FINAL

ENGINEERING EVALUATION/COST ANALYSIS (EE/CA) REPORT

FORMER WAIKANE VALLEY TRAINING AREA
ISLAND OF OAHU, HAWAII

Prepared for:

US Army Engineering and Support Center, Huntsville

Contract: DACA87-00-D-0034
Task Order: 0020
Project No. H09HI035401

Geographical District:
Honolulu

Prepared By:

ZAPATA
TRUST • INTEGRITY • QUALITY
6302 Fairview Road, Suite 600
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November 2008

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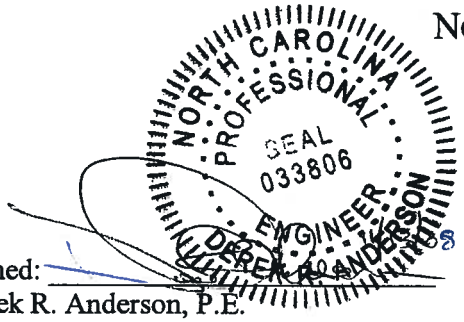
NOVEMBER 2008



Signed: _____
Derek R. Anderson, P.E.
Project Manager

Signed: _____
Michael L. Winningham
Vice President Munitions Response Program

1.0 EXECUTIVE SUMMARY

1.0.1 In January 2004, Zapata Incorporated (ZAPATA) was contracted by the US Army Engineering Support Center, Huntsville (USAESCH) to conduct an Engineering Evaluation and Cost Analysis (EE/CA) for the former Waikane Training Area. The purpose of the EE/CA is to evaluate potential ordnance-related risk, develop and evaluate Munitions Response (MR) action alternatives, and to recommend alternatives to reduce MR-related risk at the project site.

1.0.2 The former Waikane Valley Training Area is located on the eastern shore of the Island of Oahu, Hawaii, District of Koolaupoko. Waikane Valley was formerly used as a training and artillery impact area from 1942 to 1976. Of the 1,132 acres, 933 acres are considered eligible under DERP-FUDS. Marine Corps property, consisting of 199 acres formerly known as the Kamaka parcel, was not investigated under this scope of work.

2.0 SOURCE, NATURE AND EXTENT OF MEC

Using data collected during the field investigation, a qualitative risk evaluation was performed to determine the most appropriate MEC response actions for the site. The characterization approach for the Waikane Training Area consisted of the following:

- Visual Reconnaissance using Analog Geophysical Survey Instrumentation;
- Digital Geophysical Mapping; and
- Intrusive MEC Sampling.

2.1 SOURCE OF MEC

Waikane Valley was formerly used as a training and artillery impact area from 1942 to 1976. Due to its geographic location and rugged terrain, Waikane Valley was utilized for advanced training in offensive warfare and air-to-ground practice bombing during World War II. Per its lease, the Marine Corps was authorized continued use of Waikane Valley as a training area from 1953 to 1976.

2.2 NATURE OF MEC

Explosive Ordnance Disposal (EOD) sweeps of artillery impact areas, occurred in August 1976 and February to April 1984. These two EOD sweeps recovered as much as 40,000 pounds of demilitarized practice ordnance as well as 37mm and 75mm High Explosive (HE) rounds, 60mm mortars, 2.36-inch and 3.5-inch HEAT rockets, M28 HEAT grenades, and M9A1 AT rifle grenades, all of which were summarily destroyed. Subsequent to the EOD sweeps, an archaeological survey of property south and west of the 199-acre DoD-condemned parcel revealed the continued presence of dud rounds as mortars and grenades.

2.3 EXTENT OF MEC

2.3.1 ZAPATA established 152 grids (9.1 acres) and almost eight linear miles (11.5 acres) of transect paths for a total of over 20 acres of intrusively sampled area within the approximately 933-acre site. Additional areas within brush or canopy cover were visually inspected with the assistance of hand-held electromagnetic metal detectors during a visual reconnaissance covering 48.9 acres. The field team conducted digital geophysical surveying, mapping, and evaluation for the Waikane Training Area using the EM61 MK2 for data collection and the Data Analysis

System (DAS) for mapping and evaluation. Intrusive investigations were conducted for selected target anomalies to identify the source of the geophysical response associated with the target.

2.3.2 During the EE/CA field investigation, seven unexploded ordnance (UXO) items were recovered; two 81mm HE mortar rounds, three 60mm HE mortar rounds, and two 37mm HE projectiles. There was also abundant forensic evidence of HE ordnance usage, as projectile fragmentation, fuze pieces, tail fins, base plates, and other munitions debris (MD) were located throughout the valley. Over 2,000 geophysical anomalies were intrusively investigated. Of these, seven anomalies were UXO, 172 anomalies were MD, and the remaining anomalies were cultural debris, geology, or other. The UXO items ranged from six to 16 inches below ground surface (bgs) – UXOs were found at six inches (one each), eight inches (four each), 12 inches (one each), and 16 inches (one each).

2.3.3 Based on data collected during the geophysical investigation ZAPATA projects that additional ordnance items may be encountered at the site. All MEC items were found in the Southeastern Region of the site and in the Southern Impact Region.

3.0 SUMMARY OF SITE CONDITIONS

Waikane Valley is located on the eastern shore of the Island of Oahu, Hawaii, District of Koolaupoko. Its coordinates are approximately 157° 52.61' W longitude and 21° 30.14" N latitude. The Waikane Valley Training Area covers approximately 933 acres located on the coastal plain adjacent to Kaneohe Bay and on the slopes of the Koolau Mountain Range. Most of this site is covered with dense jungle vegetation including the densely forested coastal plain and thick grasses and shrubs in the higher elevations. There are several gulches/canyons throughout the parcel as well as areas with steep slopes. The Island of Oahu is the result of varied geologic processes, including volcanism, subsidence, weathering, and sedimentation (USGS, 1996). The Hawaiian Islands are sub-aerial peaks of large volcanic mountain ranges, most of which are submerged beneath the sea. Elevation ranges from 80 feet to 2,090 feet above sea level. According to the Western Regional Climate Center, this location receives an average of 76.03 inches of precipitation each year, with most of this rainfall occurring in October through March. During the month of March 2006, a total of 94 inches of rain fell on the windward side of Oahu. The average maximum temperature for this area is 79.8° F and the average minimum temperature is 68.8° F.

3.1 PAST, PRESENT AND FUTURE LAND USE

3.1.1 Past Land Use. In 1942, the Department of the Army entered into a lease agreement with Lincoln L. McCandless heirs and Waiahole Water Company, Ltd. This lease agreement established the right to use approximately 1,132 acres in Waikane Valley for advanced offensive warfare training due to the valley's geographical location and rugged terrain. Authorization for the Army to use Waikane Valley continued until July 1953 when the Marine Corps was substituted as lessee. Waikane Valley was formerly used as a training and artillery impact area from 1942 to 1976. Of the 1,132 acres, only 933 acres are considered eligible under DERP-FUDS. Marine Corps property, consisting of 199 acres formerly known as the Kamaka parcel, was not investigated under this scope of work.

3.1.2 Due to its geographic location and rugged terrain, Waikane Valley was utilized for advanced training in offensive warfare and air-to-ground practice bombing during World War II. Per its lease, the Marine Corps was authorized continued use of Waikane Valley as a training area from 1953 to 1976. However, due to its potential as a fire hazard, no tracer ammunition or incendiary shells were to be used at any time on the leased premises, and all weapons in excess of .50-caliber were fired into the designated impact areas.

3.1.3 In May 1998, the City and County of Honolulu purchased approximately 500 acres of undeveloped land in the ahupua'a (land between the mountains and the ocean) of Waikane on Oahu's windward side for use as a nature park. Some of the land was previously used for agricultural pursuits, such as growing bananas, cucumbers, and for pasturing livestock. The land was previously owned by Azabu USA Corporation, Inc., who intended to develop a golf course on the property. Azabu, a Japanese based company, had obtained all the required permits, but then encountered economic troubles obtaining the financing to develop their proposed golf course. The purchase of the land by the City prevented possible golf course development, which many people in the area were not eager to see happen.

3.1.4 Present Land Use. Waikane Valley is presently undeveloped with the exception of a small agricultural nursery of approximately five acres used for growing native plants. Sportsmen hunting wild game (wild boars) use the whole of Waikane Valley, and moto-cross and All Terrain Vehicles (ATV) enthusiast use several sections of the valley for recreation. Due to the pristine environment of the valley, the Hawaii Film Commission presently uses various areas within the boundaries of the site to film movies and television shows.

3.1.5 Future (Proposed) Land Use. The City and County of Honolulu has produced a Master Plan to develop the Waikane Valley Nature Park. The master plan is the basis for subsequent design plans developed by the City for improvements on the site. The master plan also indicates the preferred phasing of site improvements. The master plan goals and objectives are to:

- Restore the cultural and spiritual setting of Waikane Valley
- Provide educational opportunities for the community
- Provide low impact recreational opportunities for the community and the general public
- Preserve the natural resources of Waikane Valley

3.1.6 The City plans to establish trails, rest and picnic areas, lookouts to view surrounding landmarks of the site, a ceremonial gathering place (Halau), re-vegetation areas for native plants, stream ecology study areas, ponds for aquatic wildlife studies, agricultural fields, parking areas and a visitor orientation area.

3.2 PUBLIC ACCESS

A locked gate across the main road limits public access to the site; however, there are numerous paths and dirt bike/ATV trails that provide access to the site from all directions including around the locked gate. There are also numerous keys to the locked gate as evidenced by the number of vehicles entering the site for hunting, dumping household and construction debris, film crews filming movies/television segments, and visitors to a memorial recently established in the summer of 2005 for a deceased local resident.

4.0 RESPONSE ACTION ALTERNATIVES

ZAPATA evaluated four alternatives to reduce the risk of public exposure to MEC:
Alternative 1 - No DoD Action Indicated (NDAI);
Alternative 2 - Institutional Controls;
Alternative 3 - Surface Clearance with Institutional Controls; and
Alternative 4 - Clearance to Detectable Depth with Institutional Controls

4.1 NO DEPARTMENT OF DEFENSE ACTION INDICATED (NDAI)

This alternative means that no removal actions will be performed and no measures to restrict site access or modify behavior will be implemented to reduce the risk of public exposure.

4.2 INSTITUTIONAL CONTROLS

This alternative may include restricting site access with fencing, providing warnings by posting signs, instituting land use controls, and imposing administrative requirements for future property development. Institutional controls may also include educating property owners, construction personnel and the public through media such as newspaper articles, notices and informational brochures.

4.3 SURFACE CLEARANCE

This alternative involves removing all MEC visible on the surface. Surface Clearance includes items that may be submerged but are partially protruding through the surface.

4.4 CLEARANCE TO DETECTABLE DEPTH

This alternative involves the physical removal of MEC to detectable depths. The depth is determined with the geophysical instruments capability to locate various items (ferrous and non-ferrous) below ground surface.

5.0 RECOMMENDED ALTERNATIVES

5.0.1 A qualitative evaluation of MEC risk for the former Waikane Valley Training Area was developed following protocols defined in the Ordnance and Explosives Risk Impact Assessment (OERIA). OERIA uses direct analysis of site conditions and demographics to evaluate MEC risk. The potential risk posed by MEC at each area was characterized by evaluating the likelihood of exposure to MEC, the severity of exposure, and likelihood of detonation. The results of each risk assessment were used to help determine the most appropriate MEC response action for these sites.

5.0.2 Clearance to Detectable Depth with Institutional Controls is the recommended alternative for approximately 151 acres located in the southeastern portion of the valley (Southeast Region, Figure 8-1). Even though Waikane Valley has a locked gate across the main road preventing public access, the southeastern portion is very accessible to local citizens for hunting, dumping household/construction debris, and moto-cross/ATV riding as evidenced by the number of enthusiasts and trails throughout the area. There are several dirt roads in the area that provides accessibility across the area. Much of this area has topography of rolling hills with some steep slopes that overlooks the Pacific Ocean that makes the area prime for development. The City and County of Honolulu presently has a Master Plan to develop this acreage as a Nature Park

with trails, rest and picnic areas, lookouts to view surrounding landmarks of the site, a ceremonial gathering place (Halau), re-vegetation areas for native plants, stream ecology study areas, ponds for aquatic wildlife studies, agricultural fields, parking areas and a visitor orientation area. The field investigation revealed several UXO and an abundance of MD, e.g., mortar fins, base plates, expended fuzes, projectile bodies, and heavy projectile fragmentation from high-order detonations were noted throughout the area. During field activities, more UXO was discovered in this area than in the impact area.

5.0.3 Surface Clearance with Institutional Controls is the recommended alternative for approximately 78 acres located in the southern portion of the valley (Southern Impact Region, Figure 8-1). Institutional Controls are recommended for the area surrounding the former impact area to restrict access into the area. The majority of the impact area has terrain consisting of steep slopes and deep canyons/gulches with precipitous sides, which makes the area less-conducive for future residential and/or commercial development without large scale land/terrain modifications, however the public does use the area for hiking and hunting. Even though EOD units have surface cleared this area twice (1976 and 1984), the potential for encountering MEC is high, as MEC may have surfaced due to erosion and landslides from heavy rains over the last 20 years. A comprehensive Surface Clearance is recommended. Clearance to Detectable Depth is recommended for a 40-foot buffer around streams in the Southern Impact Region (12 acres) as they serve as a natural collection point for erosion transported munitions. This recommendation is based on additional MEC surfacing due to soil erosion and periodic mudslides in the training area after the previous Clearances in 1976 and 1984. This program of Removal Actions, in conjunction with Institutional Controls consisting of the posting of warning signs and distribution of informational pamphlets to training area users, is the proposed alternative for this area.

5.0.4 Institutional Controls is the recommended alternative for the Western Region (158 acres) and Mountainous Region (534 acres). While little more than small arms were found in this area during the EE/CA, the historical impact area overlaps into these Regions and there may be a potential that MEC is present. Recommended Institutional Controls for the Regions include warning signs, a public awareness campaign and construction support.

5.0.5 It is recommended that a Recurring Review be carried out every five years (Five-Year Review) to assess the continued effectiveness of the MEC removal activities and Institutional Controls. Smaller-scale annual reviews with a site visit are recommended for years other than those in which a Recurring Review is scheduled. These smaller reviews qualify as Other Long Term Management Activities, and are not to be confused with the Five-Year Reviews. The annual reviews will assess the physical condition of Intuitional Controls at the site (i.e. signage).

5.0.6 Based on historical information, the site is not suspected to contain Chemical Warfare Materiel (CWM), as CWM activities were not associated with the training activities at the site.

6.0 SUMMARY OF RECURRING REVIEW PLAN

The USACE, Honolulu District will maintain its responsibilities for managing residual risk by performing recurring reviews after the recommended MEC response actions have been

implemented. Based on specific site conditions, this involves returning to the area every year to assess and report on the continued effectiveness of periodic MEC cleanup activities, and preparing a full scale Recurring Review every five years (Five-Year Review). The annual reviews will be used to assess the physical condition of controls implemented on site. The need for recurring reviews will be coordinated with regulators and stakeholders, and justified in each recurring review report. The primary objective of the recurring review is to ensure the MEC response actions implemented as a result of this EE/CA remain effective and continue to provide protection against MEC.

7.0 COSTS

A comprehensive amount of field data were collected and analyzed over the course of nine months of field effort. ZAPATA's cost estimate was prepared using the field data, the results from two previous removal actions conducted in the area, best professional judgment, and experience with similar projects. Both removal action alternatives assume an average accessibility of 100% throughout the entire project area.

7.1 COMPREHENSIVE SURFACE CLEARANCE WITH INSTITUTIONAL CONTROLS

The total estimated cost to implement Alternative 3, Surface Clearance with Institutional Controls on 78 acres of the 90-acre Southern Impact Region is $3,588,497. This figure includes the cost of the required Institutional Controls, Recurring and Annual Reviews, a Comprehensive Surface Clearance. The Surface Clearance is estimated to require approximately 26 weeks for completion.

7.1.1 Removal Action (RA) Costs

The estimated cost to implement the RA component of this alternative is $2,025,432. The cost of the Surface Clearance is based on removing 100% of the assumed 21,130 surface anomalies at a rate of 0.75 acres per day, four ten-hour days a week for 26 weeks. These figures are based on an assumed 271 anomalies per acre over a 78-acre area. The costs outlined in Appendix E, Table 4-1.

7.1.2 Long Term Costs

Institutional control costs are $79,194. The total present value cost of six recurring reviews (5, 10, 15, 20, 25 and 30 years from present) is $420,000. A line item is included representing the present value of 24 smaller-scale annual reviews to occur in all years other than those in which a Recurring Review is scheduled, 30 years into the future ($828,000). The Recurring Review and Annual Review processes, however, are not Institutional Controls. (This assumes a cost of $70,000 per Recurring Review and $34,500 per Annual Review, and an interest rate of eight percent.)

7.2 CLEARANCE TO DETECTABLE DEPTH WITH INSTITUTIONAL CONTROLS

The estimated cost to implement Alternative 4 is $12,472,892. This figure includes the cost of Institutional Controls, Recurring and Annual Reviews.

7.2.1 Removal Action (RA) Costs

The estimated cost to implement the RA component of this alternative is $10,328,605. The project is estimated to last approximately 22 months, based on removing 100% of the estimated

157, 946 anomalies in the 151-acre Southeastern Region and 10,836 anomalies in 12 acres of the 90-acre Southern Impact Region. The costs outlined in Appendix E, Table 5-1.

7.2.2 Long Term Costs

Institutional Controls (Alternative 2) costs of $79,194 are included in this alternative. For ease of comparison, a line item representing the total present value cost ($420,000) of six recurring reviews (5, 10, 15, 20, 25 and 30 years from present) has been added. In addition, a line item is included representing the present value of 24 smaller-scale annual reviews to occur in all years other than those in which a Recurring Review is scheduled, 30 years into the future ($828,000). The Recurring Review and Annual Review processes, however, are not Institutional Controls. This assumes a cost of $70,000 per Recurring Review and $34,500 per Annual Review, and an interest rate of seven percent.

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1.0 INTRODUCTION

1.0.1 The US Army Engineering and Support Center, Huntsville (USAESCH) and the US Army Corps of Engineers, Honolulu District, Pacific Ocean Division (CEPOH) have teamed to produce this Engineering Evaluation/Cost Analysis (EE/CA) for the Waikane Training Area, Island of Oahu, Hawaii. This EE/CA report documents the decision process to determine the most appropriate Munitions Response (MR) actions for this area.

1.0.2 The results of the Munitions and Explosives of Concern (MEC) investigation conducted under the EE/CA were examined using the Ordnance and Explosives Risk Impact Assessment (OERIA). The OERIA provides a stakeholder-friendly method of risk assessment for use during an EE/CA. OERIA uses direct analysis of site conditions and human issues that evaluate MEC risk for a qualitative assessment of MEC sites. The qualitative risk assessment follows a very conservative approach and evaluates the level of MEC risk to the public in terms of the likelihood of exposure and the severity of exposure to MEC. It is important to note that exposure to MEC does not indicate that an incident or injury will occur. The person would have to perform some deliberate act, such as digging for the item, picking it up, or striking it, in order to be exposed to actual risk. An evaluation of the risk of MEC exposure has been performed for the Waikane Training Area (Chapter 5.0 – Risk Evaluation), where MEC was recovered during the EE/CA field investigation. A residual risk (no matter how small) will always be present based on past military use of the area.

1.03 The Waikane Valley Draft Final EE/CA report will be issued for public review and comment. Following the public review period, comments will be received and addressed in the report. The USAESCH will then approve the Final EE/CA Report and an Action Memorandum will be prepared to document the selected MEC response actions for the former Waikane Valley Training Area.

1.1 REGULATORY FRAMEWORK/AUTHORIZATION

1.1.1 Regulatory Framework

The work required under the Scope of Work (SOW), provided in Appendix A, falls under the Defense Environmental Restoration Program (DERP) – Formerly Used Defense Sites (FUDS) Program. This military munitions response program (MMRP) action will be performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Sections 104 and 121; Executive Order 12580; and the National Oil and Hazardous Substance Contingency Plan (NCP), Section 300.400. All activities involving work in areas potentially containing unexploded ordnance hazards will be conducted in full compliance with USAESCH, CEPOH, and Department of Defense (DOD) requirements regarding personnel, equipment, and procedures.

1.1.2 Authorization

In January 2004, Zapata Incorporated was contracted by the USAESCH to conduct an EE/CA for the Waikane Training Area. The Waikane Training Area, Island of Oahu, Hawaii consists of approximately 933 acres located on the costal plain adjacent to Kaneoha Bay and on the slopes of the Koolau Mountain Range. In 1942, the Department of the Army entered into a lease

agreement with Lincoln L. McCandless heirs and the Waiahole Water Company, Ltd. This lease established the right to use approximately 1,132 acres in Waikane Valley for advanced offensive warfare training due to the valley's geographical location and terrain. Authorization for the Army to use Waikane Valley continued until July 1953, when the Marine Corps was substituted as lessee. Waikane Valley was formerly used as a training and artillery impact area from 1942 to 1976. Of the 1,132 acres, only 933 are considered eligible under DERP-FUDS. The Marine Corps property, consisting of 199 acres formerly known as the Kamaka parcel, does not fall under FUDS and was not investigated under this SOW.

1.2 PURPOSE AND SCOPE

1.2.1 The purpose of the EE/CA is to evaluate potential ordnance risk and develop MEC response action alternatives that reduce the risk associated with MEC at the former Waikane Valley Training Area. The scope of the EE/CA is limited to the evaluation of risk to human safety associated only with the explosive hazards of MEC.

1.2.2 The future development and use of the former Waikane Valley Training Area has a direct influence on the life and livelihood of several stakeholders including the public; landowners or those with a financial or business interest; and many Federal, state, and local agencies. As presented during a Public Meeting, several stakeholders indicated that they are waiting for the potential hazards to be eliminated so that they can develop the land in the southeast portion of the site. This EE/CA report includes consideration of the concerns of the stakeholders involved. Once the EE/CA has been completed, new information and discoveries will be evaluated by CEPOH by means of Five-Year Reviews (as outlined in Chapter 8).

1.2.3 For this process to be successful, close coordination and cooperation between the stakeholders, community, regulators, and technical support personnel must occur. In serving as a cornerstone for the risk management effort, this EE/CA report identifies and evaluates reasonable alternatives and makes recommendations for MEC response actions, where appropriate.

1.2.4 This EE/CA report documents the background, approach, and evaluation process for determining the potential risk that MEC poses to the public at the former Waikane Valley Training Area. It also summarizes field activities and outlines recommendations for future MEC response actions based on the methodology described in this document.

1.2.5 Four MEC response action alternatives are identified and evaluated in this EE/CA report:

- Alternative 1: No DOD Action Indicated (NDAI);
- Alternative 2: Institutional Controls;
- Alternative 3: Surface Clearance; and
- Alternative 4: Clearance to Detectable Depth.

1.3 TECHNICAL PROJECT PLANNING (TPP) TEAM

1.3.1 US Army Engineering and Support Center, Huntsville

The USAESCH is the implementing agency for this project and has approval authority for project execution. The USAESCH provided expertise for MEC-related activities. Additionally,

USAESCH responsibilities included the procurement of Architect/Engineer (A/E) services, direction of the A/E contractor, control of the budget and schedule, and coordination of document reviews.

1.3.2 US Army Corps of Engineers, Honolulu District, Pacific Ocean Division

The CEPOH and USAESCH are the sponsors of the EE/CA. CEPOH responsibilities included coordination for site access, review of project work plans and documents, communication with the news media and public, and coordination with state and local regulatory agencies.

1.3.3 Zapata Incorporated

ZAPATA is the prime contractor to USAESCH and provided all engineering support and services for the site investigation. Blackhawk, a division of ZAPATA, collected and processed geophysical data from surveys of the Waikane Valley Training Area. ZAPATA was responsible for performance of the activities detailed in the SOW, Appendix A, and monitoring of the project budget and schedule.

1.3.4 Wil Chee Planning, Inc.

Wil Chee Planning, a subcontractor to ZAPATA, provided assistance to ensure that quantitative data generated during the project was translated and disseminated to the public in understandable terminology. Through its community relations expertise and site knowledge, Wil Chee assisted ZAPATA in effectively communicating to the public risks and proposed actions to reduce residual risks.

1.3.5 Hawaii Department of Health

The regulating agency participating in the TPP meetings was the Hawaii Department of Health, Hazard Evaluation and Emergency Response office. The Hawaii Department of Health was responsible for overseeing the project to ensure compliance with the State of Hawaii regulations and guidelines pertaining to the protection of the environment and human health.

1.4 SUMMARY OF PUBLIC PARTICIPATION

ZAPATA and Wil Chee Planning participated in two public meetings to execute the Technical Project Planning (TPP) process, and will participate in additional public meetings upon approval of the Draft-Final EE/CA. The ZAPATA project team's participation will include delivery of presentations and development and production of TPP worksheets and handout materials.

2.0 SITE DESCRIPTION AND PROBLEM IDENTIFICATION

2.1 SITE LOCATION

Waikane Valley is located on the eastern shore of the Island of Oahu, Hawaii, District of Koolaupoko. Its coordinates are approximately 157º 52.61' W longitude and 21º 30.14" N latitude (Figure 2-1).

2.2 PHYSICAL DESCRIPTION

The Waikane Valley Training Area covers approximately 933 acres located on the coastal plain near to Kaneohe Bay and on the slopes of the Koolau Mountain Range. Most of this site is covered with dense jungle vegetation including the densely forested coastal plain and thick grasses and shrubs in the higher elevations. There are several gulches and canyons with precipitous cliffs throughout the parcel as well as areas with steep slopes. Elevation above sea level ranges from 90 feet to over 2,090 feet. The Island of Oahu is the result of varied geologic processes, including volcanism, subsidence, weathering, and sedimentation (USGS, 1996). The Hawaiian Islands are sub-aerial peaks of large volcanic mountain ranges, most of which are submerged beneath the sea. According to the Western Regional Climate Center, this location receives an average of 76.03 inches of precipitation each year, with most of this rainfall occurring in October through March. The average maximum temperature for this area is 79.8º F and the average minimum temperature is 68.8º F.

