revision 4), operations will continue, and an amendment to this ESP submitted expeditiously for approval.

Continued on next page.

Table 7-1

Minimum Separation Distances (MSD)

Area	MEC	MSD (ft)[1]					
		For Unintentional Detonations			For Intentional Detonations		
		Team Separation Distance (K40)	Hazardous Fragment Distance (HFD)	To Sides and Rear using OFB [2]	Without Engineering Controls	Using Sandbag Mitigation[3]	Using Water Mitigation [3]
Pacific Jungle Combat Training Center (Maneuver Area)	105 mm M1 (Composition B Filled)	***72***	***335***	***300***	1886	200	200
	105 mm M1 (TNT Filled)	67	300	***300***	2111[4]	220[4]	275[4]

Notes:

All Values in Bold Italics are the MSDs for unintentional detonations that must be used on-site for the Area.

[1] See Appendix B for calculation sheets documenting MSDs. Note the NEW for the MGFD based on the HFD is the maximum NEW that may be collected at a collection point.

[2] OFB - Open Front Barricade (in accordance with HNC-ED-CS-S-99-1).

[3] See Appendix B for required sandbag thickness (HNC-ED-CS-S-98-7) and water containment system (HNC-ED-CS-S-00-3).

[4] This distance must be used for intentional detonations due to inability to distinguish whether the 105 mm is filled with Composition B or TNT.

b. The MSD restrictions from MEC areas to non-essential personnel will be applied during all MEC operations. The MSD identified by the US Army Engineering and Support Center, Huntsville (USAESCH) for the Pacific Jungle Combat Training Center (Maneuver Area) site is presented in Table 7-1. Preliminary site work such as surveying, laying grid lanes and anomaly detection do not require the establishment of a MSD for Quantity Distance (Q-D) purposes. Essential personnel are defined as those on-site contractor and DoD personnel required to participate in the MEC removal, along with those approved and authorized visitors. All other personnel are non-essential personnel. The outer boundaries of the MSD arcs are depicted on the Q-D map on Figures 4-1, 4-2, and 4-3. The team separation distance at this site will be the K40 overpressure distance shown in Table 7-1. Positive control of the exclusion zone (EZ) based on the MSD will be maintained at all times that MEC operations are being conducted. Prior to beginning MEC operations, the contractor will ensure that there are no non-essential personnel within the EZ and the contractor will ensure that the EZ remains clear of non-essential personnel throughout the MEC operations.

c. The Open Front Barricade (HNC-ED-CS-S-99-1) may be used to reduce the MSD as shown in Table 7-1.

d. Any occupied buildings and/or public roadways in the MSD areas during MEC operations will be evacuated and roadways blocked to prevent non-essential personnel from entering during the conduct of MEC operations. In addition, spotters may be used to stop work when non-essential personnel enter the MSD on a roadway during the conduct of MEC operations. All (Material Potentially Presenting an Explosive Hazard (MPPEH) procedures will be in accordance with DoDI 4140.62 and Engineering Manual (EM) 1110-1-4009.

8. Methods of Disposal:

a. If disposal activities are required, they will be performed by personnel qualified in accordance with TP 18 within the MRS. The MSDs for intentional detonations are shown in Table 7-1 and Q-D Arcs are shown on Figures 4-1, 4-2, and 4-3.

b. Sandbags (HNC-ED-CS-S-98-7, HNC Safety Advisory dated 7 November 2011, and the DDESB Memorandum "Clarifications Regarding Use of Sandbags for Mitigation of Fragmentation and Blast Effects due to Intentional Detonation of Munitions", Nov. 29 2010) or Water Mitigation (HNC-ED-CS-S-00-3) may be used to reduce the intentional detonation MSD as shown in Table 7-1. In addition to Single Sandbag Mitigation, Double Sandbag Mitigation is approved for items up to and including 81 mm diameter munitions that do not exceed TNT NEW of 1.39 lbs. Tamping (single or multiple items) may be used in accordance with DDESB Technical Paper 16 and the Buried Explosion Module version 6.3. These reports will be on site for all mitigation methods used.

c. All Material Potentially Presenting an Explosive Hazard (MPPEH) will be assessed and its explosives safety status determined and documented prior to transfer within the DoD or release from DoD control. Prior to release to the public, MPPEH will be documented by authorized and technically qualified personnel as Material Documented as Safe (MDAS) after a 100% inspection and an independent 100% re-inspection to determine that it is safe from an explosives safety perspective.

d. The MGFDs for Pacific Jungle Combat Training Center (Maneuver Area) are shown in Table 7-1. Items with smaller fragmentation distances may be found. Demolition of these items may be done using the item-specific minimum separation distances and engineering controls in accordance with DDESB TP 16 Fragmentation Database. For items not in the DDESB TP 16 Fragmentation Database, the maximum fragment distance may be calculated in accordance with the generic equations in DDESB TP 16. (Note: the Generic Equation Calculator (GEQ) is available on the DDESB's secure website at http://www.ddesb.pentagon.mil/.)

e. On-call explosives delivery will be used for any MEC items recovered during operations. Explosives will be provided by a local vendor on an as-needed basis. MEC will be marked and guarded until disposal is accomplished.

f. All explosive operations will follow the procedures outlined in Technical Manual (TM) 60A-1-1-31 and EM 385-1-97, Explosives Safety and Health Requirements Manual, demolition operations will be performed daily or items properly guarded until operations can be conducted.

g. All vehicles transporting explosives will be properly inspected, equipped, and placarded prior to the loading of explosives onto the vehicle, and DD Form 626 “Motor Vehicle Inspection” completed.

h. Collection points are those areas used to temporarily accumulate MEC, determined to be acceptable to move by the SUXOS and UXOSO, pending destruction at the end of the day using consolidated shots. MEC items at collection points must be laid out as shown in “Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives (OE) Sites”. The maximum net explosive weight (NEW) at a collection point will be limited such that the K40 overpressure distance for the total NEW does not exceed the HFD for the area (see Table 7-1, footnote 1).

i. If determined acceptable to move by the SUXOS and UXOSO, consolidating multiple MEC within the MRS is anticipated for this project. US Army Engineering and Support Center, Huntsville (USAESCH) publication “Procedures for Demolition of Multiple Rounds (Consolidated Shots) on Ordnance and Explosives

(OE) Sites", dated March 2000 will be used and a copy of this report will be available on site. The maximum net explosive weight (NEW) for a consolidated shot will be limited such that the K328 overpressure distance for the total NEW (including donor charges) does not exceed the MFD-H for the intentional detonation."