2.3 HISTORY

2.3.1 Past Use

In 1942, the Department of the Army entered into a lease agreement with Lincoln L. McCandless heirs and Waiahole Water Company, Ltd. for the right to use approximately 1,132 acres in Waikane Valley for advanced offensive warfare training due to the valley's geographical location and terrain. Authorization for the Army to use Waikane Valley continued until July 1953, when the Marine Corps was substituted as lessee. Waikane Valley was formerly used as a training and artillery impact area from 1942 to 1976. Of the 1,132 acres, only 933 acres are considered eligible under DERP-FUDS. The Marine Corps property, consisting of 199 acres formerly known as the Kamaka parcel, does not fall under FUDS and was not investigated under this scope of work.

2.3.2 Military Activity

Waikane Valley was used as a training and artillery impact area from 1942 to 1976. Due to its geographic location and rugged terrain, Waikane Valley was utilized for advanced training in offensive warfare and air-to-ground practice bombing during World War II. Per its lease, the Marine Corps was authorized continued use of Waikane Valley as a training area from 1953 to 1976. However, due to its potential as a fire hazard, no tracer ammunition or incendiary shells were to be used at any time on the leased premises, and all weapons in excess of .50-caliber were to be fired into the designated impact areas.

2.3.3 City Acquisition of the Property

In May 1998, the City and County of Honolulu purchased approximately 500 acres of undeveloped land in the ahupua'a (land between the mountains and ocean) of Waikane on

Oahu's windward side for use as a nature park. Some of the land was previously used for agricultural pursuits, such as growing bananas, cucumbers, and for pasturing livestock. The land was previously owned by Azabu USA Corporation, Inc., who was intending to develop a golf course on the property. Azabu, a Japanese-based company, had obtained all the required permits, but was unable to obtain financing to develop their proposed golf course. The purchase of the land by the City prevented possible golf course development, which many people in the area were not eager to see happen as they were opposed to the golf course.

2.4 CURRENT AND REASONABLY ANTICIPATED FUTURE LAND USE

2.4.1 City Anticipated Future Land Use

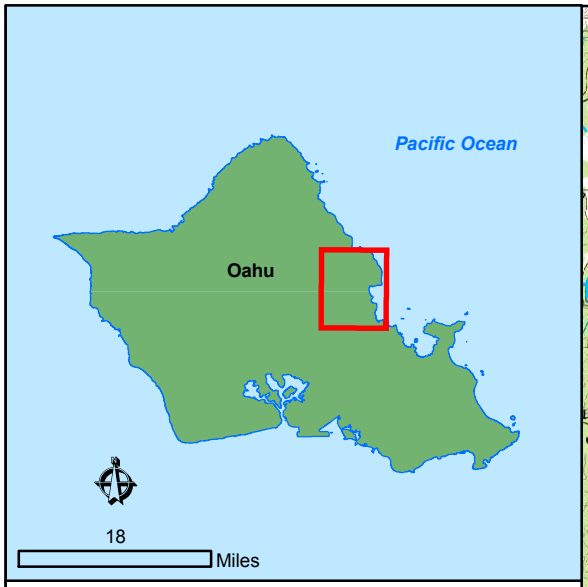
2.4.1.1 The City and County of Honolulu produced a Master Plan to develop the Waikane Valley Nature Park, which is the basis for subsequent design plans developed by the City for improvements on the site. The Master Plan also indicates the preferred phasing of site improvements. The Master Plan goals and objectives are to:

- Restore the cultural and spiritual setting of Waikane Valley
- Provide educational opportunities for the community
- Provide low impact recreational opportunities for the community and the general public
- Preserve the natural resources of Waikane Valley

2.4.1.2 The City is planning to establish trails, rest and picnic areas, lookouts to view surrounding landmarks of the site, a ceremonial gathering place (halau), re-vegetation areas for native plants, stream ecology study areas, ponds for aquatic wildlife studies, agricultural fields, parking areas and a visitor orientation area.

2.4.2 Other Land Uses

The majority of the acreage within Waikane Valley consists of inaccessible terrain that cannot be developed due to steep gulches, canyons, rocky outcrops, and mountains rising over 2,200 feet above sea level. However, evidence exists that show the whole of Waikane Valley has been used, and in all probability will continue to be used, by sportsmen hunting wild boar and other game. There are also various sections within the valley that are used for recreation by moto-cross and All Terrain Vehicle (ATV) enthusiasts. It is anticipated that a few acres of light agricultural use will continue within the valley with a current landowner operating a nursery growing native plants.



Area Overview

Source(s)
USAESCH, USGS, Oahu County

Projection
UTM Zone 4 North, WGS 1984

Note(s)
Engineering scale may only be accurate on a map size of 8.5 x 11

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Former Waikane Valley Training Area: EE/CA
General Site Location

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3.0 PROJECT OBJECTIVES

3.1 PROJECT TEAM

3.1.1 US Army Engineering and Support Center, Huntsville

The USAESCH is the implementing agency for this project and has approval authority for project execution. The USAESCH provided expertise for MEC-related activities. USAESCH responsibilities included the procurement of A/E services, direction of the A/E contractor, control of the budget and schedule, and coordination of document reviews.

3.1.2 US Army Corps of Engineers, Honolulu District, Pacific Ocean Division

The CEPOH and USAESCH are the sponsors of the EE/CA. CEPOH responsibilities included coordination for site access, review of project work plans and documents, communication with the news media and public, and coordination with state and local regulatory agencies.

3.1.3 Zapata Incorporated

3.1.3.1 ZAPATA is the prime contractor to USAESCH and provided all engineering support and services for the site investigation. ZAPATA was responsible for performance of the activities detailed in the SOW, Appendix A, and monitoring of the project budget and schedule.

3.1.3.2 In addition to the key project personnel listed on Figure 3-1, a Contracts Administrative Manager, Geographical Information Service (GIS) Manager, Word Processor, QA Specialist, and UXO Technicians were required to safely and effectively execute the EE/CA.

3.1.4 Blackhawk Division (Zapata Incorporated)

3.1.4.1 Geophysical Data

Blackhawk, a division of ZAPATA, was responsible for collecting and processing geophysical data from geophysical surveys of the Waikane Valley Training Area. During October 2005, Blackhawk conducted a geophysical prove-out in direct coordination with the USAESCH Geophysicist. ZAPATA subcontracted NAEVA Geophysical Services, Inc. to technically oversee the prove-out and data collection, and provide Quality Control.

3.1.4.2 Anomaly Reacquisition

Blackhawk was also responsible for producing Digital Geophysical Mapping (DGM) that showed the locations of subsurface targets identified from the analyzed geophysical data. The coordinates of the targets were recorded in Hawaii State Plane. Using the DGM the targets were reacquired and intrusively investigated by the ZAPATA's UXO technicians using various handheld geophysical instrumentation.

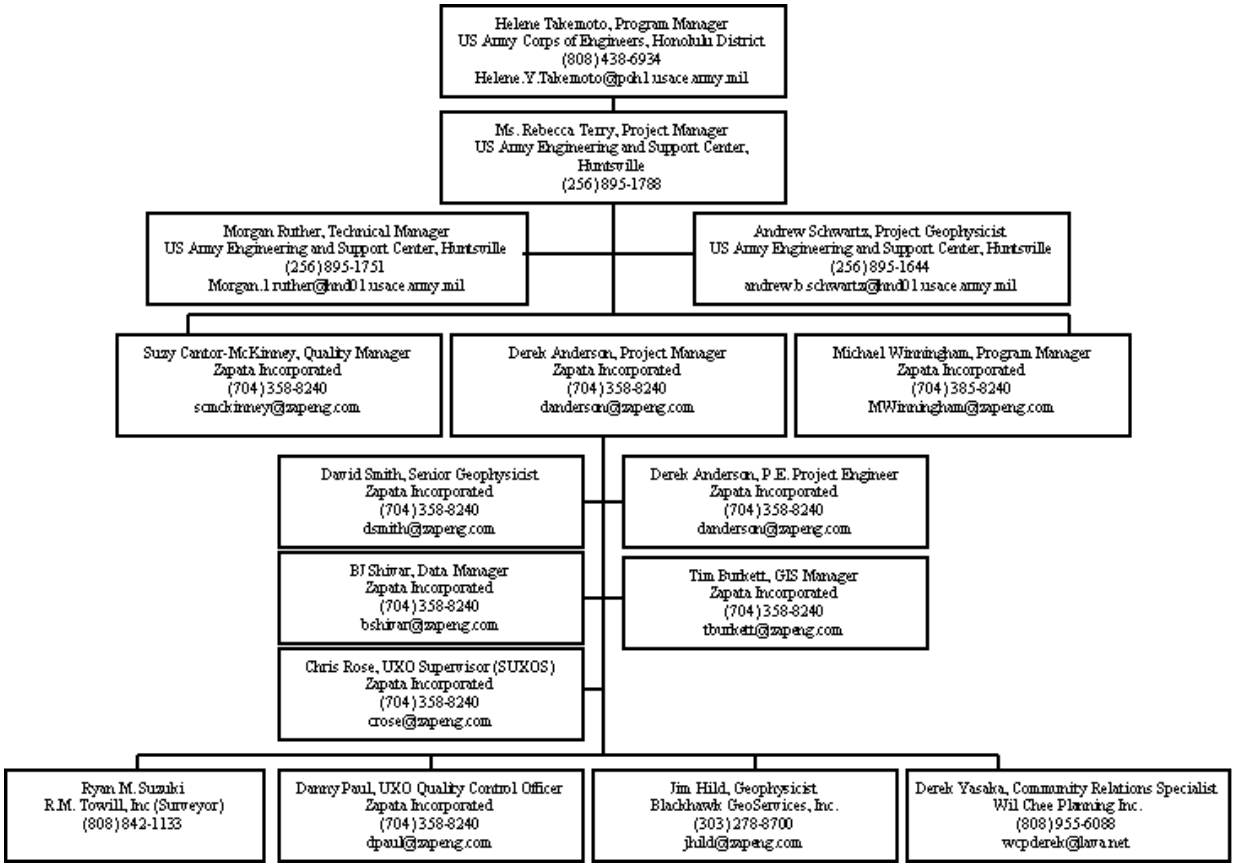
3.1.5 Wil Chee Planning, Inc.

Wil Chee Planning, a subcontractor to ZAPATA, provided assistance to ensure that quantitative data generated during the project was translated and disseminated to the public in understandable terminology. Through its community relations expertise and site knowledge, Wil Chee assisted ZAPATA in effectively communicating to the public risks and proposed actions to reduce residual risks.

3.1.6 R. M. Towill Corporation

R. M. Towill Corporation, a Professional Land Survey company licensed in the State of Hawaii and a subcontractor to ZAPATA, surveyed corner points of all sampling grids and the centerline of transects and meandering paths for the Waikane site. Survey data were incorporated into the base map, including control monuments, and grid/transect plots.

FIGURE 3-1 ORGANIZATIONAL CHART



3.2 REGULATORY AND OTHER STAKEHOLDER CONCERNS

3.2.1 Local citizens who attended the two public meetings, expressed concerns about natural and cultural resources within the Waikane Valley. Mr. Chuck Streck, PM at the time, informed those concerned that natural and cultural surveys would be conducted to identify significant resources and evaluate potential impacts to these resources. During the field investigation effort, both the natural resource biologist and archaeologist, contracted by CEPOH, conducted periodic visits to the site to evaluate potential impacts. AECOS, Inc. provided natural resource surveys and the International Archaeological Research Institute, Inc. (IARII) conducted cultural resource surveys of the project site. All established grids and transects were inspected by the archaeological contractor prior to excavation activities.

3.2.2 The Hawaii Department of Health was the only regulatory agency that participated in the public meetings. Their only concern was why we were only intrusively investigating selected subsurface target anomalies and not all anomalies. It was explained that this was not a removal

action, but an investigation that would characterize the site, evaluate the risks, and recommend remedial actions to eliminate these risks.

3.3 CONSTRAINTS

The only restriction imposed on the field investigation was a request by the local citizens that vegetation clearance be minimal and have no adverse impact to the ecological environment. Archaeological sites and other cultural resources and components (shrine/burial and heiau, etc.) were identified by IARII and avoided during field activities.

3.4 IDENTIFICATION OF POSSIBLE RESPONSE ACTION ALTERNATIVES

3.4.1 This section defines the response action objectives that provide the basis for defining and assessing the response action alternatives identified in Chapter 6.0. It also describes the response action goals and objectives for minimizing the potential MEC threat at the former Waikane Valley Training Area. The response action goal is the reduction and/or mitigation of the potential risk of MEC exposure to the public. To meet the statutory goals of the DERP (10 CFR) of "the correction of other environmental damage (such as detection and disposal of unexploded ordnance), which creates an imminent and substantial endangerment to public health or welfare or to the environment," the following objectives for preliminary risk reduction are:

- Minimize the potential public exposure to MEC, considering current and future land use, and technical and administrative feasibility; and
- Remove and dispose or destroy MEC, as necessary, in a safe and effective manner.

3.4.2 The EE/CA process evaluates the most applicable, technically feasible, and socially acceptable alternatives for responding to residual risk at a site based on their effectiveness, implementability, and cost.

3.4.1 Identification of Response Action Technologies

Potential technologies for the detection, recovery, and disposal of MEC at the former Waikane Valley Training Area are identified in the following sections. An appropriately qualified person should be involved with each of the activities described.

3.4.1.1 Detection

Several geophysical instruments and methods are available and are commonly used to detect buried ordnance. These instruments and methods are generally classified based on their detection methodology (i.e., physical, electrical, or chemical). Detection methodologies for buried ordnance include ground penetrating radar (GPR), electromagnetic induction and magnetometry. Time Domain Electro-Magnetic (TDEM) geophysical instrumentation and hand-held analog instruments (i.e., MineLab, White's, and Schonstedt®) were selected for the subsurface MEC investigation at the former Waikane Valley Training Area to locate subsurface anomalies. Selection of these instruments was based upon the results of the Geophysical Prove-out (GPO) and direct, relevant experience on similar MEC detection, location, instrument tests, and characterization operations.

3.4.1.2 Reacquisition

Digital Geophysical Mapping (DGM) selected target anomalies were reacquired using measuring tapes and a handheld magnetometry. Target anomalies reacquired within the investigation area

were then excavated manually using shovels and trowels and identified for the appropriate disposal method. Qualified UXO personnel performed all intrusive activities and handled MEC material.

3.4.1.3 Disposal

Once MEC is recovered and identified, it can be disposed of using conventional explosives in-situ (i.e., blow-in-place). In-situ detonation is the destruction of MEC prior to removal from the ground. The item is located, identified, and detonated in place. This is necessary when the item in question is deemed unsafe to remove from the original location. All other on-site detonation (safe-to-move) requires that the item be removed from the original location and relocated at a predetermined and approved on-site disposal area for detonation. MD, cultural debris (CD) and all other scrap can be turned over to a local scrap metal recycler and documented on a DD Form 1348-1A.

3.5 PROJECT OBJECTIVES

3.5.1 The objective of the EE/CA is to support an informed decision for determining the most appropriate MEC response action(s) for the sites. To achieve this, this EE/CA documented meaningful stakeholder participation; characterized the nature location and concentration of MEC, and provided a description of the MEC related problems affecting human use of the site.

3.5.2 In addition, the EE/CA is meant to identify and analyze reasonable risk management alternatives. This analysis provides a convenient record of the decision process for use in final decision-making and judicial review, if necessary. All contract actions were conducted in a manner consistent with the CERCLA and the NCP. All work conducted under this contract adhered to the DERP-FUDS and relevant US Army regulations and guidance.

3.5.3 The following points effectively summarize the objectives accomplished during this EE/CA:

- Compile existing information and data;
- Identify additional data needs and collect as appropriate;
- Characterize MEC nature, location and concentration;
- Describe MEC-related limitations on use of the site(s);
- Identify and evaluate reasonable risk-management alternatives;
- Solicit public comments on the Draft EE/CA Report; and
- Provide for the Administrative Record.

3.6 DATA QUALITY OBJECTIVES (DQOS)

3.6.1 DQOs, as outlined in Engineering Manual (EM) 1110-1-4009, are the fundamental practices necessary to successfully complete the geophysical mapping of areas throughout the former Waikane Valley Training Area. DQOs are statements defining the quality, quantity, and type of data required, the manner in which data may be collected, and the acceptable uncertainty, to provide an adequate database to support project decisions. The primary objective was to conduct geophysical mapping and subsequent anomaly investigations (sampling) in an effort to characterize the residual risks remaining at the project site. ZAPATA's technical approach was based on the Data Item Descriptions (DIDs) and the SOW and was revised based on input from

stakeholders, the public, and the US Army Corps of Engineers. The data generated and collected met the project objectives and was used to define the types of decisions made.

3.6.2 The objective of the EE/CA for the Waikane Valley has been accomplished by:

- Reviewing of existing reports, documents, and historic records, including the Inventory Project Report, and other data that may be provided by the USAESCH and CEPOH;
- Visually inspecting the Waikane Valley during a ground reconnaissance in June 2005;
- Determining the depth that MEC may be removed to reduce the current and future land use risk associated with MEC at the former Waikane Valley Training Area.
- Involvement with the landowners concerning the progress and findings of the EE/CA investigation;
- Providing technical support to the Government for meetings and public relations activities;
- Performing an Institutional Analysis (Appendix D) to identify and analyze the institutional framework necessary to support development of institutional controls as an effective MEC response-action alternative for the former Waikane Valley Training Area;
- Preparing the EE/CA Site Characterization report;
- Providing the public and local agencies the opportunity to review and comment on the EE/CA; and
- Preparing the EE/CA Action Memorandum.

3.6.3 The level of MEC risk associated with the former Waikane Valley Training Area was evaluated using a qualitative risk assessment. MEC response action alternatives were developed and evaluated based on the results of the qualitative risk assessment in Chapter 5.0 and the evaluation of the four MEC response action alternatives in Chapter 6.0 with the recommended response-actions discussed in Chapter 8.0.

4.0 SITE CHARACTERIZATION

4.1 DATA ANALYSIS

4.1.1 Field investigation activities were initiated in June 2005, and were completed in May 2006. Fieldwork was not conducted in a continuous effort due to severe weather conditions (i.e., torrential rain, flooding, mudslides, etc.). Due to the diversity of the site, i.e., rugged terrain, site activities, site population, site stability, MEC and MD encountered, and site accessibility allowed the subdivision of the 933-acre valley into discreet areas with similar characteristics for risk evaluation and the selection of alternative responses.

4.1.2 A qualitative risk evaluation was performed (Chapter 5.0) to determine the most appropriate MEC response actions for each of the areas within the 933-acre site. Figure 4-1 illustrates the four areas within the site. Characterization of the former Waikane Training Area consisted of the following:

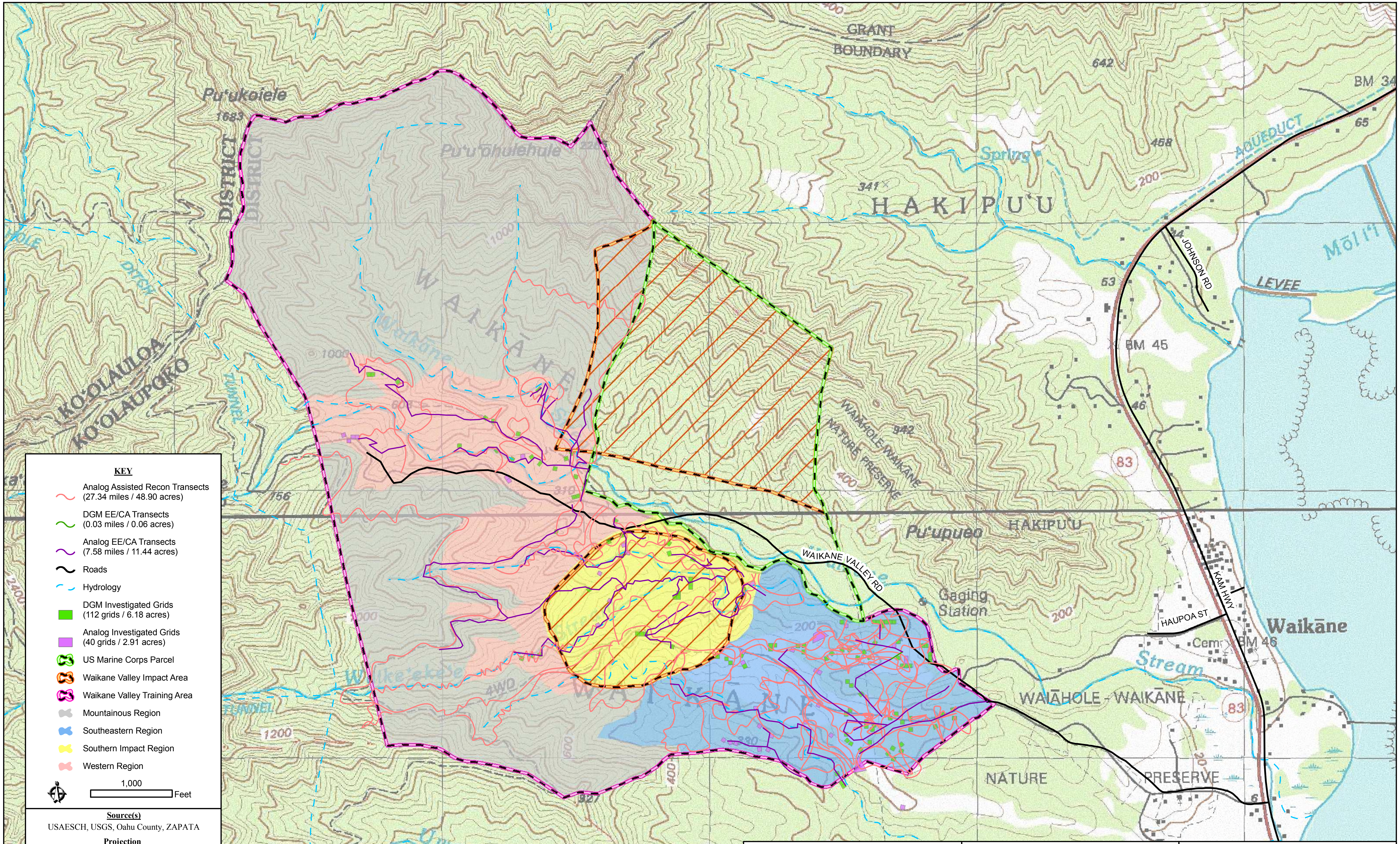
- Document Review;
- Instrument-assisted Visual Ground Reconnaissance;
- Geophysical Mapping; and,
- Intrusive Investigations.

4.1.3 Details concerning each of these tasks and the results of the EE/CA field investigation are discussed in the following sections.

4.1.4 The items recovered during the EE/CA field investigation were classified into one of four categories; i.e., UXO, Munitions Debris (MD), Cultural Debris (CD) and Small Arms (SA) (.50 caliber and smaller). These categories are defined as:

- UXO - is commonly described as a subset of MEC and is defined by the DOD as military munitions that have been primed, fuzed, armed, or otherwise prepared for action, and have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installation, personnel, or material, and remain unexploded either by malfunction, design or any other cause (10 U.S.C. 101(e)(5)(A) through (C)).
- MD - is remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization or disposal. MD contains no energetic material and is non-hazardous.
- CD - is debris found on operational ranges or munitions response sites, which may be removed to facilitate a range clearance or munitions response that is not related to munitions or range operations. Such debris includes, but is not limited to: rebar, household items (refrigerators, washing machines, etc.), automobile parts and automobiles that were not associated with range targets, fence posts, fence wire, magnetic rocks, horseshoes, banding material, aluminum cans, trash, nails, etc.
- SA - DOD recognizes caliber .50 (.50 cal) and smaller as small arms. The determining factor is that .50 cal and smaller rarely contains explosive projectiles. Small arms cartridges present a very low hazard. A deliberate effort must be applied to a very specific and small point (the primer) to make the round function. Using a

tool resembling a firing pin, i.e., a nail and hammer, or dropping the cartridge on a sharp object could function the primer. If the round functions outside the weapons chamber (unconfined space), the propellant gases would cause the bullet and cartridge to separate and, in addition, the cartridge case could also rupture. If this took place in close proximity to a person, possible injury could result. Small arms ammunition (i.e., .50 cal and smaller) presents a very low risk to the public (CEHNC 1999).



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Former Waikane Valley Training Area: EE/CA
Detailed Site Location

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4.2 ANALYSIS OF HISTORICAL RECORDS

4.2.1 There is not much historical documents or other information available on the former Waikane Valley Training Area. Most of the historical information obtained came from the Site Survey Summary Sheet and the Project Summary in the Inventory Project Report (InPR) for the Waikane Valley Training Area, Site No. H09HI035400, dated 31 May 1996.

4.2.2 The InPR stated that approximately 1,132 acres of land in Waikane Valley were acquired by the Army for use as a combat training area for 1942 to 1953. An Army Forces Middle Pacific report on the functions and activities demarcates the location of this area on a training map as "Waiahole Training Area" and "Waiahole Impact Area". Because of its geographic location and rugged terrain, Waikane Valley was utilized for advance offensive warfare training preparatory to combat operations in the forward areas of the Pacific theater. In addition to live ordnance being fired, air-to-ground practice bombs were also dropped into the valley.

4.2.3 The Marine Corps continued to use Waikane Valley as a training area for 1953 to 1976 during which live and practice ordnance were fired towards designated impact zones within the valley. Lease terms, however, precluded the use of tracer ammunition or incendiary shells due to the potential fire hazard created. Additionally, all weapons in excess of .50-caliber were to be fired into the designated impact areas only.

4.2.4 Waikane Valley is located along the east coast of the island of Oahu, Hawaii approximately nine miles northwest of the Marine Corps Air Station, Kaneohe Bay. The former training area is bordered to the north by a ridgeline, which separates Waikane Valley from the land of Hakipuu, and to the south by Waiahole Valley. To the east is the mouth of Waikane Valley and King Kamehameha Highway. Bordering the former training area to the west is the Koolau Mountain range, which forms Waikane Valley's rear wall.