APPENDIX A
MAPS

Pacific Jungle Combat Training Center MRS, Oahu. HI
Site Location Map
Figure 1-1

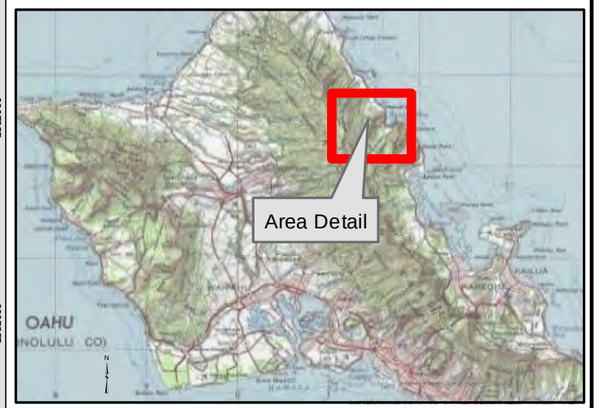
Figure 4-1

Figure 4-2

Figure 4-3

Legend

- Pacific Jungle MRS
- Northern Portion of MRS (Figure 4-1)
- Southwest Portion of MRS (Figure 4-2)
- Southeast Portion of MRS (Figure 4-3)



U.S. Army Engineering & Support Center Huntsville

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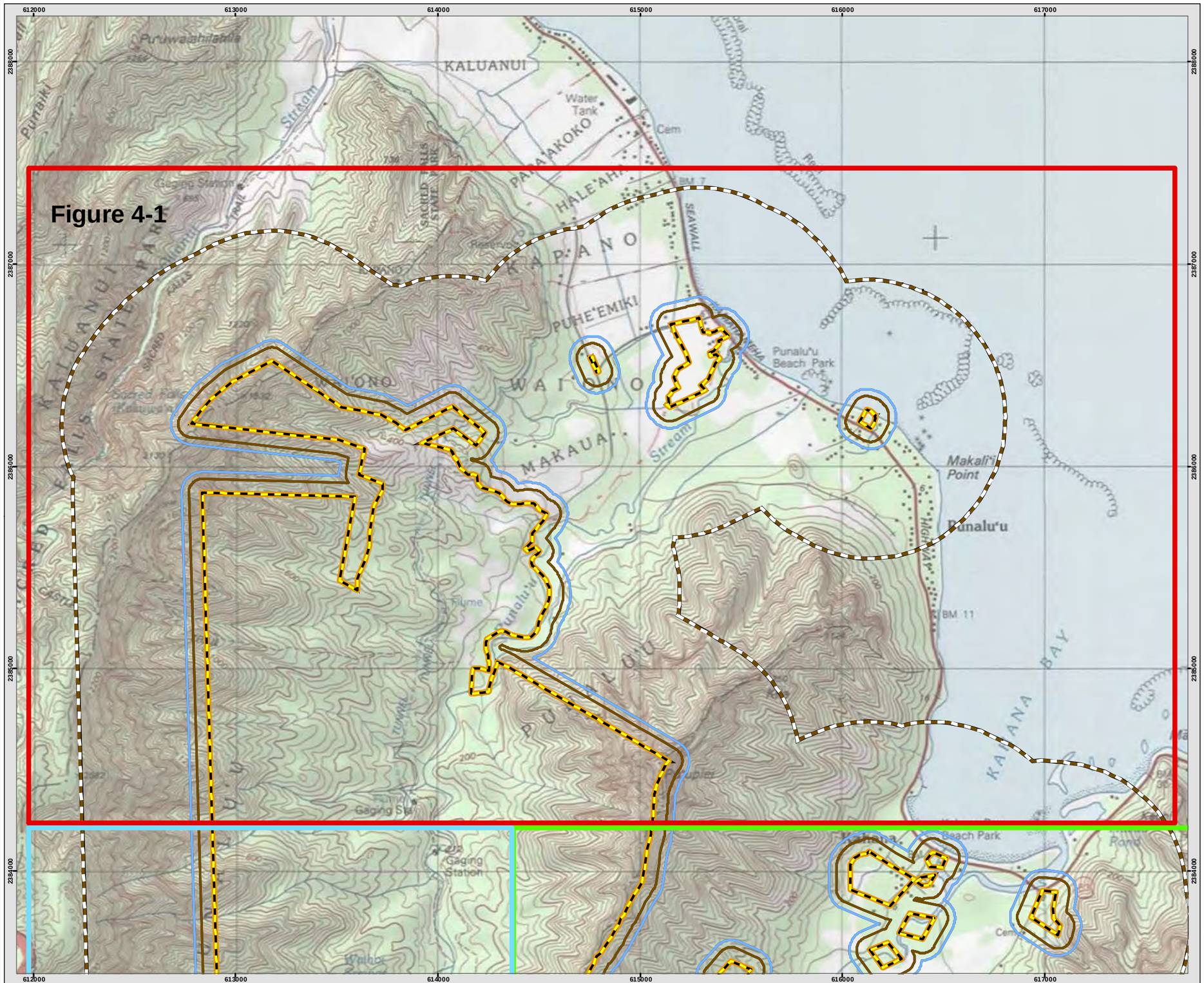
Coordinate System: WGS 1984; UTM Zone 4N

Northern Portion, Pacific Jungle Training Center MRS, Oahu, HI Figure 4-1

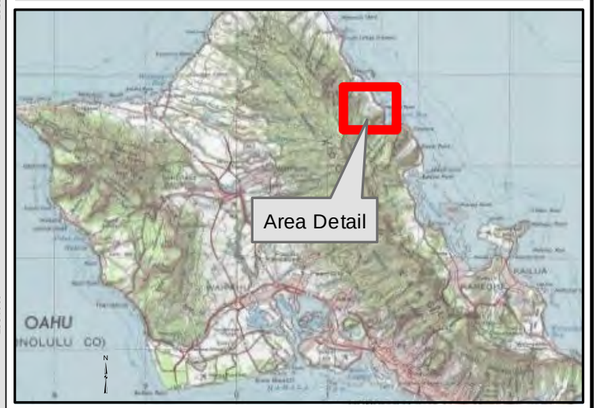


Legend

- Pacific Jungle MRS

MSD Arcs

- Sandbag; 220 Ft
- HFD; 335 Ft
- MFD-H; 2111 Ft
- Northern Portion of MRS (Figure 4-1)
- Southwest Portion of MRS (Figure 4-2)
- Southeast Portion of MRS (Figure 4-3)



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U.S. Army Engineering & Support Center Huntsville

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Southwest Portion
Pacific Jungle Training Center
MRS, Oahu. HI
Figure 4-2

Legend

- Pacific Jungle MRS

MSD Arcs

- Sandbag; 220 Ft
- HFD; 335 Ft
- MFD-H; 2111 Ft
- Northern Portion of MRS (Figure 4-1)
- Southwest Portion of MRS (Figure 4-2)
- Southeast Portion of MRS (Figure 4-3)

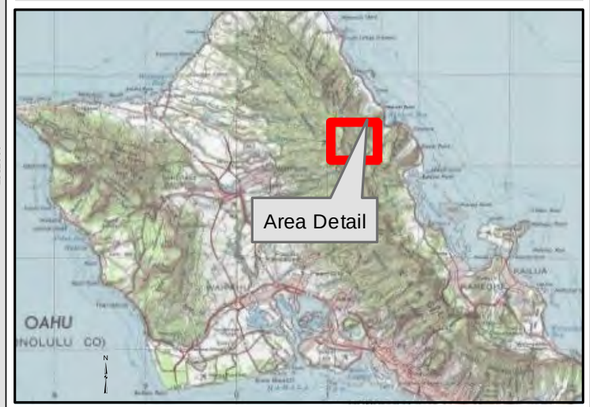

Figure 4-2

Figure 4-3

611000 612000 613000 614000 615000

2384000 2383000 2382000 2381000

0 2,000 4,000 Feet

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Coordinate System: WGS 1984; UTM Zone 4N

U.S. Army Engineering & Support Center Huntsville

Southwest Portion
Pacific Jungle Training Center
MRS, Oahu. HI
Figure 4-3

614000 615000 616000 617000 618000

2384000 2383000 2382000 2381000

Gaging Station
Waiahole Springs
Beach Park
Pond
Cemetery
Gaging Station
KAHANA VALLEY
STATE PARK
Stream
Kahana
Puumanamana
143
200
400
600
800

Legend

- Pacific Jungle MRS

MSD Arcs

- Sandbag; 220 Ft
- HFD; 335 Ft
- MFD-H; 2111 Ft
- Northern Portion of MRS (Figure 4-1)
- Southwest Portion of MRS (Figure 4-2)
- Southeast Portion of MRS (Figure 4-3)

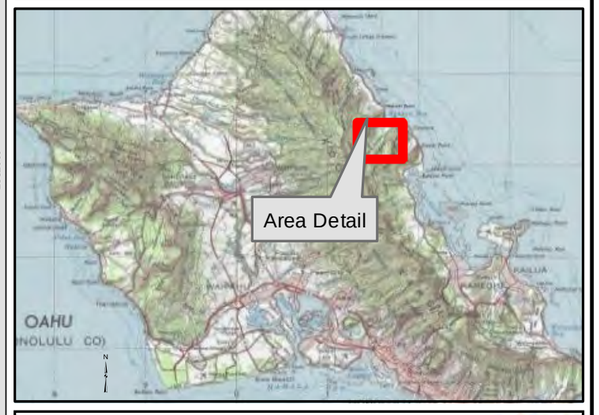

Figure 4-3

0 2,000 4,000 Feet

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Coordinate System: WGS 1984; UTM Zone 4N		

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APPENDIX B
CALCULATION SHEETS

Fragmentation Data Review Form

Database Revision Date 4/2/2012

Category:	Surface-Launched HE Rounds
Munition:	105 mm M1 (Composition B filled)
Case Material:	Steel, Mild
Fragmentation Method:	Naturally Fragmenting
Secondary Database Category:	Projectile
Munition Case Classification:	Robust

DODIC:	C445
Date Record Created:	9/21/2004
Record Created By:	MC
Last Date Record Updated:	2/26/2010
Individual Last Updated Record:	SDH
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	Composition B
Explosive Weight (lb):	5.07
Diameter (in):	4.1340
Cylindrical Case Weight (lb):	18.15800
Maximum Fragment Weight (Intentional) (lb):	0.1701
Design Fragment Weight (95%) (Unintentional) (lb):	0.0414
Critical Fragment Velocity (fps):	5058

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	1.14
TNT Equivalent Weight - Impulse (lbs):	5.780
Kinetic Energy 10^6 (lb-ft²/s²):	1.9864

Single Sandbag Mitigation

Required Wall & Roof Thickness (in)	24
Expected Max. Throw Distance (ft):	135
Minimum Separation Distance (ft):	200

Double Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Water Mitigation

Minimum Separation Distance (ft):	200.000
Water Containment System:	1100 gal tank

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	335
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	1886
MFD-V [Maximum Fragment Distance, Vertical] (ft):	1475

Overpressure Distances

TNT Equivalent (Pressure):	1.16
TNT Equivalent Weight - Pressure (lbs):	5.881
Unbarricaded Intraline Distance (3.5 psi), K18 Distance:	32
Public Traffic Route Distance (2.3 psi); K24 Distance:	43
Inhabited Building Distance (1.2 psi), K40 Distance:	72
Intentional MSD (0.0655 psi), K328 Distance:	592

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	9.88	4.54
Mild Steel:	1.87	0.89
Hard Steel:	1.54	0.73
Aluminum:	3.73	1.82
LEXAN:	8.38	5.43
Plexi-glass:	6.82	3.83
Bullet Resist Glass:	5.97	3.18

Item Notes

Fragmentation Data Review Form

Database Revision Date 4/2/2012

Category:	Surface-Launched HE Rounds
Munition:	105 mm M1 (TNT filled)
Case Material:	Steel, Mild
Fragmentation Method:	Naturally Fragmenting
Secondary Database Category:	Projectile
Munition Case Classification:	Robust

DODIC:	C445
Date Record Created:	1/27/2011
Record Created By:	SDH
Last Date Record Updated:	
Individual Last Updated Record:	
Date Record Retired:	

Munition Information and Fragmentation Characteristics

Explosive Type:	TNT
Explosive Weight (lb):	4.6
Diameter (in):	4.1340
Cylindrical Case Weight (lb):	18.15800
Maximum Fragment Weight (Intentional) (lb):	0.2648
Design Fragment Weight (95%) (Unintentional) (lb):	0.0818
Critical Fragment Velocity (fps):	4345

Sandbag and Water Mitigation Options

TNT Equivalent (Impulse):	1
TNT Equivalent Weight - Impulse (lbs):	4.600
Kinetic Energy 10^6 (lb-ft²/s²):	2.4216

Single Sandbag Mitigation

Required Wall & Roof Thickness (in)	36
Expected Max. Throw Distance (ft):	220
Minimum Separation Distance (ft):	220

Double Sandbag Mitigation

Required Wall & Roof Thickness (in)	Not Permitted
Expected Max. Throw Distance (ft):	Not Permitted
Minimum Separation Distance (ft):	Not Permitted

Water Mitigation

Minimum Separation Distance (ft):	275.000
Water Containment System:	1100 gal tank

Note: Use Sandbag and Water Mitigation in accordance with all applicable documents and guidance. If a donor charge larger than 32 grams is utilized, the above mitigation options are no longer applicable. Subject matter experts may be contacted to develop site specific mitigation options.