4.2.5 Portions of the former 1,132-acre training area are presently under cultivation or support residential dwellings. A 199-acre parcel known as the U.S. Marine Corp (USMC) parcel, of which 155 acres were used as an artillery impact area, was condemned in 1993 by the Federal government as unsafe to the public due to MEC hazards, consequently, is presently uninhabited. The USMC parcel is not covered in this EE/CA, as it is currently being managed by the US Marine Corps and is not under the FUDS program. Other portions of the valley and former training area are currently under private ownership and at one time slated for future development as a golf course. For the most part and vacant at the present time, squatters have reportedly taken up residence on these parcels.

4.2.6 There is a padlocked gate across the road leading to interior portions of Waikane Valley thereby controlling vehicular access; however, site access is possible by foot, moto-cross bikes, and All-Terrain Vehicles (ATVs) on numerous trails and paths. The 199 acres Federally-condemned USMC parcel is fenced with signs posted warning of the MEC hazards and prohibiting unauthorized entry.

4.2.7 Previous reports of MEC discovered in Waikane Valley for 1944 to 1990 include 37mm and 75mm High Explosive (HE) rounds, 60mm HE mortars, M28 High Explosive Anti-Tank

(HEAT) grenades, 2.36-inch and 3.5-inch HEAT rockets, M9A1 AT rifle grenades, 3.5-inch practice rockets, and M29 practice rifle grenades.

4.2.8 In 1944, four were injured, two fatally, when a 60mm HE mortar discovered in Waikane Valley accidentally detonated. Three children were injured in 1963 when a rifle grenade reportedly discovered in Waikane Valley exploded after it was thrown against a wall. To date, there are no other known reports of fatalities or injuries attributable to the discovery of MEC at the site.

4.2.9 In May 1998, the City and County of Honolulu purchased approximately 500 acres of undeveloped land in the ahupua'a (land between the mountains and ocean) of Waikane on Oahu's windward side for use as a nature park. Some of the land was previously used for agricultural pursuits, such as growing bananas, cucumbers, and for pasturing livestock. The land was previously owned by Azabu USA Corporation, Inc., who was intending to develop a golf course on the property. Azabu, a Japanese based company, had obtained all the required permits, but then encountered economic troubles trying to obtain the financing to develop their proposed golf course. The purchase of the land by the City prevented possible golf course development, which many people in the area were in favor.

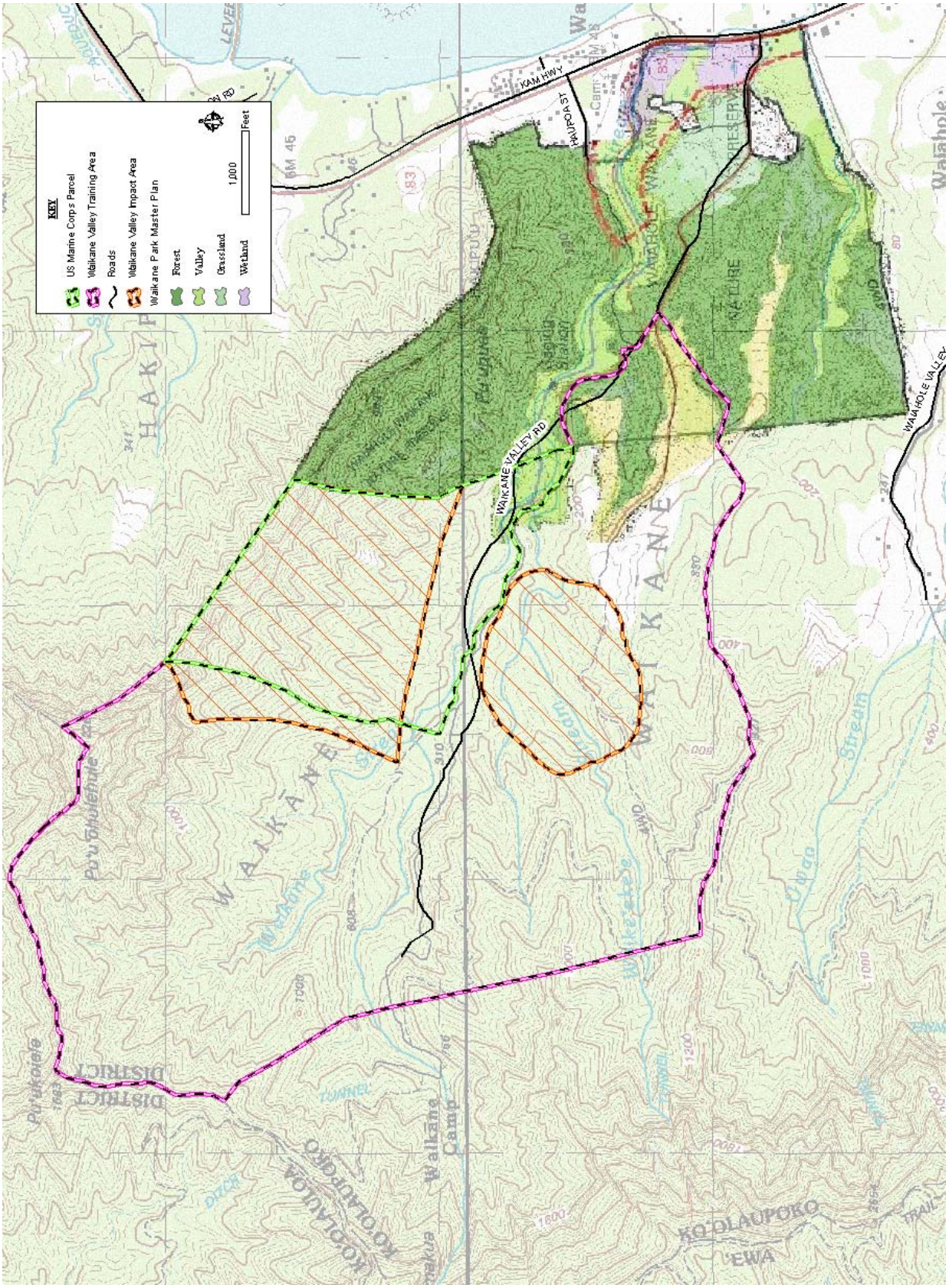
4.2.10 The City and County of Honolulu has produced a Master Plan to develop the Waikane Valley Nature Park. The master plan is the basis for subsequent design plans developed by the City for improvements on the site. The master plan also indicates the preferred phasing of site improvements. The master plan goals and objectives are to:

- Restore the cultural and spiritual setting of Waikane Valley
- Provide educational opportunities for the community
- Provide low impact recreational opportunities for the community and the general public
- Preserve the natural resources of Waikane Valley

4.2.11 The City is planning on establishing trails, rest and picnic areas, lookouts to view surrounding landmarks of the site, a ceremonial gathering place (Halau), re-vegetation areas for native plants, stream ecology study areas, ponds for aquatic wildlife studies, agricultural fields, parking areas and a visitor orientation area.

4.2.11.1 The Waikane Valley Nature Park Master Plan's regions are shown below (and at http://www.honolulu.gov/parks/facility/waikane/sitemap.htm). Development is to occur mostly in the Southeastern Region with trails extending through all other regions. The plan proposes connecting valley trails to existing trails along the Ko'olaupoko mountain range (http://www.honolulu.gov/parks/facility/waikane/plangoal.htm).

Waikane Valley Nature Park Master Plan



4.2.12 Historical photographs of site activities conducted by the Marine Corps were recovered by ZAPATA personnel from the Kaneohe Marine Corps Base Records Department and one is shown below.

Waikane Valley Trail, circa 1943

4.3 PERSONAL INTERVIEWS CONDUCTED

ZAPATA did not conduct official personal interviews during the EE/CA investigation pertaining to the site's historical use. All interviews were conducted by CEPOH and during Public Meetings.

4.4 AERIAL PHOTOGRAPHY

The usefulness of aerial photography for the former Waikane Valley Training Area was limited. If additional aerial photographs become available, they will be included as part of the information repository.

4.5 SITE INVESTIGATIONS PERFORMED

4.5.1 Previous MEC Removal Actions and Investigations

4.5.1.1 Surface MEC Removal #1 - 1976

In 1975, McCandless Estate trustees and Kamaka family heirs elected to terminate the lease with the Marine Corps as of July 1976. Following lease termination, a surface clearance was performed by the Marine Corps Brigade Explosive Ordnance Disposal (EOD) unit in 1976 and over 24,000 pounds of practice ordnance and scrap from two Marine Corps impact areas in Waikane Valley were airlifted off-site (InPR, 1996).

4.5.1.2 Surface MEC Removal Sweep #2 - 1984

A MEC surface clearance was performed within the Marine Corp property was conducted from February to April 1984. During this time, an additional 16,000 pounds of demilitarized practice ordnance, consisting of 3.5-inch rockets and M29 grenades, were recovered (IPR, 1996). An additional 232 items, including 75-mm HE projectiles and 60-mm HE mortar rounds, a 37-mm HE round, M28 HEAT grenades, M9A1 AT rifle grenades, and 2.36- and 3.5-inch HEAT rockets, were recovered and destroyed by Marine EOD personnel (InPR, 1996).

4.5.2 EE/CA Investigation

4.5.2.1 Visual Ground Reconnaissance

Initial field activities consisted of a ground reconnaissance of areas other than specific known target or impact areas within Waikane Valley to determine if there were ordnance safety concerns in these adjacent areas. The purpose of the recon was to characterize lands adjacent to the impact areas, including target boundary delineations and footprint reduction, to support the EE/CA and recommendations for future actions at the site. Two three-man teams walked meandering paths crisscrossing the valley performing a handheld geophysical instrumentation assisted visual survey. Each three-man team consisted of a data recorder, and two analog geophysical instrument operators. The data recorder walked the center path with the instrument operators flanking the data recorder on each side. Each of the team members covered a five-foot visual path width for up to a 15-foot path width per team. Vegetation/terrain sometimes prevented coverage of the full path width in some areas and allowed a greater path width in other areas resulting in an average path width of just under 15 feet. The teams covered approximately 27.3 miles and approximately 48.9 acres. The teams traversed the valley looking for visual evidence, and audible evidence using geophysical instruments, of MEC, MD, CD, and forensic evidence of HE usage. The teams used Global Positioning System (GPS) instrumentation to capture the coordinates along the paths traveled and digital cameras to document their finds. The teams also documented routes for ingress/egress and open areas that would promote the positioning of grids and transects for geophysical surveying. During the ground recon, particular attention was given to areas where MEC would have washed down (migrated) over the years to streams, gulches, and narrow ravines. No MEC was encountered during the ground recon; however, there was evidence of HE usage as several pieces of fragmentation were discovered along the recon paths. It was also noted that several areas within the valley were littered with CD, i.e., household trash, construction debris/materials, old cars and car parts, old fences and fence posts, and other assorted trash. Even though there was no MEC found, the ground recon proved beneficial as the field crew obtained a thorough understanding of the lay of the land,

especially areas that were inaccessible due to very steep and treacherous terrain and could not be developed.

4.5.2.2 Geophysical Survey

4.5.2.2.1 Digital Geophysical Mapping (DGM) - Using the information gathered from the ground recon, a total of 152 grids (ranging in size from 16 feet by 16 feet to 50 feet by 50 feet) and 7.61 miles of transects (varying width) were positioned across the valley for geophysical sampling using both DGM and analog survey techniques. The grid corners and transect centerlines were surveyed by a Professional Land Surveyor licensed in the State of Hawaii so that they could be plotted on a map. Clearance of vegetation was required on 129 grids and along transects paths to facilitate geophysical sampling. After receiving approval on the GPO from the USAESCH geophysicist, Blackhawk conducted DGM surveying on 112 grids (6.2 acres) and approximately 0.1 acres of transect using the EM61 TDEM instrumentation in the cart mode. The geophysical data were processed, filtered and enhanced and dig sheets were created using minimum response criteria decided upon following the evaluation of the baseline GPO survey. Using the dig sheets, the anomalies were reacquired and excavated to determine their identity.

4.5.2.2.2 Analog Geophysical Surveying - In addition to DGM, analog geophysical surveying using various handheld geophysical instrumentation was performed on 40 grids (2.9 acres), 0.03 miles of transects, and three additional areas within the valley (rally point, shrine area, and geophysical instrument test area). Three analog instruments were used in conjunction with each other during the analog survey: 1) the MineLab Explorer® with the large 18-inch coil, capable of detecting all metals (ferrous and non-ferrous) at a greater depth then the other instruments; 2) the White's All-Metal Detector®, also capable of detecting ferrous and non-ferrous metals; and, 3) the Schonstedt® Cx-52, which detects only ferrous metals. Due to the magnetic volcanic rock that underlies the site; various instruments were used to distinguish the metal anomalies from magnetic rock, thereby reducing the number of magnetic rocks intrusively investigated. During the analog surveying, once an audible signal was received from the analog instrument indicating a subsurface anomaly, the UXO team immediately excavated the anomaly and a Field Data Sheet was produced logging all pertinent data on the anomaly, i.e., positive identification, depth, attitude, condition, location coordinates, disposition, etc. Items determined safe to move were carried to a staging area for subsequent disposal. UXO were blown-in-place using explosive donor charges. After removing the item(s) from the excavation, the hole was checked again with the handheld instruments to ensure nothing remained in the excavation.

4.5.2.3 Intrusive Investigation

On grids where DGM was conducted, the UXO team used the dig sheets generated for that grid to reacquire the selected target anomalies within the grid using measuring tapes along the x and y axis of the grid. Handheld analog instruments were used to pinpoint the exact location of the target and the anomaly was excavated for investigation. A total of 2,079 anomalies (DGM and analog) were intrusively investigated. Each analog anomaly was recorded on a Grid/Transect Sheet and each DGM anomaly was recorded on a Field Data Sheet with pertinent information recorded, such as, positive identification, depth, attitude, condition, location coordinates, disposition, etc. Items determined safe to move were carried to a staging area for subsequent disposal. UXO were blown-in-place using explosive donor charges. After removing the item(s)

from the excavation, the hole was checked again with all three handheld instruments to ensure nothing remained in the excavation.

4.5.2.4 MEC Disposal

All UXO encountered during the investigation were blown-in-place using explosives delivered to the Waikane Valley site from ZAPATA range clearance project at Schofield Barracks, Oahu, Hawaii. A ZAPATA UXO Technician, possessing a Hawaii Blasters' License, performed all demolition operations.

4.6 WAIKANE TRAINING AREA REGIONS

One objective of the EE/CA is to support an informed decision for determining the most appropriate MEC response action(s) for the site based on site characterization. Due to the size of the former Waikane Valley Training Area project site (933 acres), the varying steep terrain, inaccessibility to some areas within the valley, network of roads, past uses, and future development plans, the site was partitioned into four distinct areas. Naturally occurring events, such as flooding and landslides; are common along the ridgeline and valleys of the entire former Waikane Valley Training Area. The median annual rainfall ranges from approximately 80 inches in the mauka (towards the mountains, inland) portion of the property. The area usually experiences wet winter months and dry summer months, like most of Oahu. During the times of severe weather, the valley becomes inaccessible due to access road washouts. During the month of March 2006, Waikane Valley received over 84 inches of rain which caused the UXO technical team to temporarily shut down operations because of accessibility issues. The area was divided into four regions using a combination of MEC/MD concentrations, anomaly concentration (using DGM data), historical use (i.e. impact area), and natural geographical boundaries (which effect site accessibility and munition containment). The Southeastern Region is the most accessible, has the highest human population, and had the most UXO and MD. The Southeastern Region is bordered by City and County of Honolulu property to the south and east and to the west isolating ridgelines serve as geographic separation from the Southern Impact Region and Mountainous Region. Areas with natural topographic boundaries provide for topographic containment of munitions, which was the case for the Southern Impact Region. The Southern Impact Region contains the historical impact area and as slopes increase to the south and west, MD decreases leading to the Western and Mountainous Regions. The Southern Impact and Western Regions are divided by a ridgeline that acts as a natural barrier containing munitions in the Southern Impact Region. The Mountainous Regions lie west and north of the Western Region with well over 80 percent of the area with a slope greater than 30 percent. The characteristics of the four areas will allow for a thorough evaluation of risk and response action alternatives. The four distinct areas are characterized as follows:

4.6.1 Southeastern Region

4.6.1.1 The Southeastern Region comprises approximately 151 acres located in the southeast portion of the project site (Figure 4-2). This area is bordered by the Southern Impact Region to the west, the Marine Corps parcel to the north and City and County of Honolulu property to the south and east. The terrain in the Southeastern Region is mostly rolling hills with 26 percent of the slopes in excess of 33 percent (40 acres). An unimproved dirt road off of Waikane Valley Road is the main route leading into and running through the area. The entrance to the access road is locked and gated. Although site access is limited by dense vegetation, terrain and a

locked and gated access road, the site remains relatively accessible to the public. Many local residents possess keys to the main gate. As for individuals that do not possess a key, the site can be accessed by unauthorized trails, paths, and stream use along Kamehameha Highway.

4.6.1.2 Due to the terrain and road network that traverses the Southeastern Region, it is very accessible by the public. The field crew encountered numerous piles of household trash and construction debris as well as stripped cars, old refrigerators, and used tires. Surface clearances of the grids and transects to remove debris and trash took place prior to conducting geophysical surveys.

4.6.1.3 A total of 95 grids (5.95 acres) and 4.3 acres of transect were positioned within the Southeastern Region for geophysical sampling and intrusive investigation of subsurface anomalies. All corners of the grids and centerlines on the transects were surveyed by at Professional Land Surveyor licensed in the State of Hawaii. Vegetation was cleared from all of the grids and transects to facilitate both DGM and analog geophysical surveys. DGM was performed on 70 of the 95 established grids and the remaining 25 grids were surveyed using analog geophysical techniques by the UXO technicians.

4.6.1.4 A total of five UXO (two 60mm and three 81mm HE mortar shells) were discovered in the southeastern section of Waikane Valley. The UXO encountered were located in areas frequented by local residents, movie crews, and recreational enthusiasts. This area is also saturated with projectile fragmentation and other MD (fins, expended fuzes and flares, etc.), which are indicative of HE usage. All UXO were disposed of by detonation.

4.6.1.5 A total of 25.95 acres were visually surveyed during the instrument assisted visual reconnaissance resulting in four MD items (a grenade fuze and three pieces of HE fragmentation).

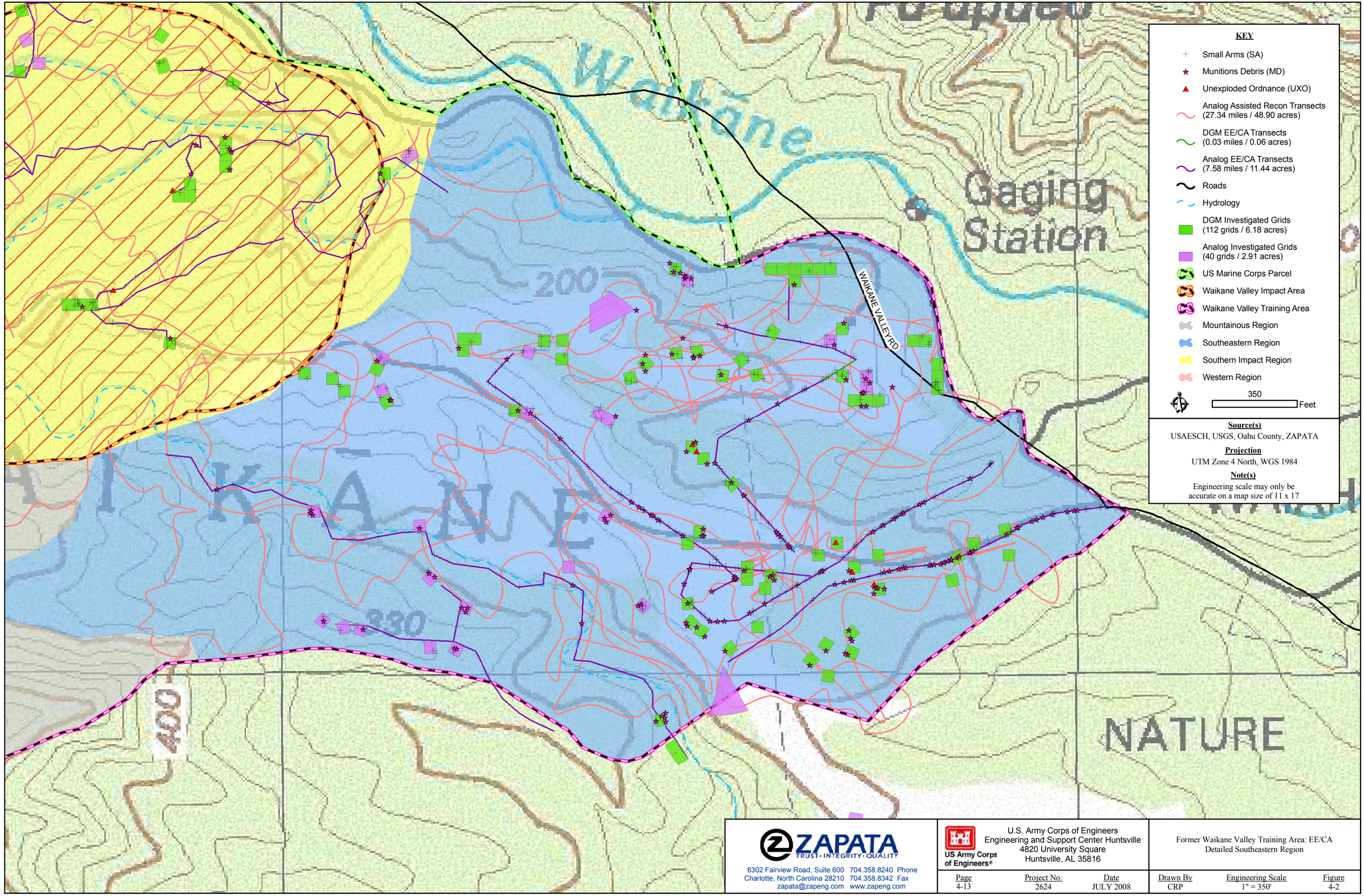
4.6.2 Southern Impact Region

4.6.2.1 The Southern Impact Region of the project site, illustrated in Figure 4-3, is approximately 90 acres in size. The Marine Corps parcel fence line shares the northern boundary of Southern Impact Region. A dirt access road runs alongside the Marine Corps parcel fence line on a mountain ridgeline with the northern side of the road dropping down a very steep slope for over 80 feet in some sections, and on the southern side rising upwards. Aside from the access road, the treacherous, rugged terrain and dense vegetation create inaccessible barriers within impact area 52 percent of the slopes in excess of 33 percent (47 acres). As stated earlier, the impact area was previously cleared of surface ordnance on two occasions (1976 and 1984) and over 40,000 pounds of MEC and scrap was removed from the area.

4.6.2.2 A total of 24 grids (1.36 acres) and 2.7 acres of transect were positioned within impact area and surrounding buffer for geophysical sampling and intrusive investigation of subsurface anomalies. All corners of the grids and centerlines on the transects were surveyed by at Professional Land Surveyor licensed in the State of Hawaii. Vegetation was cleared from all of the grids and transects to facilitate both DGM and analog geophysical surveys. DGM was performed on 18 of the 24 established grids and the remaining six grids were surveyed using analog geophysical techniques by the UXO technicians.

4.6.2.3 Two UXOs (37mm projectiles) were discovered in the Southern Impact Region. This area also has a high density of projectile fragmentation and other MD (fins, expended fuzes and flares, etc.), which are indicative of HE usage.

4.6.2.4 A total of 6.09 acres were visually surveyed during the instrument assisted visual reconnaissance with no significant findings.



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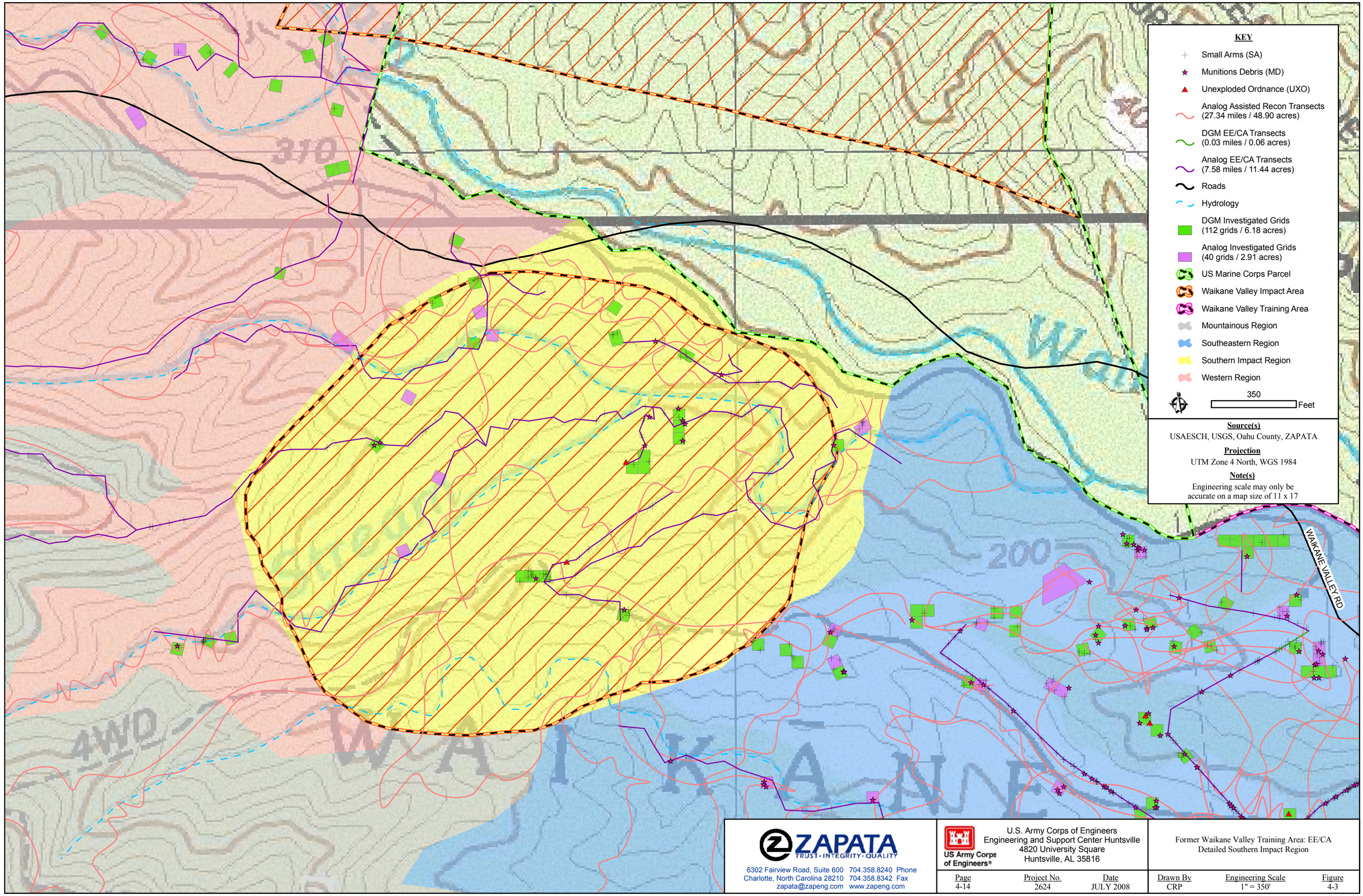
Former Waikane Valley Training Area: EE/CA
Detailed Southeastern Region

Page	Project No.	Date	Drawn By	Engineering Scale	Figure
4-13	2624	JULY 2008	CRP	1" = 350'	4-2



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Former Waikane Valley Training Area: EE/CA
Detailed Southern Impact Region

Page	Project No.	Date	Drawn By	Engineering Scale	Figure
4-14	2624	JULY 2008	CRP	1" = 350'	4-3

4.6.3 Western Region

4.6.3.1 The Western Region of the Waikane Valley is bordered by the Marine Corps parcel and the Southern Impact Region to the east, (illustrated in Figure 4-4) Pu'uohulehule Mountain (2,255 feet asl) on the north and the Koolau Mountain Range of the west and south. This area is approximately 158 acres with an unimproved dirt access road that runs through the area; however, it is impossible to travel off the access road due to cliffs rising up on one side and sheer drop-offs on the other side. The access road runs east to west along a ridgeline at an elevation ranging from less than 200 feet on the eastern end to over 725 feet on the west. Due to the rugged terrain and dense vegetation, the site is relatively inaccessible to the public with limited potential for future development and elevation ranging from 200 feet to 795 feet above sea level. The area lies at the base of the Koolau Mountain range with 83 percent of the slopes in excess of 33 percent (131 acres).

4.6.3.2 A total of 33 grids (1.78 acres) and 3.9 acres of transects were investigated in this area with DGM and analog survey instrumentation. DGM was performed on 24 of the 33 established grids and the remaining nine grids were surveyed using analog geophysical techniques by the UXO technicians. All corners of the grids and centerlines of the transects were surveyed by at Professional Land Surveyor licensed in the State of Hawaii. Vegetation was cleared from all of the grids and transects to facilitate both DGM and analog geophysical surveys.

4.6.3.3 No MEC was encountered during the investigation of this area, nor was there significant evidence of HE usage. A single piece of MD was found. The MD was a piece of HE fragmentation that was likely a kick-out from a detonation from within the impact area. Since the item was found within 500 feet of the impact area and there was no other evidence that high explosives were used in the area, the item is attributed to the Southern Impact Region. The Western Region was apparently used for foot maneuvering evident by the significant amount of small arms throughout the area.

4.6.3.4 A total of 8.11 acres were visually surveyed during the instrument assisted visual reconnaissance resulting in two small arms items.

4.6.4 Mountainous Regions

4.6.4.1 The Mountainous Region makes up the extreme northern, southwestern area totaling 534 acres. It is composed of mountain ranges with elevations ranging from 525 feet to 2,225 feet above sea level. Most of this area is highly inaccessible due to its steep and jagged mountain slopes and deep canyons with precipitous sides. Over 99 percent of the slopes in the Mountainous Region are in excess of 33 percent (533 acres).

4.6.4.2 A total of 0.6 acres of transects were intrusively investigated in this area using analog survey instrumentation. Centerlines of the transects were surveyed by at Professional Land Surveyor licensed in the State of Hawaii. Vegetation was cleared from all of the transects to facilitate analog geophysical surveys.

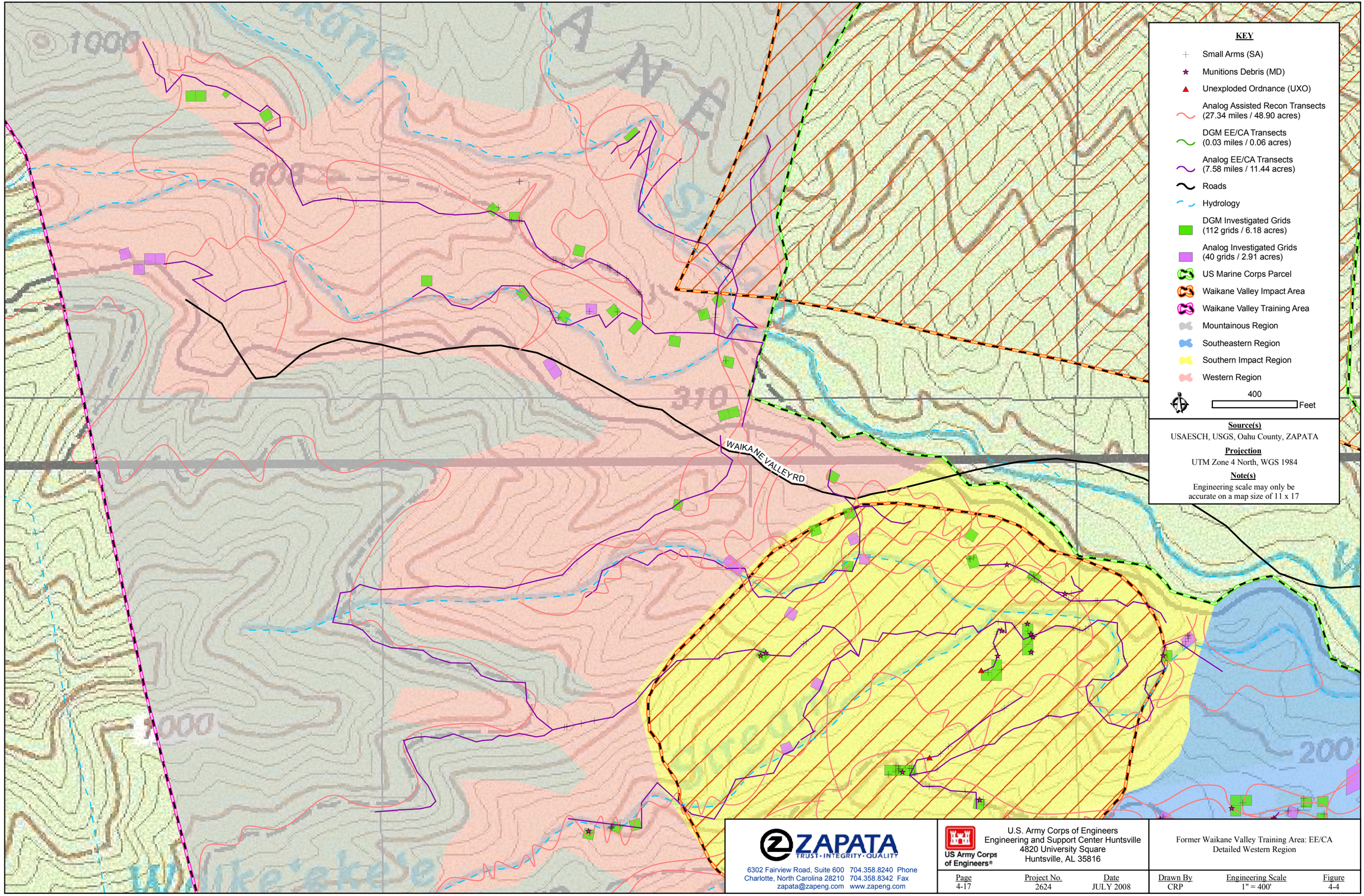
4.6.4.3 A total of 8.21 acres were visually surveyed during the instrument assisted visual reconnaissance with no significant findings.

4.7 SOURCE, NATURE AND EXTENT OF MEC

The source, nature, and extent of MEC are based on findings and conclusions of the Waikane InPR, historical records, the June 2005 ground reconnaissance, and EE/CA field activities (geophysical survey and intrusive investigations) conducted by ZAPATA.

4.7.1 Source of MEC

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



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Former Waikane Valley Training Area: EE/CA
Detailed Western Region

Page	Project No.	Date	Drawn By	Engineering Scale	Figure
4-17	2624	JULY 2008	CRP	1" = 400'	4-4

4.7.2 Nature of MEC

4.7.2.1 A wide range of UXO and MD have been documented, based on prior use and previous removal actions conducted at the former Waikane Valley Training Area. MEC and MD included 37mm and 75mm High Explosive (HE) rounds, 60mm mortars, 2.36-inch and 3.5-inch HEAT rockets, M28 HEAT grenades, and M9A1 AT rifle grenades. During the EE/CA intrusive investigation performed in 2005/2006, seven UXO items were found ranging from 37mm to 81mm in size. The following UXO items were recovered and disposed of during the EE/CA field activities:

- 81mm mortars (HE) – 2 each
- 37mm projectiles (HE) – 2 each
- 60mm mortars (HE) – 3 each

4.7.2.2 MEC and MD from this and past investigations support the asserted past use of the area in addition to other uses (MKII grenades). The only past practice in question is bombing. While bombs were not recovered, large fragments (up to 10”x2”x1”) have been recovered, which could be bomb fragmentation. Additionally, the following MD items were recovered and disposed of during the EE/CA field activities:

- 81mm mortars tail fins, parts, and fragments
- 37mm projectiles, AP-T and APC-T
- 60mm mortar tail fin
- 2.36-inch rockets, and parts
- 3.5-inch rocket
- Flares (MK 13, trip, and signal)
- Fragments (1”x1”x0.2” to 10”x2”x1”)
- MK II grenades and fuzes
- PD Fuzes (M48 and M51 Series)
- Smoke grenade
- M1 firing device

4.7.3 Extent of MEC

During the EE/CA investigation, the Southeastern Region contained five UXO items and 136 MD items, e.g., fins, expended fuzes, fragmentation, inert practice 60mm mortars and 2.36-inch rockets, etc. The Southern Impact Region, a known impact area, contained two UXO and ten MD items. The Western Region contained a single piece of MD that is attributed to the Southern Impact Region. The Mountainous Region did not contain either UXO or MD, however the historical impact area extends into the region. Much of the Mountainous Region is inaccessible due to hazardous terrain.

4.7.4 Description of Hazards of Specific Munitions

The following military munitions are a representative sampling of the UXO items found during the 2005/2006 EE/CA intrusive investigation. Features and hazards listed below are based on ORDATA II Version 1.0. Photographs of items found during the 2005/2006 EE/CA intrusive

investigation are included in Attachment C of Appendix H. (Note that the types of Munitions presented in the following sections can also be of inert configuration.)

4.7.4.1 U.S. Projectile, 60MM, HE

These are Army, fin stabilized, mortar fired, high explosive (HE) projectiles. The projectiles are painted olive drab with yellow identification markings.

Diameter/Width	Length	Weight
60.00 mm	183.00 mm	1.41 kg

Explosive/Filler Type	Net Explosive/Filler Weight
Composition B	190.00 g

4.7.4.2 U.S. Projectile, 81-MM

This is an Army, fin stabilized, mortar fired, high explosive (HE) projectile. The body is painted olive drab with yellow markings and a red warning label.

Measurement Information:

Diameter/Width	Length	Weight
81.00 mm	432.00 mm	4.24 kg

Explosive Information:

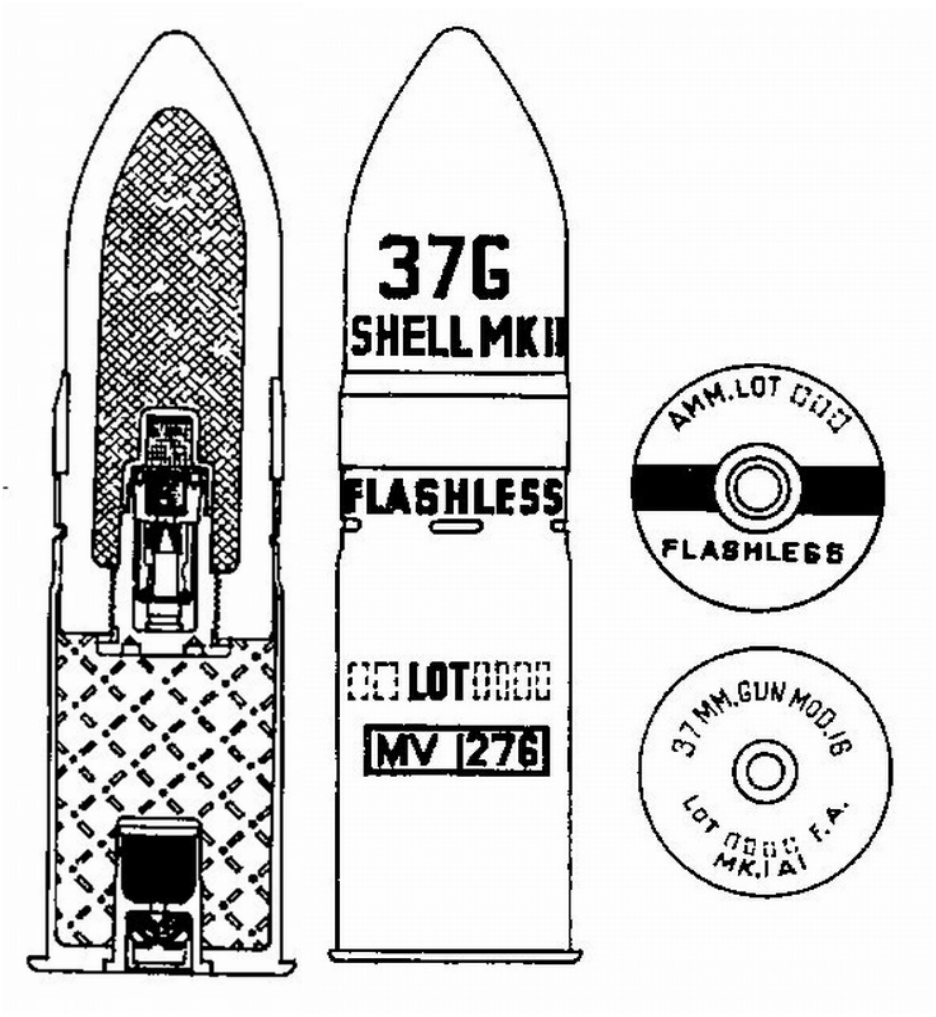
Explosive/Filler Type	Net Explosive/Filler Weight
Composition B	1.00 kg

4.7.4.3 U.S. Projectile, 37-MM, HE, MK 2(II)

This is a spin stabilized, high explosive projectile. The projectile is painted olive drab and is stenciled in yellow. (This painting and stenciling is common to ammunition loaded with high explosives).

Diameter/Width	Length	Weight
37.00 mm	113.03 mm	Not Available

Explosive/Filler	Type Net	Explosive/Filler	Weight
TNT	27.22 g		



4.7.4.4 U.S. Projectile, 37-MM, HE, M63

The high-explosive shell for tank and antitank weapons is used against targets where the explosive feature of the shell will prove more destructive than armor-piercing shot. The round is shipped complete with fuze, as are all fixed artillery shell. It is painted olive drab with yellow stenciling. Aside from the painting and marking, it may be distinguished from other tank and antitank rounds by its long, tapered nose.

Diameter/Width	Length	Weight
37.00 mm	150.37 mm	730.30 g

Explosive/Filler	Type Net	Explosive/Filler	Weight
TNT	38.56 g		

5.0 RISK EVALUATION

This qualitative evaluation of MEC risk for all the areas within the former Waikane Valley Training Area was developed following protocols defined in the OERIA. OERIA uses direct analysis of site conditions and demographics to evaluate MEC risk. The results of this risk assessment were used to help determine the most appropriate munitions response action for these sites.

5.1 CONCEPTUAL SITE MODEL

5.1.1 A preliminary Conceptual Site Model (CSM) was generated for the former Waikane Valley Training Area that showed the potential for an explosive safety risk dependent upon the presence of three elements: a source, a receptor, and an interaction between the source and the receptor. A CSM is a method of organizing, displaying, and using site data that facilitates developing the hypothesis for the site history/status and draws logical conclusions about the site. There is no risk if any one element is missing. Each of the three elements provides a basis for implementing effective risk-management response actions.

5.1.2 Human activity at the former Waikane Valley Training Area is moderate and limited to hunting activity, moto-cross and All Terrain Vehicle (ATV) riding, the filming of movies and television series, the congregation of local residents visiting memorials established on the site, and the dumping of trash and construction debris. The exposure route for MEC to a receptor is primarily direct contact as a result of some human activity. MEC will tend to remain in place unless disturbed by human activities, such as agriculture, or natural forces, such as erosion. Movement of MEC may increase the probability for direct human contact but not necessarily result in a direct contact or exposure.

5.1.3 The source of the MEC in the Waikane Valley is infantry jungle training, artillery firing, and practice bombing that took place from the onset of WWII to 1976. The UXO and MD encountered within the valley results from the firing of artillery weapons (75mm), shoulder fired anti-tank weapons (2.36-inch and 3.5-inch HEAT rockets), mortars (60mm and 81mm), small arms, and aerial practice bombing exercises conducted by the military. During the Ground Reconnaissance, only MD was observed in Waikane Valley. All items were open and exposed for inspection and verification that they were free of the potential for an explosive hazard. The MD included fragmentation and fuze fragments, without energetics.

5.1.4 Individuals visiting the Waikane Valley Training Area, including recreational enthusiasts may conduct activities that expose and/or disturb surface and subsurface material under ordinary circumstances. Their activities include moto-cross and ATV riding, hunting, walking, sightseeing, and the dumping of household trash and construction debris. While moto-cross and ATV riding are the only ground disturbing site activities, erosion and landslide that occur regularly at this site, may expose other visitors to munitions. Future development is pending anticipated removal actions.

5.2 RISK IMPACT ASSESSMENT

Risk Impact Assessment is a tool used to evaluate safety hazards to people posed by MEC. The risk impact assessment was performed in accordance with Interim Guidance 01-01, Ordnance

and Explosives Risk Impact Assessment, from the U.S. Army Engineering and Support Center (USACE, 2001). Risk impact assessment is a stakeholder-friendly method of risk assessment for use during MEC site EE/CA evaluations. This method uses direct evaluation of site conditions and human issues that create MEC risk. The results of the risk impact assessment are an input into the evaluation of the effectiveness criterion of the EE/CA response alternatives evaluation. The three processes in the risk impact assessment method are:

- Evaluate base risk factors
- Perform a baseline risk assessment
- Assess response action alternatives

5.3 BASE RISK FACTORS

The potential risk posed by MEC at a site may be characterized by evaluating the likelihood of exposure to MEC, the severity of exposure and likelihood of detonation. These components can be further defined by a set of risk factors. For example, the type of munition and its sensitivity must be considered to evaluate the likelihood of detonation and severity of exposure. Similarly, the likelihood of exposure may be evaluated by considering the MEC potential, the number of people using the site, the type of activities conducted, and the accessibility of the site. These risk factors are listed below and defined further in the following paragraphs.

- MEC Factors (Type, Sensitivity, Density, Depth);
- Site Characteristics Factors (Site Accessibility, Site Instability); and
- Demographic Factors (Site Activities, Site Population).

5.4 MEC FACTORS

5.4.1 Types of MEC

The type of MEC affects the likelihood of an incident and the severity of an injury if MEC detonates when encountered by an individual. There are four categories of MEC impacts. These categories are presented in order from highest to lowest potential hazard in Table 5-1. The MEC type for each site reflects the results of the EE/CA field investigation as well as the results of previous investigations. When multiple categories of MEC are discovered at a site, the highest hazard category is used in the risk assessment.

TABLE 5-1 MEC TYPE RISK FACTOR DETERMINATION

MEC TYPE CATEGORIES	QUALITATIVE RISK LEVEL
MEC that may kill an individual if detonated by an individual's activities	High
MEC that may cause major injury to an individual if detonated by an individual's activities	Moderate
MEC that may cause minor injury to an individual if detonated by an individual's activities	Low
Inert (*i.e.*, MD) will cause no injury	None

5.4.2 Sensitivity of MEC

Sensitivity affects the likelihood of an MEC item functioning as designed when encountered by an individual. There are four categories of MEC sensitivity presented in order from highest to lowest in Table 5-2. The sensitivity of specific MEC recovered during the field investigation and the resulting hazards they present are outlined in this document.

TABLE 5-2 MEC SENSITIVITY RISK FACTOR DEFINITION

MEC SENSITIVITY	QUALITATIVE RISK LEVEL
MEC that is highly sensitive	High
MEC that is sensitive	Moderate
MEC that may have functioned correctly or is unfuzed but has a residual risk.	Low
Munition Debris Only (non-hazardous and, therefore, not sensitive)	None

5.4.3 MEC Potential

The presence of MEC provides a means for determining the potential to encounter additional MEC. There are three categories of MEC Exposure Potential presented in order from highest to lowest in Table 5-3. Based on past military use of the site, there will always be a potential for MEC, even in an area where there has been no evidence of MEC found.

TABLE 5-3 MEC EXPOSURE POTENTIAL RISK FACTOR DEFINITION

EVIDENCE OF MEC	MEC EXPOSURE POTENTIAL
UXO was discovered during the EE/CA field investigation or during previous investigations.	High
Only MD was discovered during the EE/CA field investigation or during previous investigations	Moderate
No evidence of UXO or MD was discovered during the EE/CA field investigation or during previous investigations	Low

5.4.4 Depth Range of MEC

The depth of MEC is related to the probability that an individual will be exposed to MEC. The evaluated depth is based on the depth that MEC is recovered during the EE/CA field investigation. In general, the deeper the MEC item, the less likely it will be encountered by the public (Table 5-6).

5.5 SITE CHARACTERISTIC FACTORS

5.5.1 Site Accessibility

The accessibility of a site affects the likelihood of an individual being exposed to MEC. Structural barriers (e.g., fences) or natural barriers (e.g., rough terrain) can limit site accessibility.

Both structural and natural barriers at the site are considered when evaluating the site accessibility risk factor. The three categories within this risk factor are presented in order from highest to lowest in Table 5-4.

TABLE 5-4 SITE ACCESSIBILITY RISK FACTOR DEFINITION

ACCESSIBILITY OF SITE	DESCRIPTION	QUALITATIVE RISK LEVEL
No restriction to site	No structural barriers; gently rolling terrain; no vegetation or water restricts access	High
Limited restriction to site	Remoteness of site; structural barriers; vegetation, water, or terrain restricts access.	Moderate
Complete restriction to site	All points of entry are controlled; locked and gated	Low

5.5.2 Site Stability

Site stability affects the potential for individuals to come into contact with MEC by human or natural processes. Natural processes include recurring natural events (e.g., erosion and soil movement) or extreme natural events (e.g., volcanic eruptions and hurricanes). Human processes occur when a site experiences intentional land disturbances within its boundaries (e.g., by means of trail blazing). The three categories within this risk factor are presented in order from highest to lowest in Table 5-5.

TABLE 5-5 SITE STABILITY RISK FACTOR DEFINITION

SITE STABILITY	DESCRIPTION	QUALITATIVE RISK LEVEL
MEC most likely to be exposed by natural or human events	Unstable	High
MEC may be exposed by natural or human events	Moderately Stable	Moderate
MEC not likely to be exposed by natural or human events	Stable	Low

5.6 HUMAN FACTORS

5.6.1 Site Activities

The likelihood of an individual coming into contact with MEC is related to activities generally classified as recreational (e.g., hiking, camping, biking) or occupational (e.g., farming, construction) and are directly related to the depth of MEC. There are three risk factors within this category that take into account depth of MEC and activities at a site. For example, if MEC is deeper than one-foot below ground surface (bgs) and only surface-impact activities are being performed, the activities are considered as low-impact activities with very little risk associated with MEC exposure. On the other hand, where MEC is on the surface, all activities that can affect MEC on the surface have a high level of risk associated with MEC exposure. Table 5-6 presents the definitions for this risk factor.

TABLE 5-6 SITE ACTIVITIES RISK FACTOR DEFINITION

ACTIVITIES	DEPTH ACTIVITIES AFFECT MEC	DEPTH OF MEC (INCHES BGS)	QUALITATIVE RISK LEVEL
Child play, hiking, horseback riding	Surface	0 - 6 6 - 12 > 12	High Low Low
Ranching, camping, moto-cross/ATV, surveying, metal detecting (*i.e.*, treasure hunting)	Surface/ Subsurface up to 1 ft bgs	0 - 6 6 - 12 > 12	High Moderate Low
Construction, crop farming	Surface/ Subsurface, more than 1 ft bgs	0 - 6 6 - 12 > 12	High Moderate Low

5.6.2 Site Population

The number of people using a site and the frequency of that use affect the probability of whether MEC will be encountered by an individual. Three categories within this risk factor are presented in order from highest to lowest in Table 5-7.

TABLE 5-7 SITE POPULATION RISK FACTOR DEFINITION

NUMBER OF PEOPLE USING SITE	QUALITATIVE RISK LEVEL
Public attraction such as tourist sites, parks, beaches, other	High
Public has access to land, but not an attraction to the public	Moderate
Public access is restricted; landowners sole users of land	Low

5.7 RISK IMPACT ASSESSMENT

5.7.1 Each of the base factors identified above was evaluated using data collected during the EE/CA investigation. The following sections discuss the risk evaluation by each of the primary risk factors discussed above.

5.7.2 This risk evaluation for the former Waikane Valley Training Area uses data collected from the ground reconnaissance, intrusive investigation, previous investigations, documented reports of discovered MEC, current and future land uses, and the decision criteria discussed in Sections 5.8 through 5.11, to qualitatively assess the MEC hazard level.

5.7.3 Table 5-8 summarizes the risk evaluation area: total area evaluated, number of MEC items and MD recovered prior to this EE/CA, the potential for exposure to MEC, and the rationale for determining the level of MEC exposure potential in Areas 1-4 within the former Waikane Training Area.