Theoretical Calculated Fragment Distances

HFD [Hazardous Fragment Distance: distance to no more than 1 hazardous fragment per 600 square feet] (ft):	300
MFD-H [Maximum Fragment Distance, Horizontal] (ft):	2111
MFD-V [Maximum Fragment Distance, Vertical] (ft):	1637

Overpressure Distances

TNT Equivalent (Pressure):	1
TNT Equivalent Weight - Pressure (lbs):	4.600
Unbarricaded Intraline Distance (3.5 psi), K18 Distance:	30
Public Traffic Route Distance (2.3 psi); K24 Distance:	40
Inhabited Building Distance (1.2 psi), K40 Distance:	67
Intentional MSD (0.0655 psi), K328 Distance:	545

Note: Per V5.E3.2.2.1 of DoD 6055.09-M the minimum sited K328 distance may be no smaller than 200 ft.

Minimum Thickness to Prevent Perforation

	Intentional	Unintentional
4000 psi Concrete (Prevent Spall):	10.01	5.05
Mild Steel:	1.93	0.98
Hard Steel:	1.58	0.80
Aluminum:	3.80	1.98
LEXAN:	8.71	5.89
Plexi-glass:	7.18	4.27
Bullet Resist Glass:	6.37	3.61

Item Notes

Appendix K Biological Monitoring Plan

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FINAL

BIOLOGICAL MONITORING PLAN

PACIFIC JUNGLE COMBAT TRAINING CENTER

OAHU, HAWAII

FUDS Project Number H09HI027401
Contract: W912DY-10-D-0053
Task Order: 0002

Prepared for:

United States Army Corps of Engineering, Honolulu District
and
United States Army Engineering and Support Center, Huntsville

by:
Huikala, LLC
3375 Koapaka St., STE F200
Honolulu, HI 96819

October 2013
Revision 1

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Table of Contents

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Acronyms and Abbreviations

BMP	Biological Monitoring Plan
BMR	Biological Monitoring Report
CEPOH	United States Army Corps of Engineers, Honolulu District
CFR	Code of Federal Regulations
FS	feasibility study
HBMP	Hawaii Biodiversity & Mapping Program
MC	munitions constituents
MEC	munitions and explosives of concern
MRS	munitions response site
RI	remedial investigation
T&E	threatened and endangered
USC	United States Code
USFWS	United States Fish and Wildlife Service

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1.0 Introduction

1.0.1 A Remedial Investigation (RI) /Feasibility Study (FS) is being conducted at the former Pacific Jungle Combat Training Center located on the windward side of Oahu, Hawaii. The former Pacific Jungle Combat Training Center consists of several non-contiguous parcels within the adjacent Kahana and Punaluu Valleys that total approximately 2,545 acres. The parcels are collectively considered a munitions response site (MRS). Portions of the MRS are located within the boundaries of the Ahupua‘a ‘O Kahana State Park and Hauula Forest Reserve.

1.0.2 As part of the RI/FS, a munitions and explosives of concern (MEC) investigation and munitions constituents (MC) sampling activities will be performed. Biological monitoring is required during these activities to avoid sensitive resources as well as identify potential ecological receptors. The field work is being conducted in accordance with the *Remedial Investigation Work Plan, Pacific Jungle Combat Training Center, Oahu, Hawaii* (Huikala, 2013). The Biological Monitoring Plan (BMP) is an appendix to this document and the Work Plan should be referenced for additional details regarding the field activities.

1.1 Monitoring Purpose and Objectives

This BMP was developed to (1) insure that any action taken during field activities is not likely to jeopardize the continued existence of any threatened or endangered (T&E) species or result in the destruction or adverse modification of designated critical habitat, and (2) prohibit any action that results in a “take” of a T&E species without a determination that any “take” is not likely to jeopardize the continued existence of any T&E species, in accordance with 16 United States Code (USC) 1538(a)(1)(B), 50 Code of Federal Regulations (CFR) 17.21(a), and 16 USC 703(a). Biological monitoring will be performed to avoid T&E species and redirect field activities as necessary away from sensitive habitats.

1.2 Results of Literature and Historical Research

1.2.1 Literature research included the review of previous biological surveys in the Kahana and Punalu`u Valleys. A biological assessment of Kahana Stream in 2001 and 2002 (Fitzsimons et. al., 2005) observed a rare `o`opu `alamo`o (Lentipes concolor), a freshwater fish once thought to be extinct on Oahu. The construction of the Waiahole Ditch approximately 90 years ago diverted water from the stream which reduced flow of the water. Water flow has been decreased further by the invasion of hau (Hibiscus tiliaceus) which grows in large tangled groves. Vegetation mapping was conducted in 1972 by Nengah Wirawan in conjunction with a botanical survey of Kahana Valley (Theobald and Warawan, 1973). The mapping resulted in defining 13 different vegetation units within the valley. The current project site encompasses three main vegetation units: (1) Acacia koa-Pandanus (hala) woodland, (2) Hibiscus (hau) forest, and (3) mixed forest scrub. Given the span of time since the vegetation mapping completion, the

vegetation in these areas are presumed to have changed due to the introduction and spread of non-native plant species. A plant species list was compiled for Kahana Valley and published in a 2005 report of the Kahana Valley Ahupua`a (Mueller-Dombois and Wirawan, 2005). The majority of the native plant species are trees and epiphytic ferns.

1.2.2 Designated Critical Habitat for Oahu, Unit 20 has boundaries within the project area (Attachment 1, Figure K1-1). The portion of the critical habitat unit that falls within the project area is designated for two Cyanea species; C. crispa and C. truncata. Schiedea kaalae also has boundaries close to the project area within the same unit (United States Fish and Wildlife Service [USFWS], 2003).

1.2.3 Data results from the Hawaii Biodiversity & Mapping Program (HBMP) were reviewed for rare species observations in the general area of the MRS. All parcels were included in the HBMP data request. Rare elements were located in both Kahana and Punaluu Valleys. The greatest density of rare elements is located just outside of the western MRS boundary in Punaluu Valley. Areas outside of the MRS will not be investigated.

1.2.4 Attachment 1, Figure K1-2 overlays the investigation areas with a hexagonal grid that corresponds to the HBMP database of catalogued sightings of T&E species. The hexagons are 500 meters and within each hexagonal grid, HMBP has identified the species located within that area. The information is provided in hexagon format to protect the exact location of species. The hexagon identification numbers located in the hexagons corresponds to the spreadsheet presented in Attachment 2. Only hexagons within the investigation areas are listed.

1.2.5 The rare species information from the HBMP is provided in the following tables. Photographs of these species are provided in Attachment 3.