TABLE 5-8 ESTIMATING POTENTIAL FOR ORDNANCE AND EXPLOSIVES

OERIA Evaluation Site	Total Area (Acres)	UXO Recovered during EE/CA	MD Items Recovered during EE/CA	MEC Exposure Potential	Rationale for Level of MEC Potential
Southeastern Region	151	5	158	High	Presence of UXO.
Southern Impact Region	90	2	13	High	Presence of UXO.
Western Region	158	0	1*	Low	No significant evidence of UXO or MD during investigation
Mountainous Regions	534	0	0	Low	No evidence of UXO or MD during investigation

* This item is attributed to the Southern Impact Region

5.8 SOUTHEASTERN REGION WITHIN FORMER WAIKANE VALLEY TRAINING AREA – SITE RISK EVALUATION

Results of the evaluation of the Southeastern Region within the former Waikane Valley Training Area are summarized in Table 5-10. A discussion of each risk factor for the Southeastern Region within the former Waikane Valley Training Area is provided in the following subsections.

5.8.1 Presence of MEC Factors

5.8.1.1 Southeastern Region - Type of MEC

During the EE/CA investigation, five UXO were discovered and documented in Southeastern Region of the site. UXO found in Southeastern Region during the EE/CA investigation includes: two 81mm HE mortars and three 60mm HE mortars. One 2.36-inch rocket was discovered in Southeastern Region, however; due to the condition of the 2.36-inch rocket, it could not be determined if it was practice or HEAT as both the practice and HEAT rockets have the same characteristics. After the rocket was destroyed in place, it was determined that it was an inert practice round and classified as MD. The five UXO items classify as presenting a High MEC Type Qualitative Risk Level based on Table 5-1.

5.8.1.2 Southeastern Region - Sensitivity of MEC

The 81mm HE mortars and the 60mm HE mortars are highly sensitive to movement and extreme heat, thus producing a High MEC Sensitivity Risk Level as described in Table 5-2. Numerous 7.62mm and 5.56mm rounds were also found, but do not have an associated MEC sensitivity risk.

5.8.1.3 Southeastern Region - MEC Exposure Potential

Because UXO items were discovered in this site investigation, the potential for exposure to MEC in Southeastern Region within the former Waikane Valley Training Area is high, as described in Table 5-3.

5.8.1.4 Southeastern Region - Quantity or Density

All UXO and MD items found in Southeastern Region of the former Waikane Training Area were between elevations 110 and 385 feet of the 151-acre area. ZAPATA recovered five UXO items and 158 MD items from 36.22 acres sampled of the Southeastern Region (Figure 4-2). During the intrusive investigation, approximately 43 pounds of MD were removed from Southeastern Region.

5.8.1.5 Southeastern Region - Depth Distribution

The depths of the 5 UXO and 158 MD items ranged from less than or equal to 0.1 meters (4 inches) bgs to a depth of approximately 0.4 meters (15.75 inches) and one item was found at one-meter (39.37 inches) bgs. The average depth of all UXO and MD items in Southeastern Region is 0.1795 meters (7 inches) bgs. Table 5-9 provides a description of the recovered items, depth and location at which the item was found.

TABLE 5-9 SUMMARY OF MEC ITEMS – SOUTHEASTERN REGION

Item	Depth in meters	Southeastern Region Location	UXO
UXO: 81mm Mortar, Broken Fuze	0.2	Grid: 055-18	✓
UXO: 81mm Mortar, Broken Fuze	0.2	Grid: 145-33	✓
UXO: 60mm Mortar, Fuzed	0.4	Grid: 115-29	✓
UXO: 60mm Mortar, Broken Fuze	0.2	Grid: 103-02	✓
UXO: 60mm Mortar, Broken Fuze	0.3	Grid: 115-45	✓
MD: 2.36-inch Rocket Motor	0.2	Grid: 102-68	
MD: 2.36-inch Rocket Practice	0.1524	Grid: 093-04	
MD: 2.36-inch Rocket Practice	0.1	Grid: 098-05	
MD: 2.36-inch Rocket Tail Boom	0.2	Grid: 115-58	
MD: 37mm APC-T	0.2	Transect: G13-G14	
MD: 37mm AP-T	0.1524	Grid: 096-04	
MD: 37mm AP-T		Transect: O12-O13	
MD: 60mm tail Mortar Fins	0.2	Transect: DP2-DP3	
MD: 81mm end caps	1	Transect: DP4-DP5	
MD: 81mm Mortar Fins	0.2	Grid: 055-04	
MD: 81mm Mortar Fins	0.2	Grid: 055-15	
MD: 81mm Mortar Fins	0.3	Grid: 055-34	
MD: 81mm Mortar Fins	0.2	Transect: AR5-AR6	
MD: 81mm Mortar Fins	0.3	Transect: AR5-AR6	
MD: 81mm Mortar Fins	0.3	Transect: DP3-DP4	
MD: 81mm Mortar Fins	0.2	Transect: K1-K2	
MD: 81mm Mortar Fins	0.2	Transect: K1-K2	

Item	Depth in meters	Southeastern Region Location	UXO
MD: Grenade Fuze	0.1	Grid: 45	
MD: Grenade Fuze	0.1	Transect: G11-G12	
MD: Grenade Fuze	0.1	Transect: G5-G6	
MD: M1 firing device	0.2	Grid: 125	
MD: M48 Series Fuze		Grid: G031	
MD: M51 Series Fuse	0.2	Grid: 094-16	
MD: M51 Series Fuze	0.2	Grid: 108-53	
MD: M51 Series Fuze	0.1	Transect: AR4-AR5	
MD: M51 Series Fuze	0.2	Transect: AR6-AR7	
MD: M51 Series Fuze	0.2	Transect: G5-G6	
MD: MK 13 Flare	0	Transect: K1-K2	
MD: MKII Grenade Practice	0.1	Grid: 146-19	
MD: MKII Grenade, Practice	0.2	Grid: 055-58	
MD: Signal Flare		Grid: G040	
MD: Smoke Grenade		Transect: K2-K3	
MD: Flare	0.0762	Grid: 092-47	
MD: Flare, Fragment	0.1	Grid: 150	
MD: Flare, parts	0.3	Grid: 055-12	
MD: Fragment (6"x2"x1")	0.2	Grid: 124-04	
MD: Fragment (6"x1")	0.2	Transect: AR6-AR7	
MD: Fragment (5" x 2")	0.3	Transect: K1-K2	
MD: Fragment (4” x 5”)	0.3	Transect: G9-G9.1	
MD: Fragment (4"x4")	0.2	Transect: AR6-AR7	
MD: Fragment (4"x1"x1")	0.1	Grid: 118-21	
MD: Fragment (4"x1"x1")	0.1	Grid: 124-04.1	
MD: Fragment (4"x1"x1")	0.1	Grid: 157-24	
MD: Fragment (4"x1"x1")	0.1	Grid: 161-06	
MD: Fragment (4"x1"x1")	0.1	Grid: 194-17	
MD: Fragment (3cmx9cm)		Grid: G035	
MD: Fragment (3"x4")	0.2	Transect: AR2-AR3	
MD: Fragment (3"x4")	0.2	Transect: AR2-AR3	
MD: Fragment (3"x4")	0.3	Transect: AR5-AR6	
MD: Fragment (3"x2")	0.2	Transect: AR5-AR6	
MD: Fragment (3"x.5"x.5")	0.1	Grid: 124-10	
MD: Fragment (2cmx9cm)		Grid: G036	
MD: Fragment (2.5cmx8cm)		Grid: G143	
MD: Fragment (2"x7")	0.2	Grid: 057-10	
MD: Fragment (2"x6")	0.2	Grid: 057-04	
MD: Fragment (2"x6")	0.1	Grid: 057-23	
MD: Fragment (2"x5")	0.2	Grid: 103-05	
MD: Fragment (2"x4")	0.2	Transect: AR3-AR4	

Item	Depth in meters	Southeastern Region Location	UXO
MD: Fragment (2"x4")	0.2	Transect: AR4-AR5	
MD: Fragment (2"x4")	0.2	Transect: AR5-AR6	
MD: Fragment (2"x4")	0.2	Transect: AR5-AR6	
MD: Fragment (2"x4")	0.2	Transect: AR5-AR6	
MD: Fragment (2"x4")	0.2	Transect: K19-K20	
MD: Fragment (2"x4")	0.2	Grid: 54	
MD: Fragment (2"x4")	0.2	Grid: 111-44	
MD: Fragment (2"x4")	0.2	Transect: G6-G7	
MD: Fragment (2"x3")	0.1	Grid: 54	
MD: Fragment (2"x3")	0.2	Grid: 115-02	
MD: Fragment (2"x3")	0.3	Transect: AR2-AR3	
MD: Fragment (2"x3")	0.2	Transect: AR3-AR4	
MD: Fragment (2"x3")	0.1	Transect: AR4-AR5	
MD: Fragment (2"x3")	0.2	Transect: AR7-AR8	
MD: Fragment (2"x3")		Grid: G110	
MD: Fragment (2"x2.5"x1")	0.1	Grid: 158-57	
MD: Fragment (2"x2")	0.2	Grid: 54	
MD: Fragment (2"x2")	0.1	Grid: 54	
MD: Fragment (2"x2")	0.2	Transect: DP4-DP5	
MD: Fragment (2"x2")	0.2	Transect: DP5-DP6	
MD: Fragment (2"x2")	0.2	Transect: DP5-DP6	
MD: Fragment (2"x2")	0.2	Transect: AR1-AR2	
MD: Fragment (2"x2")	0.2	Transect: AR1-AR2	
MD: Fragment (2"x2")	0.2	Transect: AR2-AR3	
MD: Fragment (2"x2")	0.2	Transect: AR5-AR6	
MD: Fragment (2"x2")	0.2	Transect: AR5-AR6	
MD: Fragment (2"x2")	0.2	Transect: AR5-AR6	
MD: Fragment (2"x2")	0.2	Transect: AR5-AR6	
MD: Fragment (2"x2")	0.1	Transect: AR5-AR6	
MD: Fragment (2"x2")	0.1	Transect: AR7-AR8	
MD: Fragment (2"x2")	0.2	Transect: AR8-AR9	
MD: Fragment (2"x2")		Transect: DP3-DP4	
MD: Fragment (2"x1"x1")	0.1	Grid: 147-09	
MD: Fragment (2"x1"x1")	0.1	Grid: 161-21	
MD: Fragment (2"x1"x1")	0.1	Grid: 161-46	
MD: Fragment (2"x1")	0.2	Transect: DP2-DP3	
MD: Fragment (2"x1")	0.2	Transect: AR6-AR7	
MD: Fragment (2" x 4")	0.2	Transect: DP1-DP2	
MD: Fragment (2" x 4")	0.1	Transect: K2-K3	
MD: Fragment (2" x 4")	0.2	Transect: G11-G12	
MD: Fragment (2" x 4")	0.3	Transect: G11-G12	

Item	Depth in meters	Southeastern Region Location	UXO
MD: Fragment (2" x 3")	0.2	Transect: K1-K2	
MD: Fragment (2" x 3")	0.3	Transect: G11-G12	
MD: Fragment (2" x 2")	0.1	Transect: G11-G12	
MD: Fragment (2" x 1")	0.1	Grid: 114	
MD: Fragment (2" x 1")	0.2	Transect: G9-G9.1	
MD: Fragment (18” x 3”, partial 81mm)	0.4	Transect: G7-G8	
MD: Fragment (10"x2"x1")	0.2	Grid: 147-12	
MD: Fragment (1” x 4”)	0.2	Transect: G8-G9	
MD: Fragment (1” x 3”)	0.2	Transect: G7-G8	
MD: Fragment (1” x 3”)	0.2	Transect: G8-G9	
MD: Fragment (1"x6")		Grid: G031	
MD: Fragment (1"x4")		Grid: G033	
MD: Fragment (1"x4")	0.1	Transect: AR6-AR7	
MD: Fragment (1"x4")	0.1	Transect: AR7-AR8	
MD: Fragment (1"x3")	0.3	Transect: DP4-DP5	
MD: Fragment (1"x3")		Grid: G032	
MD: Fragment (1"x3")		Grid: G033	
MD: Fragment (1"x3")		Grid: G128	
MD: Fragment (1"x3")		Transect: O31-O32	
MD: Fragment (1"x2"x3")		Grid: G039	
MD: Fragment (1"x2"x1")	0.1	Grid: 194-03	
MD: Fragment (1"x2")	0.2	Transect: AR3-AR4	
MD: Fragment (1"x2")	0.1	Transect: AR5-AR6	
MD: Fragment (1"x2")		Grid: G032	
MD: Fragment (1"x2")		Grid: G033	
MD: Fragment (1"x1.5")		Grid: G031	
MD: Fragment (1"x1"x3")		Grid: G039	
MD: Fragment (1"x1")	0.1	Transect: AR2-AR3	
MD: Fragment (1"x1")		Grid: G031	
MD: Fragment (1" x 2")	0.2	Transect: G12-G12.1	
MD: Fragment (1" x 2")	0.1	Transect: G12-G12.1	
MD: Fragment (1 ½” x 4”)	0.2	Transect: G5-G6	
MD: Fragment (0.5"x1"x2")		Grid: G039	
MD: Fragment	0.1	Grid: 052-15	
MD: Fragment	0.3	Grid: 095-41	
MD: Fragment	0.3	Grid: 095-43	
MD: Fragment	0.3	Grid: 098-23	
MD: Fragment	0.3	Grid: 098-49	
MD: Fragment	0.1524	Grid: 099-03	
MD: Fragment	0.2032	Grid: 099-08	
MD: Fragment	0.2032	Grid: 100-30	

Item	Depth in meters	Southeastern Region Location	UXO
MD: Fragment	0.2	Grid: 102-24	
MD: Fragment	0.2	Grid: 102-30	
MD: Fragment	0.1	Grid: 108-54	
MD: Fragment	0.1	Grid: 108-64	
MD: Fragment	0.2	Grid: 129-08	
MD: Fragment	0.1	Grid: 134	
MD: Fragment	0.1	Grid: 134	
MD: Fragment	0.1	Grid: 144	
MD: Fragment	0.1	Grid: 144	
MD: Fragment	0.1	Grid: 144	
MD: Fragment	0.1	Grid: 150	
MD: Fragment	0.1	Grid: 150	
MD: Fragment	0.1	Grid: 151	
MD: Fragment		Grid: G031	
MD: Fragment		Grid: G143	
MD: Fragment		Transect: DP10-DP11	
MD: Fragment		Transect: K6-K7	
MD: Fragment		Transect: O14-O15	

5.8.2 Site Characteristic Factors - Southeastern Region

5.8.2.1 Southeastern Region - Site Accessibility

The Southeastern Region is bordered by the known southern impact area (and Southern Impact Region) to the west, the Marine Corps parcel to the north and dense vegetation and rugged terrain to the east and south. An access road off of Waikane Valley Road is the main route leading to and running through the Southeastern Region. The entrance to the access road is locked and gated. Although site access is limited by dense vegetation, rugged terrain and a locked and gated access road, the site remains relatively accessible to the public. Many local residents possess keys to the main gate. As for individuals that do not possess a key, the site can be accessed by unauthorized trails and streams located along Kamehameha Highway. Based on Table 5-4, the site accessibility risk level for Southeastern Region is moderate.

5.8.2.2 Southeastern Region - Site Stability

Naturally occurring events, such as flooding, landslides and soil erosion down steep banks has expose MEC in portions of Southeastern Region. MEC items may also be uncovered by owner activities, such as land clearing for horticultural purposes. Due to future nature park construction plans by the Honolulu Parks and Recreational Department, MEC would most likely be exposed to humans, thereby classifying the site as unstable with a high qualitative risk level (See Table 5-5).

5.8.3 Demographic Factors - Southeastern Region

5.8.3.1 Southeastern Region - Site Activities

5.8.3.1.1 The local population currently uses Southeastern Region for recreational activities such as hunting wild boar and other game. In addition, the local population utilizes the access road to visit a memorial in the mid-west portion of Southeastern Region. There are also various sections within Southeastern Region that is used for recreation by moto-cross and All Terrain Vehicles (ATVs) enthusiasts, which is a ground disturbing activity penetrating up to 12-inches bgs. It is anticipated that a few acres of light agricultural use will continue within the valley with a current landowner operating a nursery growing native plants.

5.8.3.1.2 As described in Section 2.4.1, the City and County of Honolulu has future plans of constructing a park in portions of Southeastern Region. These plans include: establishing trails, rest and picnic areas, lookouts to view surrounding landmarks of the site, a ceremonial gathering place (Halau), re-vegetation areas for native plants, stream ecology study areas, ponds for aquatic wildlife studies, agricultural fields, parking areas and a visitor orientation area.

5.8.3.1.3 Depth of MEC items found (Section 5.8.1.5), in conjunction with the type of activities engaged in on site, determine the Site Activities Risk Factor for each item. Two 81mm HE mortars, classified as UXO, have depths of 0.2 meters (7.87 inches) bgs justifying a moderate site activity risk level. The three 60mm HE mortars were located at 0.2, 0.3 and 0.4 meters bgs also results in a moderate qualitative risk level. Each qualitative risk level determination is based on Table 5-6.

5.8.3.2 Southeastern Region - Site Population

Currently, there is a moderate accessibility and public use of Southeastern Region (see Site Activities, Section 5.8.3.1). Based future plans for a nature park, there could be an increase in population and high frequency of area usage. However, at present the Site Population Risk Factor is determined to be Moderate, based on Table 5-7.

5.8.4 Baseline Risk Impact Assessment - Southeastern Region

Because surface UXO was found less than 1 foot bgs in Southeastern Region, and the types of activities occurring and/or will occur in this area, it is likely that individuals would be exposed to MEC during area activities. Since the level of risk associated with the type and sensitivity of MEC at the site is high, the MEC hazard to the exposed individual is high. Although the site access is currently moderate, the depths of MEC found and the future subsurface activities planned, contribute to the high overall hazard level within Southeastern Region of the former Waikane Valley Training Area. The summary of risk factors for Southeastern Region of the former Waikane Valley Training Area is located on Table 5-10.

TABLE 5-10 SUMMARY OF RISK FACTORS – SOUTHEASTERN REGION

	MEC DISCOVERED	QUALITATIVE RISK LEVEL	OVERALL SITE MEC HAZARD LEVEL
MUNITIONS AND EXPLOSIVES OF CONCERN FACTORS	Type: (2) 81mm HE mortars (3) 60mm HE mortars	High	High
	Sensitivity	High	
	Site Density*	4.3 MEC & HE MD/acre	
	Depth Range (bgs)	0.2 to 0.4 meters	
SITE FACTORS	Access	Moderate	
	Stability	High	
DEMOGRAPHIC FACTORS	Activity	Moderate	
	Population	Moderate	

* Based on five MEC and 149 HE MD Items (potentially from HE ordnance) found over 36.22-acres during the EE/CA investigation (a total of 158 MD items were found).
bgs = below ground surface

5.9 SOUTHERN IMPACT REGION WITHIN FORMER WAIKANE VALLEY TRAINING AREA – SITE RISK EVALUATION

Results of the evaluation of the Southern Impact Region within the former Waikane Valley Training Area are summarized in Table 5-12. A discussion of each risk factor for the Southern Impact Region within the former Waikane Valley Training Area is provided in the following subsections.

5.9.1 Presence of MEC Factors

5.9.1.1 Southern Impact Region - Type of MEC

During the EE/CA investigation, two MEC items were discovered and documented in the Southern Impact Region of the site. UXO found in the Southern Impact Region during the EE/CA investigation includes two 37mm HE rounds. One 3.5-inch rocket was discovered in the

Southern Impact Region, however; due to the condition of the 3.5-inch rocket, it could not be determined if it was practice or HEAT. After the rocket was destroyed in place, it was determined that it was an inert practice round and classified as MD. The two UXO items are classified as presenting a High MEC Type Qualitative Risk based on Table 5-1.

5.9.1.2 Southern Impact Region - Sensitivity of MEC

The two 37mm rounds are highly sensitive to movement and extreme heat, thus producing a High MEC Sensitivity Risk Level as described in Table 5-2. Numerous 7.62mm and 5.56mm rounds were also found, but do not have a MEC sensitivity risk associated.

5.9.1.3 Southern Impact Region - MEC Exposure Potential

Because the Southern Impact Region was a former impact area and UXO items were discovered in this site investigation, the potential for exposure to MEC in the Southern Impact Region within the former Waikane Valley Training Area is high, as described in Table 5-3.

5.9.1.4 Southern Impact Region - Quantity or Density

All UXO and MD items found in the Southern Impact Region of the former Waikane Training Area were between elevations 155 and 420 feet of the 90-acre area. ZAPATA recovered two UXO items and 13 MD items from the 10.24 acres sampled (Figure 4-3). During the intrusive investigation, approximately seven pounds of MD were removed from the Southern Impact Region.

5.9.1.5 Southern Impact Region - Depth Distribution

Based on the dig results, depths of the two UXO and 13 MD items ranged from 0 to 0.2 meters (8 inches) bgs and 0.3 meters (12 inches) bgs, respectively. The average depth of all UXO and MD items in the Southeastern Region is 0.179 meters (7 inches) below ground surface. Table 5-11 provides a description of the recovered items, depth and location at which the item was found.

TABLE 5-11 SUMMARY OF MEC ITEMS – SOUTHERN IMPACT REGION

Item	Depth in meters	Southern Impact Region Location	UXO
UXO: 37mm Projectile, MKII	0.1524	Transect: B6G-I1	✓
UXO: 37mm Projectile, M63	0.2	Grid: G62	✓
MD: Trip Flare	0.2	Transect: D8-D9	
MD: M51 Series Fuze	0.2	Grid: G63	
MD: M48 Series Fuze	0.15	Grid: G142	
MD: Fragment/Fuze Components	0.3	Grid: G66	
MD: Fragment (Mortar)	0.15	Grid: G159	
MD: Fragment (6”x2”x1”)	0.2	Grid: G169	
MD: Fragment (4”x1”x1”)	0.3	Grid: G169	
MD: Fragment (2”x3”x1”)	0.2	Grid: G66	
MD: Fragment (2”x2”x3”)	0.2	Transect: H5-H6	
MD: Fragment (2”x1”x3”)	0.2	Transect: H2-H3	
MD: Fragment (2”x1”)	0.2	Grid: G165	
MD: Fragment	0.1	Transect: D4-D5	
MD: 3.5-inch Rocket	0	Grid: G168	

5.9.2 Site Characteristic Factors - Southern Impact Region

5.9.2.1 Southern Impact Region - Site Accessibility

Southern Impact Region is the known impact area bordered by Southeastern Region to the east, the Marine Corps parcel to the north dense vegetation and rugged terrain to the east and south. An unimproved dirt road also borders Southern Impact Region to the north. Due to the treacherous, rugged terrain and dense vegetation, the site is relatively inaccessible to the public. Based on Table 5-4, the site accessibility risk level for Southern Impact Region is moderate.

5.9.2.2 Southern Impact Region - Site Stability

Naturally occurring events, such as flooding, landslides, and soil erosion have exposed MEC in portions of Southern Impact Region, thereby classifying the site as unstable with a high qualitative risk level (See Table 5-5).

5.9.3 Demographic Factors - Southern Impact Region

5.9.3.1 Southern Impact Region - Site Activities

5.9.3.1.1 The local population currently uses Southern Impact Region for recreational activities such as hunting and hiking. Off-road driving is difficult due to the very coarse terrain and dense vegetation. The City and County of Honolulu plans to construct a park mainly in Southeastern Region of the site, however; it is possible that they may construct hiking trails to archaeological sites located within Southern Impact Region.

5.9.3.1.2 Depth of MEC items found (Section 5.8.1.5), in conjunction with the type of activities engaged in on site, determine the Site Activities Risk Factor for each item. The two 37mm HE rounds are located at 0.1524 and 0.2 meters bgs. Current use of the property results in

a moderate Qualitative Risk Level. The future construction plans result in a high Qualitative Risk Level. Each Qualitative Risk Level determination is based on Table 5-6.

5.9.3.2 Southern Impact Region - Site Population

Currently, there is a moderate accessibility and public use of Southern Impact Region (see Site Activities, Section 5.8.3.1). However, due to future plans for a nature park, there could be an increase in population and high frequency of area usage. The Site Population Risk Factor is determined to be moderate, based on Table 5-7.

5.9.4 Baseline Risk Impact Assessment - Southern Impact Region

Because surface UXO was found less than one foot bgs in Southern Impact Region, and the types of activities occurring and will occur in this area, it is likely that individuals would be exposed to MEC during area activities. Since the level of risk associated with the type and sensitivity of MEC at the site is high, the MEC hazard to the exposed individual is high. Although the site access is currently moderate, the depths of MEC found and the future subsurface activities planned, contribute to the high overall hazard level within Southern Impact Region of the former Waikane Valley Training Area. The summary of risk factors for Southern Impact Region of the former Waikane Valley Training Area is located on Table 5-12.

TABLE 5-12 SUMMARY OF RISK FACTORS – SOUTHERN IMPACT REGION

	MEC DISCOVERED	QUALITATIVE RISK LEVEL	OVERALL SITE MEC HAZARD LEVEL
MUNITIONS AND EXPLOSIVES OF CONCERN FACTORS	Type: (2) 37mm rounds	High	High
	Sensitivity	High	
	Site Density*	1.3 MEC & HE MD/acre	
	Depth Range (bgs)	0.1524 to 0.2 meters	
SITE FACTORS	Access	Moderate	
	Stability	High	
DEMOGRAPHIC FACTORS	Activity	Moderate	
	Population	Moderate	

* Based on two MEC and 11 HE MD Items (potentially from HE ordnance) found over 10.24-acres during the EE/CA investigation (a total of 13 MD items were found).
bgs – Below Ground Surface

5.10 WESTERN REGION WITHIN FORMER WAIKANE VALLEY TRAINING AREA – SITE RISK EVALUATION

Results of the evaluation of the Western Region within the former Waikane Valley Training Area are summarized in Table 5-13. A discussion of each risk factor for the Western Region within the former Waikane Valley Training Area is provided in the following subsections.