Table 1-1: Rare Species Identified or Suspected within Area of Investigation

Species	Description/Observation
Hawaiian Duck or Koloa Maoli (*Anas wyvilliana*)	One observation in 1978. The remaining birds on Oahu are most likely hybrid *A. platyrhynchos* x *A. wyvilliana*. Endangered.
Hawaiian Moorhen or `Alae`ula (*Gallinula chloropus*)	Sighting in 1968. Small endemic waterbird. Nesting occurs year round but most activity is between March and August. Endangered.
Hawaiian Coot or `Alae Ke`oke`o (*Fulica alai*)	Species observed in1975. An endemic waterbird, population levels appear to be stable or slightly increasing on a few of the islands. Vulnerable.

Species	Description/Observation
Oahu ‘Elepaio (*Chasiempis sandwichensis ibidis*)	Observations in 1926, 1950, and 1955. This subspecies is only found on Oahu. Nesting season is from January through July. This endangered subspecies is endemic to Oahu. Any trees to be cleared during field work will be inspected for any nests or adults prior to cutting.
O`opu Alamo`o (*Lentipes concolor*)	Observation in 1990. Rare endemic goby found in pristine streams. Vulnerable.
Yellow-faced bee (*Hylaeus* [Nesoprosopis] *unica*)	Observed 1911. Small bees native to Hawaii. May be extirpated. Species of Concern.
Hedylepta monogramma	Observed 1911. Endemic leaf roller moth.
Oceanic Hawaiian Damselfly (*Megalagrion oceanicum*)	Species observed in 1976. Candidate species found around stream habitats.
Crimson Hawaiian Damselfly (*Megalagrion leptodemas*)	Observed 1990s. Very rare species endemic to Oahu, known only from 4 populations in the Koolau mountains. Candidate.
Blackline Megalagrion Damselfly (*Megalagrion nigrohamatum nigrolineatum*)	Observation in the 1990s. Rare endemic Oahu species found around stream habitats. Candidate.
`Oha, Haha (*Cyanea grimesiana* var. *grimesiana*)	One individual observed in 1959. A member of the Campanulaceae family, this species is likely extinct in the wild on Oahu. Endangered.
Opelu (*Lobelia hypoleuca*)	Observation in 1932. A member of the Campanulaceae family, this species is uncommon in higher elevations of all of the main Hawaiian Islands. Not listed.
Ma`aloa (*Neraudia melastomifolia*)	Observed in 1926. Shrub in the nettle family (Urticaceae), Uncommon on Kauai, Oahu, Molokai, and West Maui. Vulnerable.
Ko`oko`olau (*Bidens campylotheca* subsp. *campylotheca*)	Observed 1927. Small shrub in the Asteraceae family Oahu, Lanai, and Hawaii. Species of Concern

Species	Description/Observation
Anini (*Eurya sandwicensis*)	Observed in 1908. A small tree or shrub in the tea family (Theaceae). Rare on Kauai, Oahu, Molokai, Maui, and Hawaii. Species of Concern.
`Ohe (*Joinvillea ascendens*)	Observed 1931. An indigenous species in Hawaii, an erect herb that does not appear to have limited reproductive abilities. Candidate.
Laukahi (*Lindsaea repens* var. *macreana*)	Observed 1908. A small endemic fern.
Haha (*Cyanea humboldtiana*)	Observed 1929. Endemic species in the Campanulaceae restricted to the Ko`olau mountains on Oahu. Endangered.
Ma`oli`oli (*Schiedea kaalae*)	Observed in 1933. A small plant appearing to have no woody portions. Extremely rare. Endangered.
Kihi (*Adenophorous periens*)	Observed in 19??. Most likely extirpated from Oahu. Endangered.

2.0 Field Work

2.0.1 Biological monitoring will be completed in conjunction with the field activities in accordance with the approved BMP and Work Plan. The objective of biological monitoring in the field is to avoid any T&E species and/or habitat.

2.0.2 Prior to field activities, the following steps will be performed:

- Examine topographic maps to determine terrain characteristics, access, boundaries, and reference points for the subject property.
- Search pertinent literature to familiarize the principal biologist with other plant and animal studies conducted in the general area.
- Review historical plant locations from data provided by HBMP.
- Conduct a rare species review with all individuals participating in field investigations, including supervisors and Army Corps of Engineers, Honolulu District (CEPOH) representatives. All known or predicted rare plant and animal species will be reviewed with the field teams.

2.0.3 The field team will include one biologist who will be on-site during MEC investigation or

MC sampling activities requiring biological monitoring. Activities may include, but are not limited to, surveying and transect layout, vegetation removal for MEC investigation or MC sampling, and establishment of blow-in-place or consolidated shot areas.

2.0.4 During the field activities, visual monitoring will be used to identify areas of biological concern. Due to the density of the vegetation at the site, a biologist will accompany each of the field teams during vegetation clearance and transect stakeout to ensure that sensitive habitats or species are not disturbed. Transects are three feet wide and spaced in parallel in accordance with the Work Plan. The field team biologist will identify areas along the transect lines to avoid and direct the field teams to move away from these areas at a distance considered protective of the habitat. The biologist will determine the appropriate distance in buffer distance on a case-by-case basis. Areas with slopes greater than 18 degrees are excluded from the field investigation due to accessibility and safety concerns.

2.0.5 The biologist will collect notes regarding plant associations and distribution, disturbances, topography, substrate types, exposure, and drainage. Plant identifications are made in the field. Plants that cannot be positively identified will be photo-documented for later determination in the herbarium, and for comparison with the recent taxonomic literature. Any rare plant observations will be documented on the Rare Plant Field Data Form (Attachment 4). The individual plant or plant population will be photo-documented; the location will be marked with a global positioning system unit, and flagged to mark the plant or population.

2.0.6 The biologist will also document individuals of each bird and mammal species observed, as well as signs of their presence, such as footprints, droppings, or burrows on the Animal Observation Data Sheet (Attachment 4). Birds are identified by sight using the naked eye and 10-power binoculars, and by calls.

2.0.7 Wetland areas are anticipated within the areas of investigation. Transect placement will be evaluated prior to investigation in order to avoid impact to these areas.

2.0.8 Daily reporting of biological observations and findings will be submitted to the Huikala supervisor. Any significant findings, such as rare or endangered species observed, will also be reported. Huikala will forward the information to the CEPOH representative. Weekly findings will be summarized and included in the post-field work Biological Monitoring Report (BMR).

3.0 Post-Field Work

Upon completion of field activities, a BMR will be prepared and submitted. The BMR will summarize and present the findings of the field observations. Additionally, the BMR will include a brief discussion regarding T&E species or habitats that were expected but not observed during field activities.

4.0 References

Fitzsimons, J.M., J.E. Parham, L.K. Benson, M.G. McRae, and R.T. Nishimoto, 2005. *Biological Assessment of Kahana Stream, Island of Oahu, Hawaii: An Application of PABITRA Survey Methods. Pacific Science (2005): vol. 59, no. 2:273-281*.

Hawaii Biodiversity & Mapping Program, University of Hawaii, Center for Conservation Research and Training 3050 Maile Way, Gilmore Hall #406, Honolulu, Hawaii 96822

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Theobald, W.L., and N. Wirawan, 1973. *Kahana Valley Botanical Survey, Ko`olau District, Island of Oahu*. Department of Botany, University of Hawaii, Honolulu, Technical Report Prepared for Division of State Parks, Outdoor and Historical Sites, Department of Land and Natural Resources, State of Hawaii, Honolulu.

Wil Chee Planning, 1993. *Defense Environmental Restoration Program - Formerly Used Defense Sites Inventory Project Report.* December.

USFWS, 2003. *Endangered and Threatened Wildlife and Plants; Final Designation or Nondesignation of Critical Habitat for 101 Plants Species from the Island of Oahu*. Federal Register Vol. 68. No. 116. Tuesday June 17, 2003.

Attachments

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Attachment 1 – Figures

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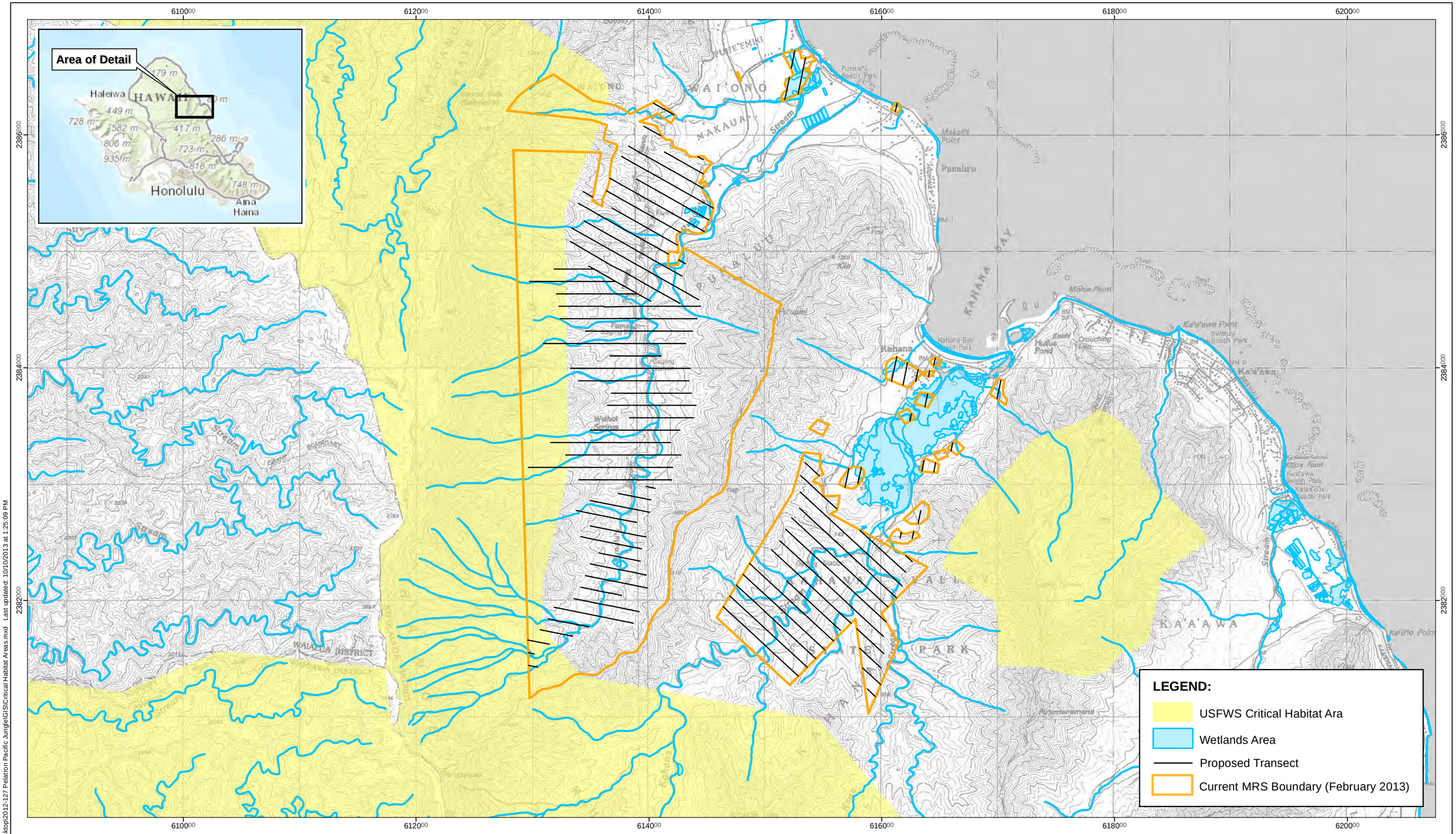

Coordinate System: Universal Transverse Mercator NAD83, Zone 4 North
Sources: U.S. Geological Survey; U.S. Army Corps of Engineers; GIS data layer for "Critical Habitat for Threatened & Endangered Species", U.S. Fish and Wildlife Service, Department of the Interior <http://criticalhabitat.fws.gov/crithab/>
References:

1. "Final Site Inspection Report, Pacific Jungle Combat Training Center," prepared by Parsons, December 2008.
2. "DERP-FUDS Inventory Project Report Pacific Jungle Combat Training Center, Kahana and Punaluu Valleys, Island of Oahu, Hawaii, Site No. H09HI027400," prepared by Wil Chee Planning, December 1993.