5.10.1 Presence of MEC Factors

5.10.1.1 Western Region - Type of MEC

A portion of the northern impact area that extends over into Waikane Valley from the Marine Corps parcel is located in the northeast portion of the Western Region. During the EE/CA investigation there was no MEC and a single isolated piece MD encountered in the Western Region. The piece of MD was a fragment from a high explosive round leading to a High MEC Type Qualitative Risk Level based on Table 5-1.

5.10.1.2 Western Region - Sensitivity of MEC

No MEC and one piece of MD was discovered in the Western Region. It is expected that the MD originated in the Southern Impact Region because it was isolated and within 500 feet of the Southern Impact Region. It was, however, found in the Western Region resulting in a High MEC Sensitivity Risk Level. The sensitivity must be assumed high because the contributing ordnance is unknown. Additionally, some 7.62mm and 5.56mm rounds were found, but do not have an associated MEC Sensitivity Risk Level.

5.10.1.3 Western Region - MEC Exposure Potential

Because only an MD item was discovered during this site investigation, the potential for exposure to MEC in the Western Region within the former Waikane Valley Training Area is moderate, as described in Table 5-3.

5.10.1.4 Quantity or Density

A single isolated MD item was found in the southeastern corner of the Western Region of the former Waikane Training Area between elevations 205 and 950 feet in an area of approximately 13.93 acres (Figure 4-4). The fragment was within 500 feet and is considered a kick-out from Southern Impact Region. No UXO was found.

5.10.1.5 Depth Distribution

No UXO items were recovered in the Western Region during the EE/CA field investigation. The single MD item was found at a depth of 0.05 meters (2 inches).

5.10.2 Site Characteristic Factors

5.10.2.1 Site Accessibility

The Western Region is bordered by the Marine Corps parcel and Southern Impact Region to the east and Mountainous Region (and Koolau Mountain Range) to the north, south and west. The access road runs through the Western Region, however; it is nearly impossible to travel off-road. This area is relatively inaccessible to the public because of the rugged terrain and dense vegetation. Based on Table 5-4, the site accessibility risk level for the Western Region is moderate.

5.10.2.2 Site Stability

Naturally occurring events, such as flooding, landslides, and soil erosion occur at the site classifying the Western Region as unstable with an associated high qualitative risk level (See Table 5-5).

5.10.3 Demographic Factors

5.10.3.1 Site Activities

5.10.3.1.1 The local population currently uses the Western Region for recreational activities such as hunting and hiking. Again, off-road driving is nearly impossible due to the very coarse terrain and dense vegetation. The City and County of Honolulu uses the access road to gain access to an irrigation canal west of the Western Region, which is outside of the site boundary. The City and County of Honolulu plans to construct a park mainly in Southeastern Region of the site, however; it is possible that they may construct hiking trails throughout the Western Region.

5.10.3.1.2 Since no MEC items were found in the Western Region, and the single MD item is attributed to the Southern Impact Region it is unlikely that an individual will come in contact with MEC or MEC related items. Based on results from the EE/CA investigation; site activities, in conjunction with no MEC items found, yield a Low Qualitative Risk Level. The Qualitative Risk Level determination is based on Table 5-6.

5.10.3.2 Site Population

Currently, there is a moderate accessibility and public use of the Western Region. Due to future plans for a nature park, there could be an increase in population and high frequency of area usage. However, the Site Population Risk Factor is currently moderate, based on Table 5-7.

5.10.4 Baseline Risk Impact Assessment

While the MEC Type and Sensitivity Qualitative Risk Levels are High, and Site Access and Population Moderate, no MEC was discovered in the Western Region. The single piece of MD (frag) was within 500 feet of the Southern Impact Region and is considered a kick-out from a detonation from within the Southern Impact Region because of the MD's proximity to the Southern Impact Region, it's isolation, and the fact that no other evidence of high explosive was nearby. The resulting Overall Site MEC Hazard Level is Low. The summary of risk factors for the Western Region of the former Waikane Valley Training Area is located on Table 5-13.

TABLE 5-13 SUMMARY OF RISK FACTORS – WESTERN REGION

	MEC DISCOVERED	QUALITATIVE RISK LEVEL	OVERALL SITE MEC HAZARD LEVEL
MUNITIONS AND EXPLOSIVES OF CONCERN FACTORS	Type: None	High	Low
	Sensitivity	High	
	Site Density*	<0.1 MEC & HE MD/acre	
	Depth Range (bgs)	0.05m	
SITE FACTORS	Access	Moderate	
	Stability	High	
DEMOGRAPHIC FACTORS	Activity	Low	
	Population	Moderate	

* Based on one HE MD Item (potentially from HE ordnance) found over 13.93-acres during the EE/CA investigation (a total of one MD item was found).
bgs – Below Ground Surface

5.11 MOUNTAINOUS REGIONS WITHIN FORMER WAIKANE VALLEY TRAINING AREA – SITE RISK EVALUATION

Results of the evaluation of the Mountainous Region are summarized in Table 5-14. A discussion of each risk factor for the Mountainous Region is presented in the following subsections.

5.11.1 Presence of MEC Factors

5.11.1.1 Mountainous Region - Type of MEC

During the EE/CA investigation, no MEC/MD items were found. As such the MEC Risk is classified as none, as described in Table 5-1.

5.11.1.2 Mountainous Region - Sensitivity of MEC

Since no MEC/MD items were found, the MEC sensitivity risk level is classified as none, as described in Table 5-2.

5.11.1.3 Mountainous Region - MEC Exposure Potential

Because no MEC/MD items were found, the potential for exposure to MEC in the Mountainous Region within the former Waikane Valley Training Area is low, as described in Table 5-3.

5.11.1.4 Quantity or Density

No MEC/MD was found during the EE/CA investigation while sampling 8.74 acres of the 534-acre site.

5.11.1.5 Depth Distribution

No MEC/MD items were found in this region.

5.11.2 Site Characteristic Factors

5.11.2.1 Site Accessibility

The Mountainous Region is mainly composed of the Koolau Mountain Range. It is bordered by the Marine Corps parcel and Western Region to the east and Koolau Mountain Range Ridgeline to the north, west, and south. The Mountainous Region is only accessible by foot. This area is relatively inaccessible to the public because of the rugged terrain and dense vegetation. Based on Table 5-4, the site accessibility risk level for the Mountainous Region is moderate.

5.11.2.2 Site Stability

Naturally occurring events, such as flooding, landslides, and soil erosion occur at the site classifying the Mountainous Region as unstable with an associated high qualitative risk level (See Table 5-5).

5.11.3 Demographic Factors

5.11.3.1 Site Activities

5.11.3.1.1 The Mountainous Regions encompasses approximately 534 acres of the former Waikane Valley Training Area and is mainly characteristic of mountain ranges with elevations ranging from 525 feet to over 2,090 feet above sea level. The area is isolated by terrain and vegetation limiting potential site activities to hunting and hiking. The City and County of Honolulu plans to construct a park mainly in Southeastern Region of the site, however; it is possible that they may construct hiking trails within portions of the Mountainous Region.

5.11.3.1.2 Since no MEC/MD items were found in the Mountainous Region, and site activities are limited to hunting and hiking, it is unlikely that an individual will come in contact with MEC. The resulting Site Activities Qualitative Risk Level is Low, based on Table 5-6.

5.11.3.2 Site Population

Local use of the Mountainous Region is very limited. The public has access to the land, but terrain and vegetation act as natural barriers resulting in a Low Site Population Qualitative Risk Factor, based on Table 5-7.

5.11.4 Baseline Risk Impact Assessment

Neither MD nor MEC were found in this region. Although MEC items were not found at this site, if present, MEC could be exposed because of site stability. However, considering the types

of activities occurring and since no MEC were found, the MEC Hazard Level is low. The summary of risk factors for the Mountainous Region is located on Table 5-14.

TABLE 5-14 SUMMARY OF RISK FACTORS – MOUNTAINOUS REGION

	MEC DISCOVERED	QUALITATIVE RISK LEVEL	OVERALL SITE MEC HAZARD LEVEL
MUNITIONS AND EXPLOSIVES OF CONCERN FACTORS	Type: None	None	Low
	Sensitivity	None	
	Site Density*	None	
	Depth Range (bgs)	None	
SITE FACTORS	Access	Moderate	
	Stability	High	
DEMOGRAPHIC FACTORS	Activity	Low	
	Population	Low	

* No MEC or HE MD Items (potentially from HE ordnance) were found over 8.74-acres during the EE/CA investigation.
bgs – Below Ground Surface

5.12 REMOVAL ACTION ALTERNATIVE EVALUATION

Each alternative discussed below is assigned an impact evaluation score using a alphabetic rank from "A" to "D" representing the relative impact of the response-action alternative, with "A" having the highest relative impact and "D" having no impact. The comparisons, as seen in Tables 5-15 through 5-18, provide a qualitative indication of the change in the potential for harm and level of protectiveness at the area for each response-action alternative that could be implemented and is independent of costs associated with each alternative.

5.12.1 Alternative 1: No Department of Defense Action Indicated (NDAI)

The NDAI alternative is included to provide a baseline comparison with other risk-reduction alternatives. No technology is associated with this alternative, which is synonymous with the "No DOD Action Indicated" choice. No risk-reduction measure resulting in the treatment, containment, removal of or limited exposure to MEC will be implemented. Therefore, potential MEC will not be removed and no restriction will be placed on access to the site. The NDAI alternative is appropriate for sites where no MEC has been found, where there is no documented

evidence of MEC usage, or where the nature and extent of the MEC occurrence poses minimal threat to those who may encounter the items.

5.12.2 Alternative 2: Institutional Controls

This alternative utilizes education and land-use restrictions to minimize exposure of area users to MEC. Institutional Controls rely on behavior modification and site-access control strategies to eliminate or minimize risk. Institutional Control strategies including educational programs (e.g., informational pamphlets and depiction of site hazards) and/or physical site-access controls, are appropriate where risk to the public has been documented as low to moderate, and can be managed without the removal of MEC. With the exception of digging for signpost installation, intrusive activity is not typically associated with this alternative. Such controls can be implemented with low capital cost and low subsequent annual operating costs.

5.12.3 Alternative 3: Surface Clearance

This alternative involves UXO technicians who are trained to perform a visual inspection of the entire surface of the area, to recognize, handle, and dispose of ordnance, and to remove MEC from the ground surface. The UXO technicians are responsible to ensure proper disposal of the recovered material. This alternative is effective in minimizing the risk of incidental contact with MEC in areas where intrusive activities are not likely.

5.12.4 Alternative 4: Clearance to Detectable Depth

5.12.4.1 This alternative involves all activities necessary to fully locate excavate and remove MEC to a depth consistent with the geophysical instrument's maximum depth of detection. Activities may potentially include vegetation clearance as necessary to conduct geophysical surveys, completion of geophysical investigations, excavation of anomalies and destruction of MEC. Technologies that may be used for this alternative include magnetic and/or electromagnetic geophysical investigative methods and management/disposal of MEC (including detonation of UXO). This alternative includes surface clearance over the entire site and excavation and removal in suspected impact areas.

5.12.4.2 The overall OERIA hazard level for Southeastern Region and Southern Impact Region within the former Waikane Valley Training Area is ranked high, while the hazard level for Western Region and the Mountainous Regions is ranked low. This conclusion was reached through evaluations of each area, as supported by criteria outlined in the March 27, 2001 Interim Guidance for OERIA. MEC and MD were discovered in Southeastern Region and Southern Impact Region during the Ground Reconnaissance, EE/CA investigation and prior field investigations. The Southeastern Region and Southern Impact Region reflect a high MEC exposure potential, which suggests a greater likelihood of injury to persons who may come into contact with UXO.

TABLE 5-15 OE RISK IMPACT ASSESSMENT – SOUTHEASTERN REGION

ALTERNATIVES[A]	MEC FACTORS[B]				SITE CHARACTERISTICS[C]		HUMAN FACTORS[D]		OVERALL RANK
	TYPE	SENSITIVITY	DENSITY	DEPTH	ACCESS	STABILITY	ACTIVITY	POPULATION	
Baseline Risk Assessment (Existing Conditions)	High	High	4.3 MEC & HE MD/acre	0.2 to 0.4m	Moderate	High	Moderate	Moderate	High
No DOD Action Indicated	D	D	D	D	D	D	D	D	D
Institutional Controls	D	D	D	D	A	D	A	A	C
Surface Clearance	B	B	B	B	D	D	C	D	B
Clearance to Detectable Depth	A	A	A	A	D	D	B	D	A

bgs = Below Ground Surface.
a Each alternative is assigned an impact evaluation score with "A" having the highest relative impact and "D" having no impact.
b MEC factors are discussed/defined in Section 5.2.
c Site Characteristics are discussed/defined in Section 5.3.
d Human Factors are discussed/defined in Section 5.4.

TABLE 5-16 OE RISK IMPACT ASSESSMENT – SOUTHERN IMPACT REGION

ALTERNATIVES[A]	MEC FACTORS[B]				SITE CHARACTERISTICS[C]		HUMAN FACTORS[D]		OVERALL RANK
	TYPE	SENSITIVITY	DENSITY	DEPTH	ACCESS	STABILITY	ACTIVITY	POPULATION	
Baseline Risk Assessment (Existing Conditions)	High	High	1.3 MEC & HE MD/acre	0.1524 to 0.2 meters	Moderate	High	Moderate	Moderate	High
No DOD Action Indicated	D	D	D	D	D	D	D	D	D
Institutional Controls	D	D	D	D	A	D	A	A	C
Surface Clearance	B	B	B	B	D	D	C	D	B
Clearance to Detectable Depth	A	A	A	A	D	D	B	D	A

bgs = Below Ground Surface.
a Each alternative is assigned an impact evaluation score with "A" having the highest relative impact and "D" having no impact.
b MEC factors are discussed/defined in Section 5.2.
c Site Characteristics are discussed/defined in Section 5.3.
d Human Factors are discussed/defined in Section 5.4.

TABLE 5-17 OE RISK IMPACT ASSESSMENT – WESTERN REGION

ALTERNATIVES[A]	MEC FACTORS[B]				SITE CHARACTERISTICS[C]		HUMAN FACTORS[D]		OVERALL RANK
	TYPE	SENSITIVITY	DENSITY	DEPTH	ACCESS	STABILITY	ACTIVITY	POPULATION	
Baseline Risk Assessment (Existing Conditions)	High	High	<0.1 MEC & HE MD/acre	0.05m	Moderate	High	Low	Moderate	Low (MD attributed to adjacent Region)
No DOD Action Indicated	D	D	D	D	D	D	D	D	D
Institutional Controls	D	D	D	D	A	D	A	A	A
Surface Clearance	B	B	B	B	D	D	C	D	D
Clearance to Detectable Depth	A	A	A	A	D	D	B	D	D

bgs = Below Ground Surface.
a Each alternative is assigned an impact evaluation score with "A" having the highest relative impact and "D" having no impact.
b MEC factors are discussed/defined in Section 5.2.
c Site Characteristics are discussed/defined in Section 5.3.
d Human Factors are discussed/defined in Section 5.4.

TABLE 5-18 OE RISK IMPACT ASSESSMENT – MOUNTAINOUS REGION

ALTERNATIVES[A]	MEC FACTORS[B]				SITE CHARACTERISTICS[C]		HUMAN FACTORS[D]		OVERALL RANK
	TYPE	SENSITIVITY	DENSITY	DEPTH	ACCESS	STABILITY	ACTIVITY	POPULATION	
Baseline Risk Assessment (Existing Conditions)	None	None	None	None	Moderate	High	Low	Low	Low
No DOD Action Indicated	D	D	D	D	D	D	D	D	D
Institutional Controls	D	D	D	D	A	D	A	A	A
Surface Clearance	B	B	B	B	D	D	C	D	D
Clearance to Detectable Depth	A	A	A	A	D	D	B	D	D

bgs = Below Ground Surface.
a Each alternative is assigned an impact evaluation score with "A" having the highest relative impact and "D" having no impact.
b MEC factors are discussed/defined in Section 5.2.
c Site Characteristics are discussed/defined in Section 5.3.
d Human Factors are discussed/defined in Section 5.4.

6.0 IDENTIFICATION OF RESPONSE ACTION ALTERNATIVES AND EVALUATION

6.1 IDENTIFICATION OF RESPONSE ACTION ALTERNATIVES

6.1.1 The four MEC response action alternatives identified and evaluated in this EE/CA report were developed in response to conditions identified in Chapter 5.0 by reducing public interaction with MEC. These alternatives were selected because they provide discernible variability in their potential effectiveness, implementability, and cost and they are consistent with other ordnance sites throughout the United States. These alternatives are:

- Alternative 1: No DOD Action Indicated (NDAI);
- Alternative 2: Institutional Controls (engineering controls, educational programs, legal mechanisms, and construction support);
- Alternative 3: Surface Clearance; and
- Alternative 4: Clearance to Detectable Depth.

6.1.2 Implementation of the NDAI alternative would involve no site-specific work. Implementation of Institutional Controls focuses on separating the public from MEC and educating the public to recognize the hazards associated with MEC. MEC clearance alternatives include implementation of technologies for efforts associated with removal of MEC from the surface and subsurface (i.e., Surface Clearance and Clearance to Detectable Depth). A combination of institutional controls and surface/subsurface clearance can also be implemented at the sites based upon the presence of UXO and the current and future land use. For example, institutional controls can be implemented to effectively manage residual risk that may remain once a surface clearance has been conducted.

6.1.1 Alternative 1: No DOD Action Indicated

Surface and subsurface MEC removal would not occur under this alternative, which does not include any US Army -initiated actions under current or projected future land use. However, NDAI indicates that the FUDS program will review any new information regarding DOD activities as it becomes available. If munitions are discovered in the future, the USACE will reconsider the status of the property. NDAI is indicative of a determination that is open to further and future review of an area.

6.1.2 Alternative 2: Institutional Controls

6.1.2.1 Institutional controls protect property owners and the public from hazards present at a site by warning of the MEC hazard and/or limiting the access or use of a site. Institutional controls include engineering controls, educational programs, legal mechanisms, and construction support. The overall effectiveness of institutional controls depends entirely on local agencies and private landowner support, involvement, and willingness to enforce and maintain institutional controls implemented to eliminate public interaction with MEC.

6.1.2.2 An Institutional Analysis was performed to identify local agencies and private landowners and determine how institutional controls could be implemented at the former Waikane Valley Training Area. The analysis identified which, if any, of the described institutional controls were applicable and which agencies or entities would be responsible for

implementing, maintaining, or enforcing the institutional controls. The following paragraphs describe in detail the four types of institutional controls.

6.1.3 Engineering Controls

6.1.3.1 Engineering controls either limit the public's access to a site or limit the public's exposure to the residual contamination that remains on a site to an acceptable level. Engineering controls can take on many forms and are often developed to meet the specific conditions of a site. Engineering controls are most effective when implemented in conjunction with other types of institutional controls (e.g., educational programs, construction support), rather than as stand-alone mechanisms.

6.1.3.2 When using engineering controls to limit the public's exposure to MEC, the current land use of the area around the contaminated site must be considered. For example, if residential areas, schools, or playgrounds surround the property, or if the public frequents the property, the potential for exposure and adverse consequences is increased and, therefore, a higher level of access control would be necessary. Examples of engineering controls that have historically been effective in limiting access and reducing exposure to MEC are warning signs, fences, security patrols, and soil caps.

6.1.3.3 Engineering controls protect against inadvertent access or exposure to the hazards associated with a site. They have the advantage of being passive (i.e., once they are in place they do not require human interaction to provide notice or protection, other than to maintain the integrity of the control). Another advantage of engineering controls is that they provide a direct deterrent to those who are the most likely to come into contact with a contaminated area by either limiting access or providing a warning describing the nature of the hazards posed by a contaminated site. Engineering controls are an important part of institutional control programs in areas where it is particularly important to protect against inadvertent access, such as in areas where it can be expected that children will be in the vicinity. Engineering controls require routine inspection and maintenance in order to remain effective.

6.1.3.1 Warning Signs

6.1.3.1.1 Warning signs can be used to provide notice and information regarding the MEC hazard present at a site. Warning signs provide the following information:

- Nature of the MEC hazard;
- How to avoid the MEC hazard; and
- Who to contact for additional information.

6.1.3.1.2 Warning signs installed on posts or warning signs affixed to existing or added fencing can be used to deter access to a site or give notice so that inappropriate uses of the site are avoided.

6.1.3.1.3 While warning signs on posts may not provide the physical barrier of a fence, a warning sign has the added benefit of providing information to the public concerning the nature of the MEC hazard present at a site in areas where fencing may not be optional.

6.1.3.1.4 Warning signs on posts can be installed at all major access points of entry and/or along the perimeter fencing of an MEC site. There has been considerable debate whether warning signs are an effective means of communicating safety hazards at an MEC site, or if they actually encourage scavenging of MEC items. Given the potential for an otherwise unwary public to access an area containing MEC, and given the current trend in legal liability cases involving injury and death, warning signs communicating a hazard to the public are useful and have been proven effective at similar MEC sites throughout the United States. The posted warning signs will inform the public of potential safety hazards and communicate the following information:

- Why a safety hazard exists in the context of the history of the military installation or training area;
- How to avoid encountering an MEC item (e.g., by staying within picnic or campground areas or on specified roads and trails where MEC has been removed, and by avoiding access and/or excavation in areas of suspected MEC); and
- What to do and whom to contact if an MEC item is encountered.

6.1.3.2 Fences

6.1.3.2.1 Fences are probably the most common type of engineering control that has historically been used to limit public access to an MEC site. Fences are used to restrict inadvertent public entry to a site that poses a threat to human safety. By providing access only at certain points of entry, appropriate notice can be given to all users and uses incompatible with the existing site conditions.

6.1.3.2.2 Fences can physically restrict access to a site and can vary in effectiveness based upon the type and height of the fence installed. Generally speaking, the more substantial a fence, the more effective it is (i.e., a wall is more effective than a barbed-wire fence). Taller fences are considered to be more effective at restricting access than shorter fences. Fences are considered for use in areas where MEC is present and where public access to MEC would likely result in potential exposures. At sites where the risk of MEC exposure is low, fencing may not be necessary. Generally, fences would not be appropriate as a permanent method of exposure prevention because they require continual maintenance and repair, and a determined individual can overcome even the best of fences. A barbed-wire fence affixed with warning signs is considered an effective temporary measure to restrict access to MEC sites. This type of fence would prevent individuals from inadvertently accessing an MEC site.

6.1.3.2.3 Barricades can be of value when closing roads or trails that access MEC sites. Barricades consist of locking gates that limit or preclude public access. Other forms of barricades, including rock barriers or densely vegetated areas, can also be effective in blocking road/trail access. As with fences, barricades are generally more effective when combined with warning signs.

6.1.3.3 Security Patrols

Security patrols can be instituted by the entity having jurisdiction over an individual area and would involve law enforcement authorities or private security firms. In order to be effective, regulations regarding site access would have to be implemented and then enforced by the entity

having jurisdiction over that area. Private entities could restrict trespassing through a combination of local police and private security firms.

6.1.3.4 Soil Caps

Placing a cap on a contaminated site by covering it with concrete, asphalt, or clay has been proven to be an effective physical barrier to public exposure to certain types of residual contamination. Such an engineering control would have definite application for certain MEC-contaminated sites, if the cap were combined with a restriction on any future excavation at the site. By combining the engineering control of the cap with the legal restriction of limiting future use, the risk of the public coming into contact with MEC is virtually eliminated.

6.1.3.5 Educational Programs

6.1.3.5.1 The use of educational programs is an effective strategy to manage and reduce residual risk from public exposure to MEC. An educational program may take on many forms and be easily tailored to meet the specific needs of a site and the surrounding community. Examples of educational programs include formal education seminars and public notices.

6.1.3.5.2 Educating the local community is an extremely important part of any institutional control program. Generally, if people are aware of and understand the hazards associated with an MEC-contaminated site, they will take the necessary precautions to avoid exposure. Education programs can be tailored to meet the specific needs of a particular audience (e.g., local homeowners, school children, regulators, and developers) and can be performed as often as necessary to educate those that are at greatest risk for exposure to MEC. Educational efforts constitute a stand-alone institutional control, but can also improve the effectiveness of other controls that are part of the overall program.

6.1.3.6 Formal Education Seminars

Formal education seminars may include periodic community education classes. The classes can be given to a number of different audiences including open public forums, local government and/or regulatory personnel, emergency response personnel, property owners, private developers and real estate agents, children at the local schools, and local business personnel who may have laborers who work in the area of concern. The training seminars can be tailored to meet the specific interests/concerns of the audience, and can be an effective method to "spread the word" as to the nature and extent of the hazards associated with MEC and the precautions to be taken in the event that a person comes in contact with MEC. The training classes may either be provided by personnel knowledgeable in the specific conditions of the site or through the distribution of MEC safety awareness training videos to local organizations and public libraries. In order to be effective, educational seminars need to be continual (e.g., every 6 months) so that the audience of concern does not forget or become complacent about the hazards associated with MEC. Formal education seminars that are consistently performed are successful in educating new homeowners and visitors to the area.

6.1.3.7 Public Notices

The local community can be educated through the implementation of a wide-ranging public notice campaign that may include mass mailings of informational pamphlets, display case installation, public service announcements on local radio or television stations, or periodic

notices in local newspapers. This type of educational media will serve to educate the local community and visitors to the area. One method that has been used at sites with a high public turnover rate is to notify any new residents/businesses to the area once they have contacted the local utility to start a new service. Once the utility company has received the request for the new service, they can include in their initial mailing to the new customer a brochure outlining the site-specific hazards and what should be done in the event of an emergency. The following paragraphs provide details concerning various types of public notices that can be used to educate and inform local communities.

6.1.3.8 Real Estate Environmental Notices

Some state codes require real estate disclosure statements on residential real property proposed for transfer. These state codes usually require disclosure of matters relating to the physical condition of the property to be transferred, including the known presence of hazardous materials or substances.

6.1.3.9 Community Awareness Meetings

Community awareness meetings are generally held when significant site remediation documents that address MEC issues are released to the public and provide information regarding:

- MEC previously recovered at the site;
- Options available to remove ordnance (if required) and enhance public safety;
- How this information was evaluated in the EE/CA report; and
- Recommendations being made to address ordnance issues at a particular site.

6.1.3.10 Media Advertisements and Information Spots

Media advertisements and information spots can be important tools in promoting public awareness regarding MEC issues at a site. Media advertisements can include newspaper, radio, and television interviews. Although the media is generally limited in terms of the depth of information portrayed, it does have the advantage of reaching the widest possible audience.

6.1.3.11 Display Cases

Display cases can be positioned throughout the area of concern with emphasis on local public gathering areas (e.g., post offices, schools, libraries, and shopping centers). Display cases can showcase the types of ordnance used at the site, provide visual schematics/photographs that can be used to educate the public concerning the hazards associated with MEC, and provide information concerning whom to contact if MEC is found. Display cases typically provide a distribution slot for informational pamphlets/fact sheets that can be picked up by the public.

6.1.3.12 Informational Pamphlets, Fact Sheets, and Letter Notifications

Informational pamphlets and fact sheets can be developed and distributed to support safety briefings and/or speaking engagements and are also effective as stand-alone educational materials. Informational pamphlets and fact sheets can be developed to warn the public of the hazards of ordnance in the historical context of former military operations that occurred at an MEC site. Informational pamphlets and fact sheets can be mailed to residents in the vicinity of an MEC site or they can be distributed from central locations such as libraries, or posted on educational display cases positioned at strategic locations throughout the site (e.g., hiking trailheads and local libraries). In that regard, an effective informational pamphlet or fact sheet

will contain photographs and/or drawings of typical ordnance items that the public might encounter and previously recovered MEC site locations on a map. A telephone number for the appropriate local authority is typically included in the informational pamphlet or fact sheet. Letter notifications (generally distributed via US certified mail) are also an effective means of informing local property owners of the results of the EE/CA investigation and the types of ordnance that have been found surrounding their property. Letter notifications can be mailed to each landowner within an MEC site to inform them of the EE/CA investigation results and the proposed recommendations for the area. The initial distribution and development of educational materials would be funded by the USACE. Long-term implementation would be the responsibility of landowners and local agencies.

6.1.3.13 Internet

As the general public's use of the Internet increases, a Web site can become a valuable public information tool, allowing the reader greater proficiency in understanding MEC issues. Web sites are accessible through public Web browsers in local libraries and educational institutions and via Web browsers in the home or workplace. Use of a Web site has several benefits: a large amount of information can be posted (e.g., public notices, news releases, fact sheets, maps, reports, survey results) and the information can be updated on a regular basis.

6.1.4 Legal Mechanisms

6.1.4.1 Specific legal approaches including easements, restrictive covenants, reversionary interests, zoning, permitting, siting restrictions, and overlay zoning have been used for many purposes other than limiting exposure to environmental risks such as MEC. Legal mechanisms are particularly effective types of institutional controls due to the following:

- Other than periodic monitoring necessary for enforcement, legal mechanisms do not require the physical maintenance that is necessary for other types of institutional controls, such as engineering controls; and
- Title recording systems, local planning commissions, and other administrative systems and associated staff already exist in most jurisdictions and can be used to implement a legal mechanism as part of an institutional control program. Additional funding may be required for the administering agency depending on the extent of additional effort required due to the implementation of an institutional control program at a site within their jurisdiction.

6.1.4.2 Legal mechanisms require constant oversight and support in order to remain effective. Administrative programs to implement and enforce legal mechanisms are already in place; however, they are sometimes not effective in protecting against inappropriate land use and should be used in conjunction with other programs. Legal mechanisms are categorized into two broad areas: proprietary controls and local government controls.

6.1.5 Proprietary Controls

6.1.5.1 Proprietary controls are those institutional controls that are associated with ownership of the land and are, therefore, often included in the deed for the land. Proprietary controls are classified as either non-possessory or possessory controls.

6.1.5.2 Non-possessory proprietary controls means the holder of these interests has a right to use or restrict use of a piece of land, but does not have the right to actually possess it. Examples of this type of control include easements, restrictive covenants, and reversionary interests.

6.1.5.3 A possessory proprietary control means that the holder of the control retains either a full or partial interest in the future use of the land. Such controls can be achieved either by retaining ownership or by retaining a major share in a joint ownership of a property through a limited partnership with others. Such programs have been used both in the private sector, as well as by the government, where the holder of the possessory proprietary control wishes to retain some say in the future use of a property without having the responsibility of complete and total ownership. Limited partnerships are an example of a possessory proprietary control that has been used in the past to limit future land use.

6.1.5.4 Easements

6.1.5.4.1 The most common non-possessory proprietary control is known as an easement. An easement is an interest in a piece of land that entitles its holder to use the land or restrict the use of the land owned by another. Easements may be categorized as appurtenant or gross, affirmative or negative, or statutory.

- Appurtenant Easement. An easement is considered appurtenant if the holder is the owner of nearby land that benefits from the easement. For example, this occurs when a neighbor is allowed to walk across another person's property to access the beach.
- Gross Easement. A gross easement is one in which the holder, usually a company or public entity, does not own the land, but has the ability to use it. For example, this occurs when a gas company is allowed to lay a gas line on another person's property.
- Affirmative Easement. An affirmative easement allows the holder of the easement to use the land in a way that otherwise they could not. This is the most common type of easement. An example of an affirmative easement is,
- again, the gas company that has the ability to lay a gas line on another person's property.
- Negative Easement. A negative easement prohibits the use of the land in a manner that would otherwise be legal. An example of a negative easement is the owner of a hazardous waste landfill who is prohibited from developing the property for another use because of the current use of the site.
- Statutory Easements. Some states have developed statutory easements, including conservation easements, which restrict the property use to one that is compatible with conservation of the environment or scenery. In the particular case of sites contaminated with MEC, an easement may be enacted that would restrict the new property owner to land uses that are compatible with the level of MEC clearance performed during the removal action.

6.1.5.4.2 As with all proprietary controls, the effectiveness of an easement to control appropriate use of a property containing residual contamination is dependent on the compliance of the property owner with the easement. Generally, only the holder of an easement has the power to enforce compliance with the terms of the easement. This requires that the holder remain aware of activities at the property and is kept informed of any proposed changes in use of the property. If the holder of the easement (e.g., DOD) does not act on a land use violation once

it has been identified, third parties (such as local or county governments) do not have the authority to enforce the easement.

6.1.5.5 Restrictive Covenants

6.1.5.5.1 A restrictive covenant, which is also known as a deed restriction, can be used to prohibit certain types of development, use, or construction on a piece of land where residual contamination does not allow unrestricted use of the property. Under a restrictive covenant, legal action can be taken to enforce the restriction if the new property owner does not abide with the development restrictions imposed at the time of sale or lease. A restrictive covenant may be either affirmative or negative. An example of an affirmative restrictive covenant would be a landowner that is required to do something that they would otherwise not be required to do. An example of a negative restrictive covenant would be a landowner that may not do something that they are otherwise normally free to do.

6.1.5.5.2 Restrictive covenants tend to be a less desirable method of control than easements. Restrictive covenants have been controversial in the past because many were intended to maintain elite neighborhoods and viewed to be racist in their intent. For this reason, many restrictive covenants have been removed by judicial order. In addition, the variability of state property laws tends to be greater for restrictive covenants than for easements, making them more difficult to administer. In general, a covenant does not give the holder the right to enter and inspect the property to ensure that the owner is complying with the covenant. Therefore, an easement or some other agreement should also be agreed upon at the time a covenant is implemented as an institutional control.

6.1.5.6 Reversionary Interests

This type of proprietary control is also known as "future estates." The deed establishes certain conditions that would cause the property to revert back to the original owner if the conditions cited in the reversionary interest are violated. As such, this type of institutional control is like an easement, but with the added provision that if the terms of the institutional control are violated, the property will revert back to the original owner (the holder of the reversionary interest). The existence of a reversionary interest does not, in itself, prevent incompatible land uses, but it does provide the means for stopping the incompatible activities by reverting ownership rights to the original owner if a violation were to occur. Reversionary interests have been effectively used in the past to control future land use on sites that contain environmental contamination. Although a reversionary interest does not prevent inappropriate use of a property, it can serve to halt such activities by reacquisition of the land by the holder of the reversionary interest.

6.1.6 Local Government Controls

Local government controls provide potential avenues for the implementation of institutional controls at sites that are contaminated with MEC. Controls on land use that local governments have the power to impose and enforce include zoning restrictions, permitting programs, siting restrictions, and overlay zoning.

6.1.6.1 Zoning Restrictions

The primary method of locally controlling land use is through the development of zoning ordinances and community master plans. A typical zoning program geographically divides an

area into zones with different regulations written to apply to each zone. The regulations vary between zones but apply equally to all properties within a zone. Generic zoning categories include residential, commercial, and industrial. The zoning restrictions that have been developed by the local zoning board are often posted in a master plan that lays out the type of land use that is allowed in a particular area.

6.1.6.2 Permitting Programs

6.1.6.2.1 Permitting programs are another means that local governments have to limit land use. In establishing a permit program, the permitting agency determines specific conditions that must be met before a certain use or action is allowed on a property. Existing permit programs include building permits, water/sewer connection permits, and state well drilling permitting systems that have been developed to protect the quality and use of groundwater. Permit programs have also been developed to help ensure that site developers are aware of and comply with special procedures that are required in the development of a parcel (e.g., requiring a builder to replace the existing soil on a parcel because of its poor structural characteristics). Historically, permit programs have been developed in areas where special requirements are necessary to protect human safety and the environment because of residual contamination that remains on a property. For example, a permit program can be established for the sites that would require a developer to contact the CEPOH, to provide construction support by clearing the construction footprint of an area (if necessary) prior to excavation for footings or foundations.

6.1.6.2.2 The general protection standard for construction safety in MEC sites identified in this EE/CA report is to maintain a 2-foot buffer (which will have been subjected to MEC excavation and clearance) between the anticipated level of construction disturbance and any potential MEC that may lie below the disturbed site. For this reason, and because of the potential for excavation to occur in small, focused areas, construction support has been identified. Construction support would require anomaly detection and excavation similar to that of a Clearance to Detectable Depth. Each site where construction support is contemplated should be scrutinized to determine whether there is a reasonable potential to expect MEC at depth.

6.1.6.3 Siting Restrictions

Siting restrictions have historically been used to limit land use in areas subject to natural hazards such as earthquakes and floods. This type of control has also been used to protect natural resources from development (such as with the existing wetlands program). Several states and local governments also have substantial siting restrictions in place that limit the future development of properties within their jurisdiction.

6.1.6.4 Overlay Zoning

6.1.6.4.1 Siting restrictions may be combined with local zoning ordinances or master plans to establish an effective institutional control. This practice is known as "overlay zoning." When using overlay zoning, the specific siting restriction is used as an overlay on the local government's master plan, thereby highlighting any discrepancies between the two. In the case of sites contaminated with MEC, the location of the site may be identified on an overlay of the local zoning map or master plan. The overlay would serve to notify those involved in land use planning of the hazards and land use restrictions associated with the site.

6.1.6.4.2 An MEC overlay could be applied to any land use at the sites, allowing the county to regulate development in consideration of potential MEC issues. For example, if an area identified as an MEC site fell within a commercial land use, that area could be identified as "commercial" with an "MEC overlay" designation. For an MEC overlay to be effective, it should define the depth and extent to which MEC clearances have occurred at the site. The county could then stipulate the conditions under which excavation or development could occur.

6.1.6.4.3 In practice, construction support could be implemented as an "overlay" applied to those areas at the sites where construction may occur. For example, a portion of the area may be designated for residential development or a parking lot requiring cut and fill. Here, an overall recommendation for an MEC clearance throughout the site may be made (to address public access). In portions of the area where cut and fill would be required, deeper MEC clearances could be specifically designated in the areas to be cut. The same concept could be applied to a deep utility corridor that may transect the area.

6.1.6.5 Construction Support

6.1.6.5.1 Construction support is UXO support where construction would occur. Construction support is an option in areas that have not been recommended for a subsurface clearance. These are areas where there is a very low probability of subsurface ordnance being present (i.e., areas with little or no MEC that are recommended for institutional controls only).

6.1.6.5.2 UXO support during construction activities may require the following:

- UXO safety support; or
- A complete subsurface clearance response, depending on the probability of encountering UXO.

6.1.6.5.3 If the probability of encountering UXO is low, only UXO safety support will be required. Once a determination is made that the probability of encountering UXO is moderate to high (e.g., MEC was employed or disposed of in the area of concern), UXO-qualified personnel must conduct a Clearance to Detectable Depth of the known construction footprint and remove all discovered UXO. The level of effort for construction support is both site specific and task specific and will be determined on a case-by-case basis.

6.1.6.5.4 Typically, standard MEC excavation operating procedures associated with construction support are similar to those described in Engineer Pamphlet (EP) 75-1-2. Construction support would likely be implemented at the time of construction. It should be noted that construction support should be initiated if the following two conditions exist:

- The area identified for construction will be excavated deeper than that anticipated for the land use; and
- MEC is suspected in the area of anticipated ground disturbance associated with construction.

6.1.6.5.5 UXO Safety Support

A UXO team consisting of a minimum of two qualified UXO personnel (one UXO Technician III and one UXO Technician II) is normally used to provide safety support during construction activities in areas potentially contaminated with UXO. The UXO team reviews any archival

information available regarding the area of the proposed construction activities. If possible, the UXO team determines the probable types of UXO that may be encountered and specific safety considerations. The UXO team meets with on-site management and construction personnel and conducts a general work and safety briefing prior to commencement of any on-site activities. The UXO team then monitors all excavation activities in areas potentially contaminated with UXO. One member of the team should be positioned to the rear and upwind of the excavation equipment for continuous visual observation of activities. If the construction contractor unearths or otherwise encounters suspect UXO, all excavation activities are stopped. The UXO team then assesses the condition of the MEC item to determine if disposal by means of explosive detonation is required. Once UXO has been encountered in an excavation, no further excavation is permitted at that location until the UXO item has been removed.

6.1.6.5.6 Subsurface Clearance of Construction Footprint

6.1.6.5.6.1 The subsurface clearance process requires close coordination among on-site management personnel of the CEPOH, the construction contractor, and the UXO contractor. The UXO team should physically preview the actual construction footprint with other on-site management personnel and discuss visual observations and potential areas of concern. Subsurface clearance actions must be accomplished in strict accordance with the approved Work Plan, Site-Specific Health and Safety Plan, Explosives Safety Plan, and Explosives Safety Submission (if required).

6.1.6.5.6.2 The UXO team should be familiar with these plans and should review any archival information available regarding the area of the proposed construction activities. If possible, the UXO team should determine the probable types of UXO that may be encountered and specific safety considerations. Prior to commencing subsurface clearance activities, the UXO team should provide a general work and safety briefing to all on-site personnel.

6.1.6.5.6.3 In the event subsurface utilities are suspected in an excavation area, the UXO team must attempt to verify their location. All located utilities should be marked by paint, pin flags, or other appropriate means to visually delineate their approximate subsurface routing.

6.1.6.5.6.4 Area preparation may require reduction and/or removal of vegetation that may impede or limit the effectiveness of subsurface clearance actions. Vegetation reduction/removal may be accomplished through manual removal, mechanical removal, controlled burning, or defoliation. A surface clearance may be required to remove any existing MEC from the surface of the work area. All MEC, MD, and metallic scrap (cultural debris) that may interfere with a subsurface geophysical survey will be removed from the surface of the work area and staged for later disposal. A subsurface geophysical survey will be conducted to identify and locate all anomaly sources. Subsurface geophysical surveys may be completed using detection instrumentation with real time or post-processing identification and discrimination techniques.

6.1.6.5.6.5 Anomaly excavation operations are required to intrusively investigate and identify the source of all anomalies located during the subsurface geophysical survey of the construction footprint. During excavation operations, only those personnel deemed necessary for the operation shall be within the exclusion zone. Typically, activity-essential personnel will manually complete anomaly excavations of less than one foot using a shovel (or similar hand

tool). If an anomaly source is deeper than one foot, earth-moving machinery can be used to assist in excavation efforts unless site constraints or accessibility restrict or prohibit use. Earth-moving machinery should not be used to excavate within 12 inches of an anomaly source. When an anomaly excavation gets within approximately 12 inches of an anomaly source, the excavation should be completed manually with a shovel (or similar hand tool).

6.1.6.5.6.6 After the source of the anomaly is identified and removed, an approved geophysical instrument will be used to validate the process. If the geophysical instrument does not continue to detect an anomaly, then the excavation may be backfilled and restored in accordance with contract requirements. Estimated costs for implementation of various types of Institutional Controls, including construction support, are provided in detail in Appendix E.

6.1.6.5.7 Implementation of Construction Support

6.1.6.5.7.1 Construction support must be coordinated in advance of construction activities with the CEPOH office. Property owners will be required to provide a to-scale plan map showing the location and footprint of the planned construction, as well as a description of the activity and the anticipated depth of intrusion (e.g., a footing for a garage with a two-foot below grade excavation; construction of a below-ground swimming pool with a planned nine-foot below-ground surface excavation).

6.1.7 Alternative 3: Surface Clearance

6.1.7.1 This MEC response action alternative includes the location and removal of ordnance from the ground surface. For surface clearance, teams of UXO-qualified personnel use visual identification, aided by hand-held metal detectors, to search for ordnance. The surface clearance would be conducted by establishing a system of grids within a series of sweep lanes. These lanes are typically five feet in width or narrower, depending on the geophysical instrumentation used.

6.1.7.2 UXO recovered during the surface clearance would be detonated in place if not safe to move to an on-site area specifically designated for destruction of recovered UXO items. Additionally, surface clearance and detonation of UXO would occur within public safety exclusion zones, which vary in size, depending on the maximum fragmentation range of the UXO item recovered. MEC-related scrap would be taken off site and turned in to a scrap metal recycler for demilitarization and disposal. The average cost per acre to perform a Surface Clearance of MEC at the former Waikane Valley Training Area is provided in Appendix E.

6.1.8 Alternative 4: Clearance to Detectable Depth

6.1.8.1 This MEC response action alternative includes the subsurface excavation and clearance of all detected ordnance items using geophysical instrumentation within a specified MEC site. Risk reduction benefits and costs increase as the depth of clearance increases. Clearance to Detectable Depth removes detectable hazards and provides effective risk reduction for areas subject to both surface and intrusive activities. Clearance to Detectable Depth would require teams of UXO-qualified personnel to excavate all detected subsurface anomaly sources and dispose of all UXO items discovered. Geophysical methods would be used to map and identify anomalies in the proposed clearance areas. The geophysical methods that would be used to detect subsurface ordnance for a clearance action would be very similar to those employed for the EE/CA field investigation. The subsurface source locations of anomalies identified through

processing of the geophysical data would be located (surveyed) and marked with pin flags. UXO-qualified personnel would intrusively investigate the marked locations to identify the source of the anomalies. Depending on the amount of ordnance expected on the surface, a surface clearance might be necessary prior to geophysical mapping and subsequent removal of detectable ordnance. UXO recovered during the intrusive investigation would be relocated if safe and moved for disposal, or detonated in place after establishment of a public safety exclusion zone sized to provide a safe fragmentation distance from the item being detonated.

6.1.8.2 Clearance to Detectable Depth does not address unlimited intrusive activities because no detection, mapping, and clearance of MEC based on aboveground-deployed detection methods can be 100 percent effective. Intrusive activities requiring excavations below the level of MEC clearance in known MEC areas should be evaluated and, if necessary, performed only in conjunction with construction support.

6.1.8.3 The average cost per acre to perform a Clearance to Detectable Depth at the Former Waikane Valley Training Area Combat Training Area is provided in Appendix E.

6.2 MEC RESPONSE ACTION ALTERNATIVE EVALUATION CRITERIA

6.2.1 An EE/CA is a non time-critical decision process by which the most applicable, technically feasible, and socially acceptable alternatives (including No DOD Action Indicated) for remediating a site are evaluated for their effectiveness, implementability, and cost.

6.2.2 Removal of all MEC is not considered practicable, given technical limitations and cost considerations. In addition, permanent exclusion of the public from areas that have the potential to contain MEC is not feasible, given private land ownership, future demands for use of the land, and the potential for entry, inadvertent or intentional, to the former Waikane Valley Training Area. The purpose of an EE/CA is to evaluate potential ordnance risk, footprint reduction and develop alternative plans of action.

6.2.3 The chain of events that can result in a potential MEC incident causing injury or death involves many steps and may be viewed as a process flow. The chain is:

MEC present	→	MEC in a sensitive state or configured to detonate	→	Public access (including excavation)	→	Individual interaction with MEC (potential MEC incident)

6.2.4 Breaking or weakening this chain of events is a major focus for developing alternatives that limit public interaction with MEC. The steps in this process are:

- Document available information pertaining to the nature and extent of MEC;
- Identify areas where further investigation is warranted;
- Conduct a field investigation of the project site to statistically characterize the nature and extent of MEC;
- Provide decision criteria for evaluating and recommending the most feasible alternatives; and

- Utilize proven technologies and management strategies (long- and short-term) to manage MEC in a manner that will break or weaken the chain of events identified above.

6.2.5 Using these steps, four MEC response action alternatives were developed for the purpose of this EE/CA. Detailed descriptions of these alternatives are presented in Chapter 7.0.

6.2.6 This section describes the evaluation criteria and process used to determine the most appropriate MEC response actions for the former Waikane Valley Training Area. The results of the qualitative risk analysis in Chapter 5.0 are used as a basis for the evaluation of the four MEC response action alternatives in Chapter 6.0. The evaluation and determination of the most appropriate MEC response action alternative for each OERIA evaluation area (Chapter 8.0) is used to form the basis for the specific recommendations made for the former Waikane Valley Training Area (Chapter 8.0).

6.2.7 For each OERIA evaluation area, MEC response action alternatives are first evaluated in terms of their effectiveness, implementability, and cost. The purpose of this evaluation is to identify the most appropriate MEC response action alternatives to render each evaluation area compatible with its current and projected future land use. For effectiveness, the ranking considers protection of human safety, compliance with applicable or relevant and appropriate requirements (ARARs), and long- and short-term effectiveness. For implementability, the alternatives are ranked by technical and administrative feasibility, agency and community acceptance, and availability of services and materials. Cost considerations are made using detailed costing assumptions and costing backup (Appendix E). The exception is the NDAI alternative, which has no associated costs.

6.2.1 Effectiveness

Effectiveness is a measure of an alternative's ability to reduce the potential for exposure to or interaction with MEC. It is generally a measure of an alternative's ability to meet the criteria of protecting public safety and the identified ARARs. Effectiveness is also evaluated in terms of long-and short-term practicability. A concise interpretation of these criteria is as follows:

6.2.1.1 Protection of Human Safety

6.2.1.1.1 This criterion is a measure of how well the alternative reduces the public's exposure to and interaction with MEC, the reduction in terms of possible injury or death to humans, and protection of the environment. As such, it considers the following:

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

6.2.1.1.2 Effectiveness rankings are based mainly upon whether UXO was recovered during the EE/CA field investigation (or during previous investigations) and the probability of exposure to UXO based on population data and current and future land uses. For Institutional Controls

(Alternative 2), it is difficult to account for the benefit in reduction of exposure as a result of display board placement, community awareness outreach programs, or educational media. It has been assumed that the effectiveness of Institutional Controls in protecting human safety would be greater than NDAI (Alternative 1), but less than Surface Clearance (Alternative 3) or Clearance to Detectable Depth (Alternative 4).

6.2.1.2 Compliance with ARARs

6.2.1.2.1 This criterion is a measure of how well the alternative meets the identified chemical-, action-, and location-specific ARARs (Federal, state, and local). Currently, no chemical-specific ARARs exist for ordnance sites.

6.2.1.2.2 Recommended MEC response actions will be conducted in accordance with appropriate regulations. An analysis of the ARARs for the Former Waikane Valley Training Area should occur during planning of the cleanup phase of the project.

6.2.1.3 Long-Term Effectiveness

This criterion is a measure of how well the MEC response action alternative protects human safety once it has been implemented. The remaining potential for exposure or interaction with UXO is characterized by the following factors:

- The magnitude of potential exposures and interaction following implementation of the selected alternative;
- The permanence of the exposure and interaction reduction due to implementation of the selected alternative; and
- The reliability of the controls and maintenance measures in managing residual MEC following implementation of the selected alternative.

6.2.1.4 Short-Term Effectiveness

This criterion is a measure of how well the MEC response action alternative meets the exposure and interaction reduction objectives during its implementation. This includes:

- The ability of the alternative to reduce risk during implementation;
- The potential for adverse effects on the environment during the alternative's implementation;
- The time required to implement the alternative; and
- The potential for adverse effects on humans, including the community and personnel involved in implementation of the alternative.

6.2.2 Implementability

Implementability is a measure of whether an MEC response action alternative can be physically and administratively implemented, such as the ability to construct, excavate, or demolish. It is also a measure of the availability of the services and materials needed to implement the alternative. Other considerations regarding implementability include local agency and community acceptance of a given alternative. A concise interpretation of the criteria governing implementability is as follows:

6.2.2.1 Technical Feasibility

This criterion refers to:

- The reliability of the action with regard to implementation;
- The actual ease of field implementation (e.g., construction, clearance action);
- The ease in undertaking future actions related to the initial undertaking; and
- The ability to monitor the effectiveness of the action.

6.2.2.2 Administrative Feasibility

This criterion is a measure of the ease with which an alternative can be implemented in terms of permits and rights-of-entry, coordination of services to support the action (e.g., legal services), or the arrangement of delivery or security services.

6.2.2.3 Availability of Services and Materials

This criterion is a measure of the availability of goods and services needed to support implementation of the alternative. Examples of this criterion include the availability of specialized personnel (i.e., UXO-qualified technicians) and equipment (e.g., geophysical instruments), availability of explosives for demolition purposes, availability of a suitable disposal facility for the ordnance scrap (i.e., proximity of local scrap metal recycling facility), and the condition of the existing infrastructure to allow ingress and egress of personnel and material to and from the project site.

6.2.2.4 Local Agency Acceptance

This criterion deals with the acceptance of the alternative by applicable state, county, and city agencies, as expressed by representatives under the agency's authority. Rankings of alternatives under this criterion are marked under the "Agency Acceptance" column in the tables in Chapter 8.0 showing rankings of implementability. Local agency acceptance has been established based on information gathered during public meetings, and interaction with local agencies to date, and may be updated at any time during the EE/CA review process.