0 2,500
SCALE: 1" = 2,500'

PROJECT: Pacific Jungle Combat Training Center FUDS Project No. H09HI027401	**CRITICAL HABITAT AND WETLANDS AREAS**			
LOCATION: City and County of Honolulu, Hawaii	DRAWN BY: JJC 7/19/2013	CHECKED BY: CAL 7/19/2013	PROJECT NO. 2012-127	FIG NO. **K1-1**

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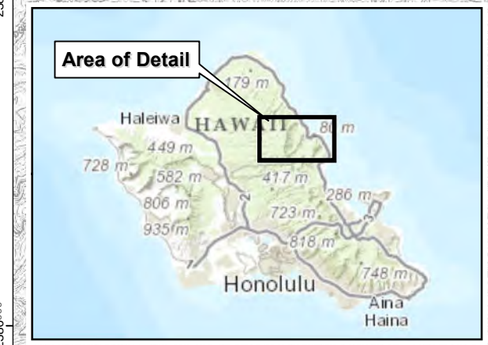

6080000 6100000 6120000 6140000 6160000 6180000 6200000

2388000 2386000 2384000 2382000 2380000

LEGEND:

125 Species Identification Number from HBMP Database

MRS Boundary (February 2013)

Coordinate System: Universal Transverse Mercator NAD83, Zone 4 North
Sources: U.S. Geological Survey; U.S. Army Corps of Engineers; City and County of Honolulu, Department of Planning and Permitting (gis.hicentral.com)
References:

1. "Final Site Inspection Report, Pacific Jungle Combat Training Center," December 2008, prepared by Parsons.
2. "DERP-FUDS Inventory Project Report Pacific Jungle Combat Training Center, Kahana and Punaluu Valleys, Island of Oahu, Hawaii, Site No. H09HI027400," prepared by Wil Chee Planning, December 1993.

0 3,000
SCALE: 1" = 3,000'

PROJECT: Pacific Jungle Combat Training Center FUDS Project No. H09HI027401	**THREATENED OR ENDANGERED SPECIES HEXAGON MAP**			
LOCATION: City and County of Honolulu, Hawaii	DRAWN BY: JJC 8/14/2012	CHECKED BY: CAL 8/14/2012	PROJECT NO. 2012-127	FIG NO. **K1-2**

N:\Graphics\2012\2012-127 Pelatron Pacific Jungle\GIS\Threatened or Endagnered Species Hexagon Map.mxd Last updated: 7/30/2013 at 1:40:55 PM

Attachment 2 – Threatened and Endangered Species List

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Threatened and Endangered Species List

ID #	SCIENTIFIC NAME	COMMON NAME	LOCATION NOTES	ECO TYPE	USESA	GRANK	GENERAL NOTES
11							
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35							
36	Anas wyvilliana	Hawaiian Duck, Koloa	Kahana Stream and Marsh	Animal-Vertebrate	LE	G1	Associated species: Coot (ABNME14021.028) and Gallinule (ABNME13012.088).
37	Gallinula chloropus sandvicensis	Hawaiian Gallinule, `Alae-`ula	Kahana	Animal-Vertebrate	LE	G5T2	Associated species: Coot (ABNME14021.028) and Koloa (ABNJB10070.072).
38	Fulica alai	`Alae Ke`oke`o, Hawaiian Coot	Kahana Stream and Marsh	Animal-Vertebrate	LE	G2	Associated species: Gallinule (ABNME13012.088), Koloa (ABNJB10070.072).
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111	Megalagrion leptodemas	Crimson Hawaiian Damselfly		Animal-Invertebrate	C	G1	Hawaiian Continuous Perennial Stream [CANFS000A0.060].
112	Megalagrion nigrohamatum nigrolineatum	Blackline Megalagrion Damselfly		Animal-Invertebrate	C	G4T2	Hawaiian Continuous Perennial Stream [CANFS000A0.060].
113	Lobelia hypoleuca	`Opelu, Liua, Mo`owahie		Plant		G3	
114	Neraudia melastomifolia	MA`ALOA, MA`OLOA, `OLOA		Plant		G2	
115	Chasiempis sandwichensis ibidis	Oahu `Elepaio	Kahana Valley State Park	Animal-Vertebrate	LE	G3T1	
116							
117							

Threatened and Endangered Species List

ID #	SCIENTIFIC NAME	COMMON NAME	LOCATION NOTES	ECO TYPE	USESA	GRANK	GENERAL NOTES
118							
119							
120							
121							
122							
123							
124	Cyanea grimesiana subsp. grimesiana	`OHA, HAHA, `OHA WAI	Punaluu Valley	Plant	LE	G1T1	
134							
135							
136							
137							
138	Lentipes concolor	`O`opu Alamo`o		Animal-Vertebrate		G3	
139							
140							
141	Megalagrion oceanicum	Oceanic Megalagrion Damselfly	Punaluu	Animal-Invertebrate	C	G2	
142	Bidens campylotheca subsp. campylotheca	Ko`oko`olau, Koko`olau	Punaluu Valley	Plant	SOC	G2T2	SUNNY ROCKY SLP W/ LANTANA (S27DEGBM); SUNNY, ROCKY SLP (A37SHE01)
143	Eurya sandwicensis	ANINI, WANINI		Plant	SOC	G2	
144	Joinvillea ascendens subsp. ascendens	`OHE		Plant	C	G5T1	Side of hill, open (S31HUMBM).
145	Lindsaea repens var. macraeana			Plant		G5T2	
146	Cyanea humboldtiana	`Oha, Haha, `Oha wai	Punaluu	Plant	LE	G1	
147	Schiedea kaalae		Punaluu	Plant	LE	G1	
148	Adenophorus periens		Punaluu	Plant	LE	G1	
149	Chasiempis sandwichensis ibidis	Oahu `Elepaio	Punaluu	Animal-Vertebrate	LE	G3T1	
150							
151							
152							
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156	Chelonia mydas	Honu, Green Turtle		Animal-Vertebrate	LELT	G3	
157	Hawaiian Continuous Perennial Stream	HAWAIIAN CONTINUOUS PERENNIAL STREAM		Natural Community		G1	DRAINING LG AMPHITHEATER-HEADED VLY, ADJ VEG ALIEN-DOM BELOW CA 2000 FT, NATIVE WET FOREST ABOVE; ASSOCIATED SPP: MEGALAGRION NIGROHAMATUM NIGROLINEATUM [IIODO73071.018], MEGALAGRION LEPTODEMAS [IIODO73040.002].
158							
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Threatened and Endangered Species List

ID #	SCIENTIFIC NAME	COMMON NAME	LOCATION NOTES	ECO TYPE	USESA	GRANK	GENERAL NOTES
170							
171							
172							
173							
174	Nesoprosopis unica	Unique Yellow-faced Bee		Animal-Invertebrate	SOC	GH	
175	Hedylepta monogramma	(Moth)		Animal-Invertebrate		G1	
176	Chasiempis sandwichensis ibidis	Oahu `Elepaio	Castle Trail	Animal-Vertebrate	LE	G3T1	
177							
203							
204							
205							
206							
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210							
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224							
226	Hawaiian Continuous Perennial Stream	HAWAIIAN CONTINUOUS PERENNIAL STREAM		Natural Community		G1	DRAINING LG AMPHITHEATER-HEADED VLY, ADJ VEG ALIEN-DOM BELOW CA 2000 FT, NATIVE WET FOREST ABOVE
228							
231							
234							
235							
237							
239							

ACROYMNS

C	Candidate
GRANK	Global Rank
LE	Listed Endangered
LT	Listed Threatened
SOC	Species of Concern
USESA	Federal Status (United States Endangered Species Act)

Footnote:

Global rank (GRANK) is a reflection of the overall condition of an element throughout its global range. Subspecies are denoted by a T-Rank; multiple rankings indicate a range of values. An H-rank indicates that all sites are historical.

G1 = Critically imperiled; Less than 6 viable element occurrences (EOs) OR less than 1,000 individuals

G2 = Imperiled; 6-20 EOs OR 1,000-3,000 individuals

G3 = Rare, uncommon or threatened, but not immediately imperiled; 21-100 EOs OR 3,000-10,000 individuals

G4 = Not rare and apparently secure, but with cause for long-term concern; this rank is clearly lower than G3 but factors exist to cause some concern; i.e., there is some threat, or somewhat narrow habitat.

G5 = Demonstrably widespread, abundant, and secure

Attachment 3 – Photographs

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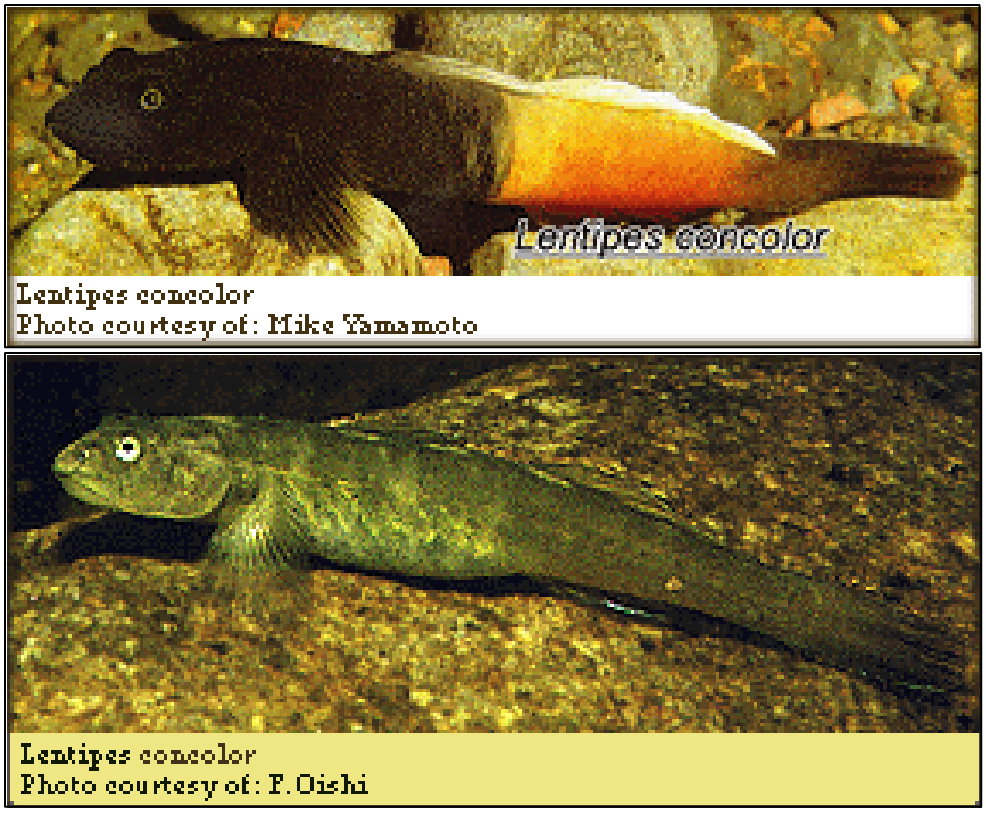
Photograph 1 – Oahu Elepaio (*Chasiempis sandwichensis ibidis*)

Photograph 2 – Hawaiian Duck or Koloa Maoli (*Anas wyvilliana*)

Photograph 3 – Hawaiian Moorhen or `Alae`ula (*Gallinula chloropus*)

Photograph 4 – Hawaiian Coot or `Alae Ke`oke`o (*Fulica alai*)



Photograph 5 – O`opu Alamo`o (*Lentipes concolor*)

Photograph 6 – Yellow-faced Bee (*Hyleus sp.*)

Photograph 7 – Leafroller moth (*Hedylepta sp.*)

Photograph 8 – Crimson Hawaiian Damselfly (*Megalagrion leptodemus*)

Photograph 9 – Oceanic megalagrion damselfly (*Megalagrion oceanicum*)

Photograph 10 – Blackline Megalagrion Damselfly (*Megalagrion nigrohamatum nigrolineatum*)

Photograph 11 – `Oha, Haha (*Cyanea grimesiana* var. *grimesiana*)

Photograph 12 – Opelu (*Lobelia hypoleuca*)

Photograph 13 – Ma`aloa (*Neraudia melastomafolia*)

Photograph 14 – Ko`oko`olau (*Bidens campylotheca* subsp. *campylotheca*)

Photograph 15 – Anini (*Eurya sandwicensis*)

Photograph 16 – `Ohe (*Joinvillea ascendens*)

Photograph 17 – Laukahi (L*indsaea repens* var. *macreana*)

Photograph 18 – Haha (Cyanea humboldtiana)

Photograph 19 – Ma`oli`oli (*Schiedea kaalae*)

Photograph 20 – Kihi (*Adenophorous periens*)

Attachment 4 – Field Data Forms

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Rare Plant Field Data

Scientific Name _____ Date _____

Agency _____ Observers _____

Agency Population Reference _____ Island _____ Elevation _____ft/m

Location/Directions/Flagging Scheme/GPS Notes _____

_____

_____

Photo taken? Y/N ___ Notes _____

Individual Plant Information

Plant #	Tag ? Y/N	Sex P or M/F Both or Unk	Ht. (m)	Basal Diam (cm) or N/A	Age Class: mature, immat, seedling	Reproduct. Status: veg, bud, flwr, imm frt, mat frt, dormant	Vigor: healthy mod, poor, dead

Population Structure

Age Class	Observer Definition of Age Class (Define criteria for seedling, immature, and mature, e.g. height, reproductive status, etc.)	Counted # of Individuals	Estimated # of Individuals
Seedling			
Immature			
Mature			
Total			

SPECIAL CONCERN ANIMAL OBSERVATION DATA SHEET

Species Scientific Name: _____

Common Name: _____

Sex: M / F

Date Observed: _____

Method of Observation: _____

Observer/Collector: _____

Affiliation/Address: _____

Site Name: _____

Directions to Site From Known Landmark/GPS Coordinates: _____

_____

_____

General Description of Habitat: _____

_____

_____

Additional Notes (e.g. behavior, condition, maturity): _____

_____

_____

_____

Photo taken: Y / N