6.2.2.5 Community Acceptance

This criterion relates to the degree of acceptance of the alternative by the community, including owners of property adjacent to the area. Public sentiment expressed during town hall meetings, public workshops, city council or county supervisor meetings, or institutional analysis is a means of determining community acceptance. Rankings of alternatives under this criterion are marked under the "Community Acceptance" column in the tables in Chapter 8.0 showing rankings of implementability. Community acceptance has been established based on information gathered during community meetings, and interaction with private landowners to date, and may be updated at any time during the EE/CA review process.

6.2.3 Cost

6.2.3.1 The cost of implementing each of the MEC response action alternatives has been estimated. The exception is NDAI, which has no associated costs. A detailed summary of these costs and costing assumptions is presented in Appendix E. For Institutional Controls (Alternative 2), the costs include those associated with access controls (e.g., warning signs), community awareness outreach programs (e.g., display cases, periodic community awareness meetings, informational pamphlets, landowner notifications, MEC safety awareness training video), construction support, and administration and maintenance costs associated with these activities. For Surface Clearance (Alternative 3) and Clearance to Detectable Depth (Alternative

4), the costs are one-time capital costs and do not include monitoring for sensitive species or habitat restoration.

6.2.3.2 Examples of capital costs include those costs incurred by the UXO-qualified contractor for conducting the field activities (i.e., surface clearance, geophysical mapping, intrusive MEC sampling, and demolition activities) associated with implementing a subsurface clearance. Examples of operation and maintenance costs would include repairing and replacing perimeter signs and educational display boards over a specified length of time.

6.2.3.3 The benefit of the investment in reducing risk is also considered when ranking the MEC response action alternatives. This involves identifying the overall reduction in risk to the public versus the cost of implementing the alternative. For example: if two alternatives provide an equal or comparable amount of protection, the less expensive alternative would provide the greatest benefit for the dollars spent and, therefore, would be ranked as the better alternative in terms of cost benefit.

6.2.4 Example of Alternative Evaluation Process

6.2.4.1 Table 6-1 provides an example evaluation of the four MEC response action alternatives, as presented in Chapter 8.0. As shown in Table 6-1, each alternative is ranked according to the criteria presented in Sections 6.2.1, 6.2.2, and 6.2.3. The alternative that is determined to be the best alternative when assessed with the criteria receives a numerical ranking of 1. The second best alternative receives a numerical ranking of 2, and so forth. Once the numerical ranking has been determined for the three criteria (effectiveness, implementability, and cost) for each of the four MEC response action alternatives, the overall score is determined by adding up the individual numerical rankings for each alternative. For example, NDAI received a ranking of "4" for effectiveness, a ranking of "1" for implementability, and a ranking of "1" for cost. The overall score is determined by adding these up, yielding a final score of "6." This is continued for each of the four alternatives until all of the individual rankings have been added up and the totals have been placed into the column marked "Overall Score."

TABLE 6-1 EXAMPLE OF ALTERNATIVE EVALUATION PROCESS

ALTERNATIVE	EFFECTIVENESS RANK	IMPLEMENTABILITY RANK	COST RANK	OVERALL SCORE	OVERALL RANK
1. No DOD Action Indicated (NDAI)	4	1	1	6	1
2. Institutional Controls	3	2	2	7	2
3. Surface Clearance	2	3	3	7	2
4. Clearance to Depth	1	4	4	8	4

Note: Ranking from best to worst; best = 1

6.2.4.2 Using the overall score, an overall ranking of the four alternatives is performed in the column marked "Overall Rank." The alternative with the lowest score (in this case, NDAI) is ranked 1 (best), the alternative with the second lowest score is ranked 2 (second best), and the alternative with the highest score is ranked 4 (last). As shown in Table 5-1, NDAI (Alternative

1) ranked as the best alternative (ranked 1) in this example evaluation based on its effectiveness, implementability, and cost.

6.2.4.3 Using this comparative evaluation and ranking process, an analysis of the four MEC response action alternatives were performed for each of the OERIA evaluation areas at the former Waikane Valley Training Area (Chapter 5.0).

6.3 COMPARATIVE ANALYSIS OF MEC RESPONSE ACTION ALTERNATIVES

6.3.1 This chapter describes the evaluation process for determining the most appropriate MEC response action alternatives for the former Waikane Valley Training Area. The evaluation criteria used to assess the alternatives are presented in Chapter 5.0. The results of the qualitative risk assessment and the comparative analysis of the four MEC response action alternatives in this chapter form the basis for the recommendations made for the former Waikane Valley Training Area, which are presented in Chapter 8.0, Recommended MEC Response Action Alternatives.

6.3.2 Prior to conducting this comparative analysis of the four MEC response action alternatives, the level of hazard that MEC presents in each of the OERIA risk evaluation areas (Table 6-2) was determined (Chapter 5.0) based on current and future land uses, results of the EE/CA field investigation and previously documented reports of discovered MEC. Using this information, and the three risk factors (MEC Factors, Site Characteristics Factors, and Demographic Factors) evaluated in Chapter 4.0, the hazard level that MEC presents to the public was qualitatively assessed. The MEC hazard level for each OERIA evaluation area (Table 6-2) was used in this comparative analysis to help determine the most appropriate MEC response action alternatives for the former Waikane Valley Training Area.

TABLE 6-2 OERIA EVALUATION SITES AND HAZARD LEVEL RESULTS

OERIA EVALUATION SITE	OERIA HAZARD LEVEL
Waikane Valley Training Area	
Southeastern Region	High
Southern Impact Region	High
Western Region	Low
Mountainous Regions	Low

6.3.3 This chapter analyzes the effectiveness, implementability, and cost of each MEC response action alternative for the risk evaluation areas identified in Chapter 5.0. Effectiveness includes protection of human safety, compliance with ARARs, and both long- and short-term effectiveness. In terms of effectiveness, protection of human safety was evaluated first as a threshold criterion. Once the alternative met the threshold level, the evaluation was performed weighing all criteria equally. The equal weighing of criteria complies with the NCP provided that minimum threshold levels are met. Implementability includes technical and administrative feasibility, availability of services and materials, and both local agency and community acceptance. Local agency and community acceptance of the various alternatives was rated based on public meetings and interaction with local agencies and the community to date. Cost includes both the value of the investment and its corresponding benefit.

6.3.4 The MEC hazard level determined in Chapter 5.0 for the three OERIA evaluation areas (see Table 6-2) was used as the basis for the effectiveness rankings throughout this comparative analysis of the four MEC response action alternatives. For example, in an OERIA evaluation area with a "High" MEC hazard level, NDAI (Alternative 1) is considered an unacceptable MEC response action alternative and it is not evaluated for that specific evaluation area. NDAI would offer no risk reduction benefits in terms of protecting human safety in an area with a high MEC hazard level. For an area with a "Moderate" MEC hazard level, NDAI is evaluated as an acceptable MEC response action alternative; however, NDAI is ranked as the least acceptable of the four MEC response action alternatives in terms of protection of human safety and short-term and long-term effectiveness. For an area with a "Low" MEC hazard level, NDAI is evaluated as an acceptable MEC response action alternative and is ranked accordingly in terms of its effectiveness.

6.3.5 The four OERIA evaluation areas were evaluated using this comparative analysis of the four MEC response actions to help identify the best MEC response action alternative(s) to render the areas compatible with their intended disposition. Alternatives were ranked in numerical order, with "1" being the best alternative for that criterion. The alternative with the lowest ranking score is considered the best in terms of these evaluation criteria.

6.3.6 Institutional Controls, although evaluated as a separate MEC response action alternative in this comparative analysis, is recommended in conjunction with a surface and/or subsurface clearance action or may be recommended as a site-wide MEC response action.

6.3.7 Southeastern Region

The overall MEC hazard level in this area is high, based on the results of the EE/CA field investigation and evaluation of the three risk factors (i.e., MEC Type, Site Characteristics, Site Demographics) defined in the qualitative risk assessment (Chapter 5.0). Using this information, the four MEC response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate MEC response action alternative for the Southeastern Region.

6.3.7.1 Effectiveness

Table 6-3 provides the effectiveness criteria of the four alternatives for the Southeastern Region. The evaluation of each of these alternatives is presented below.

TABLE 6-3 EFFECTIVENESS CRITERIA EVALUATION – SOUTHEASTERN REGION

	EFFECTIVENESS					
ALTERNATIVE	PROTECTION OF HUMAN HEALTH	COMPLIANCE WITH ARARS	LONG-TERM	SHORT-TERM	SCORE	RANK
1. No DOD Action Indicated (NDAI)	N/A	N/A	N/A	N/A	N/A	N/A
2. Institutional Controls	3	1	3	1	8	1
3. Surface Clearance	2	2	2	2	8	1
4. Clearance to Depth	1	3	1	3	8	1

Note: Ranking from best to worst; best = 1.

6.3.7.1.1 Protection of Human Safety

NDAI is not considered an acceptable alternative for the Southeastern Region because it does not meet the minimum threshold criterion for the protection of human safety. Clearance to Detectable Depth is ranked 1 (most effective) in terms of human safety because of its ability to provide reduction in risk associated with MEC on the surface and subsurface in the near and distant future. Surface clearance is ranked 2 for protection of human safety, as it is limited to a one-time reduction of MEC onsite. Institutional Controls is ranked 3 because it does not provide for the removal of MEC and is therefore less protective of human safety in a high hazard area where MEC have been located.

6.3.7.1.2 Compliance with ARARs

Compliance with the ARARs would be addressed for any activity that would require vegetation clearance, construction/installation, or intrusive activities at the site. Alternatives that require less effort should also require less compliance with ARARs, so the Alternatives are rated appropriately with their level of effort.

6.3.7.1.3 Long-Term Effectiveness

Clearance to Depth is ranked 1 (best), as it would involve Surface Clearance followed by a Subsurface Clearance to detectable depth, making it more effective that a Surface Clearance alone, which is ranked 2. Clearance to Depth is unaffected by MEC migration and with high OERIA hazard levels it is normally the most effective alternative over the long term, because in those situations it usually provides the maximum protection of human safety. Institutional Controls are ranked 3 (last) because they would not be as effective over the long term as a removal action in reducing risks associated with the high OERIA hazard level in the Southeastern Region. NDAI is not considered an acceptable alternative due to the high-risk level associated with Southeastern Region.

6.3.7.1.4 Short-Term Effectiveness

Since the OERIA hazard level of the Southeastern Region is high, Institutional Controls would be the most effective alternative over the short term because of current land use and site accessibility. Surface Clearance is ranked 2 (second) because it would take more time to implement than Institutional Controls. Clearance to Depth is ranked 3 (last) for short-term effectiveness because it would take the longest to implement. NDAI is not considered an acceptable alternative due to the high hazard level associated with the site.

6.3.7.1.5 Overall Effectiveness Ranking for Alternatives 1 through 4

Based upon un-weighted OERIA scoring, Institutional Controls (alternative 2) ranks first. However, subjectively Protection of Human Health greatly outweighs the other Effectiveness criteria and ought to have greater consideration in the selection of a remedial action alternative. On that basis, Clearance to Detectable Depth (Alternative 4) is judged the most effective munitions response action alternative when considering overall effectiveness based upon its ongoing ability to greatly reduce the risk associated with the high OERIA hazard level and because it provides the most protection to the public from MEC. Because the OERIA hazard level is high and MEC is suspected to be present onsite, NDAI is not considered an acceptable alternative. Surface Clearance (Alternative 3) is ranked second, because it would provide a one-time reduction of the risk associated with MEC and reduce the risk associated with the overall

OERIA hazard level, while affording less protection than Alternative 4. Due to heavy rains and the severe erosion problems within the area with MEC resurfacing and migrating down the steep slopes, Alternative 3 has a short-term effectiveness. Institutional Controls (Alternative 2) are ranked first and ought to be considered a part of any munitions response action.

6.3.7.2 Implementability

The implementability criteria evaluation consists of technical feasibility, administrative feasibility, services and materials, local agency acceptance, and community acceptance. The evaluation of each alternative based on technical and administrative feasibility considers the extent of logistical and managerial support. Service and materials evaluates each alternative in relation to the extent of personnel and supplies required. Local agency and community acceptance of an alternative is based on interviews with entities affected by activity on-site. Table 6-4 provides the implementability criteria of the four alternatives for the Southeastern Region. The evaluation of each of these alternatives is presented below.

TABLE 6-4 IMPLEMENTABILITY CRITERIA EVALUATION – SOUTHEASTERN REGION

	IMPLEMENTABILITY						
ALTERNATIVE	TECHNICAL FEASIBILITY	ADMINISTRATIVE FEASIBILITY	SERVICES AND MATERIALS	LOCAL AGENCY ACCEPTANCE	COMMUNITY ACCEPTANCE	SCORE	RANK
1. No DOD Action Indicated (NDAI)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2. Institutional Controls	1	1	1	3	3	9	1
3. Surface Clearance	2	2	2	2	2	10	2
4. Clearance to Depth	3	3	3	1	1	11	3

Note: Ranking from best to worst; best = 1.

6.3.7.2.1 Technical and Administrative Feasibility

NDAI is not considered an acceptable alternative due to the high hazard level associated with the site. Utilization of Institutional Controls is ranked 1 (first) as a stand-alone response, in terms of technical and administrative feasibility, as it would require less technical and administrative expertise than a stand-alone removal action. Implementation of a Surface Clearance would be the second ranked approach, after Institutional Controls only, as it involves more technical effort associated with a removal action. Although the Surface Clearance alternative requires specially trained and qualified UXO personnel and a means of MEC disposal, this alternative requires fewer resources than the lower ranked Clearance to Depth of Detection alternative. Administratively, Surface Clearance and Clearance to Depth score similarly.

6.3.7.2.2 Services and Materials

Institutional Controls is ranked 1 because the supplies and personnel needed to install and maintain warning signs and distribute informational pamphlets are less than those required for a removal action. Surface Clearance is ranked 2 because it would require qualified UXO-personnel as well as the means of disposing MEC. Implementation of the Clearance to Depth of Detection alternative would require more equipment and expertise than a Surface Clearance, in addition to UXO personnel and additional MEC disposal. Therefore, Clearance to Depth of

Detection is ranked 3 for availability of services and materials. NDAI is not considered an acceptable alternative due to the moderate hazard level associated with the site.

6.3.7.2.3 Local Agency Acceptance

Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider the Clearance to Depth as the most appropriate and acceptable alternative for the Southeastern Region based on the high overall hazard level and current and projected site activities. Therefore Surface Clearance is ranked 2 on its ability to reduce the risk associated with MEC on the surface. Institutional Controls are ranked 3 for this area, considering the current and projected land use for the Southeastern Region and the suspected presence of MEC.

6.3.1.1.1 6.3.7.2.4 Community Acceptance

The community has considered that a Clearance to Depth is the most acceptable alternative in this area based on the high OERIA hazard level and the current and future land. Surface Clearance is therefore ranked 2 because the removal of surface MEC would provide a reduction in the risk associated with MEC items on the surface. Likewise, the community may favor a Surface Clearance over Institutional Controls. Institutional Controls is ranked 3. NDAI is not considered an acceptable alternative due to the high hazard level associated with the site.

6.3.7.2.5 Overall Implementability Ranking for Alternatives 1 through 4

Based on implementability rankings in areas of technical feasibility, administrative feasibility, services and materials required, local agency acceptance, and community acceptance, Institutional Controls is ranked 1 (most effective). Surface Clearance was ranked 2 and Clearance to Depth is ranked 3. NDAI is not considered an acceptable alternative due to the high hazard level associated with the site.

6.3.7.3 Cost

The cost evaluation considers evaluation of the actual cost, investment, and benefit associated with each alternative. The cost of each alternative is detailed in Appendix E. The investment criterion evaluates each alternative in terms of monetary investment required. The benefit of an alternative considers the most effective means of risk reduction for the cost required to perform the action. Table 6-5 provides the cost criteria of the four alternatives for the Southeastern Region. The evaluation of each of these alternatives is presented below.

TABLE 6-5 COST CRITERIA EVALUATION – SOUTHEASTERN REGION

	COST				
ALTERNATIVE	**COST**	**INVESTMENT**	**BENEFIT**	**SCORE**	**RANK**
1. No DOD Action Indicated (NDAI)	$0	NA	NA	NA	NA
2. Institutional Controls	$1,421,285	1	3	4	1
3. Surface Clearance	$4,038,786	2	2	4	1
4. Clearance to Depth	$11,051,607	3	1	4	1

Note: Ranking from best to worst; best = 1.

6.3.7.4 Investment and Benefit

Alternatives 2, 3, and 4 are ranked equally based on their score. The Clearance to Depth of Detection alternative ranks 1 in benefit when considering the specific site conditions, and current and projected land use of the site, but 3 in investment. The cost associated with Institutional Controls is considerably lower than the two removal options and therefore receives a ranking of 1 in terms of investment and a rank of 3 when considering level of protection produced for the cost. Surface Clearance ranks 2 in investment and benefit producing the same benefit for the investment, because of the dynamic nature of the terrain and environment. NDAI is not considered an acceptable alternative due to the high hazard level associated with the site.

6.3.7.5 Overall Ranking of Alternatives

The overall ranking of the different alternatives in term of their effectiveness, implementatibility and cost is presented in Table 6-6. The alternative with the lowest score would be considered best for the combined criteria. However, as discussed in paragraph 6.3.7.1.1, Protection of Human Health is weighted more than the other effectiveness factors. On that basis, although the un-weighted scoring indicates that Institution Controls have the best score, weighted scoring indicates that Clearance to Detectable Depth is the best remedial action alternative. Institutional Controls, based on the un-weighted scoring, should be considered a part of an effective munitions response action.

TABLE 6-6 ALTERNATIVE EVALUATION – SOUTHEASTERN REGION

	ALTERNATIVE				
ALTERNATIVE	**EFFECTIVENESS RANK**	**IMPLEMENTABILITY RANK**	**COST RANK**	**SCORE**	**RANK**
1. No DOD Action Indicated (NDAI)	N/A	N/A	N/A	N/A	N/A
2. Institutional Controls	1	1	1	3	1
3. Surface Clearance	1	2	1	4	2
4. Clearance to Depth	1	3	1	5	3

Note: Ranking from best to worst; best = 1.

6.3.8 Southern Impact Region

The overall MEC hazard level in this area is high, based on the results of the EE/CA field investigation and evaluation of the three risk factors (i.e., MEC Type, Site Characteristics, Site Demographics) defined in the qualitative risk assessment (Chapter 5.0). Using this information, the four MEC response action alternatives evaluated in this EE/CA report are comparatively analyzed in the following subsections to determine the most appropriate MEC response action alternative for the Southern Impact Region.

6.3.8.1 Effectiveness

Table 6-7 provides the effectiveness criteria of the four alternatives for the Southern Impact Region. The evaluation of each of these alternatives is presented below.

TABLE 6-7 EFFECTIVENESS CRITERIA EVALUATION – SOUTHERN IMPACT REGION

	EFFECTIVENESS					
ALTERNATIVE	PROTECTION OF HUMAN HEALTH	COMPLIANCE WITH ARARS	LONG-TERM	SHORT-TERM	SCORE	RANK
1. No DOD Action Indicated (NDAI)	N/A	N/A	N/A	N/A	N/A	N/A
2. Institutional Controls	3	1	3	1	8	1
3. Surface Clearance	2	2	2	2	8	1
4. Clearance to Depth	1	3	1	3	8	1

Note: Ranking from best to worst; best = 1.

6.3.8.1.1 Protection of Human Safety

NDAI is not considered an acceptable alternative for the Southern Impact Region because it does not meet the minimum threshold criterion for the protection of human safety. Clearance to Detectable Depth is ranked 1 (most effective) in terms of human safety because of its ability to provide reduction in risk associated with MEC on the surface and subsurface in the near and distant future. Surface clearance is ranked 2 for protection of human safety, as it is limited to a one-time reduction of MEC onsite. Institutional Controls is ranked 3 because it does not provide for the removal of MEC and is therefore less protective of human safety in a high hazard area where MEC have been located.

6.3.8.1.2 Compliance with ARARs

Compliance with the ARARs would be addressed for any activity that would require vegetation clearance, construction/installation, or intrusive activities at the site. Alternatives that require less effort should also require less compliance with ARARs, so the Alternatives are rated appropriately with their level of effort.

6.3.8.1.3 Long-Term Effectiveness

Clearance to Depth is ranked 1 (best), as it would involve Surface Clearance followed by a Subsurface Clearance to detectable depth, making it more effective that a Surface Clearance alone, which is ranked 2. Clearance to Depth is unaffected by MEC migration and with high OERIA hazard levels it is normally the most effective alternative over the long term, because in those situations it usually provides the maximum protection of human safety. Institutional Controls are ranked 3 (last) because they would not be as effective over the long term as a removal action in reducing risks associated with the high OERIA hazard level in the Southern Impact Region. NDAI is not considered an acceptable alternative due to the high-risk level associated with Southern Impact Region.

6.3.8.1.4 Short-Term Effectiveness

Since the OERIA hazard level of the Southern Impact Region is high, Institutional Controls would be the most effective alternative over the short term because of current land use and site accessibility. Surface Clearance is ranked 2 (second) because it would take more time to implement than Institutional Controls. Clearance to Depth is ranked 3 (last) for short-term

effectiveness because it would take the longest to implement. NDAI is not considered an acceptable alternative due to the high hazard level associated with the site.

6.3.8.1.5 Overall Effectiveness Ranking for Alternatives 1 through 4

Based upon un-weighted OERIA scoring, Institutional Controls (alternative 2) ranks first. However, subjectively Protection of Human Health greatly outweighs the other Effectiveness criteria and ought to have greater consideration in the selection of a remedial action alternative. On that basis, Clearance to Detectable Depth (Alternative 4) is judged the most effective munitions response action alternative when considering overall effectiveness based upon its ongoing ability to greatly reduce the risk associated with the high OERIA hazard level and because it provides the most protection to the public from MEC. Because the OERIA hazard level is high and MEC is suspected to be present onsite, NDAI is not considered an acceptable alternative. Surface Clearance (Alternative 3) is ranked second, because it would provide a one-time reduction of the risk associated with MEC and reduce the risk associated with the overall OERIA hazard level, while affording less protection than Alternative 4. Due to heavy rains and the severe erosion problems within the area with MEC resurfacing and migrating down the steep slopes, Alternative 3 has a short-term effectiveness. Institutional Controls (Alternative 2) are ranked first and ought to be considered a part of any munitions response action.

6.3.8.2 Implementability

The implementability criteria evaluation consists of technical feasibility, administrative feasibility, services and materials, local agency acceptance, and community acceptance. The evaluation of each alternative based on technical and administrative feasibility considers the extent of logistical and managerial support. Service and materials evaluates each alternative in relation to the extent of personnel and supplies required. Local agency and community acceptance of an alternative is based on interviews with entities affected by activity on-site. Table 6-8 provides the implementability criteria of the four alternatives for the Southern Impact Region. The evaluation of each of these alternatives is presented below.

TABLE 6-8 IMPLEMENTABILITY CRITERIA EVALUATION – SOUTHERN IMPACT REGION

	IMPLEMENTABILITY						
ALTERNATIVE	TECHNICAL FEASIBILITY	ADMINISTRATIVE FEASIBILITY	SERVICES AND MATERIALS	LOCAL AGENCY ACCEPTANCE	COMMUNITY ACCEPTANCE	SCORE	RANK
1. No DOD Action Indicated (NDAI)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2. Institutional Controls	1	1	1	3	3	9	1
3. Surface Clearance	2	2	2	2	2	10	2
4. Clearance to Depth	3	3	3	1	1	11	3

Note: Ranking from best to worst; best = 1.

6.3.8.2.1 Technical and Administrative Feasibility

NDAI is not considered an acceptable alternative due to the high hazard level associated with the site. Utilization of Institutional Controls is ranked 1 (first) as a stand-alone response, in terms of technical and administrative feasibility, as it would require less technical and administrative expertise than a stand-alone removal action. Implementation of a Surface Clearance would be the second ranked approach, after Institutional Controls only, as it involves more technical effort associated with a removal action. Although the Surface Clearance alternative requires specially trained and qualified UXO personnel and a means of MEC disposal, this alternative requires fewer resources than the lower ranked Clearance to Depth of Detection alternative. Administratively, Surface Clearance and Clearance to Depth score similarly.

6.3.8.2.2 Services and Materials

Institutional Controls is ranked 1 because the supplies and personnel needed to install and maintain warning signs and distribute informational pamphlets are less than those required for a removal action. Surface Clearance is ranked 2 because it would require qualified UXO-personnel as well as the means of disposing MEC. Implementation of the Clearance to Depth of Detection alternative would require more equipment and expertise than a Surface Clearance, in addition to UXO personnel and additional MEC disposal. Therefore, Clearance to Depth of Detection is ranked 3 for availability of services and materials. NDAI is not considered an acceptable alternative due to the moderate hazard level associated with the site.

6.3.8.2.3 Local Agency Acceptance

Based on interaction with agency representatives to date, it has been determined that local agencies are likely to consider the Clearance to Depth as the most appropriate and acceptable alternative for the Southern Impact Region based on the high overall hazard level and current and projected site activities. Therefore Surface Clearance is ranked 2 on its ability to reduce the risk associated with MEC on the surface. Institutional Controls are ranked 3 for this area, considering the current and projected land use for the Southern Impact Region and the suspected presence of MEC.

6.3.8.2.4 Community Acceptance

The community has considered that a Clearance to Depth is the most acceptable alternative in this area based on the high OERIA hazard level and the current and future land. Surface Clearance is therefore ranked 2 because the removal of surface MEC would provide a reduction in the risk associated with MEC items on the surface. Likewise, the community may favor a Surface Clearance over Institutional Controls. Institutional Controls is ranked 3. NDAI is not considered an acceptable alternative due to the high hazard level associated with the site.

6.3.8.2.5 Overall Implementability Ranking for Alternatives 1 through 4

Based on implementability rankings in areas of technical feasibility, administrative feasibility, services and materials required, local agency acceptance, and community acceptance, Institutional Controls is ranked 1 (most effective). Surface Clearance was ranked 2 and Clearance to Depth is ranked 3. NDAI is not considered an acceptable alternative due to the high hazard level associated with the site.

6.3.8.3 Cost

The cost evaluation considers evaluation of the actual cost, investment, and benefit associated with each alternative. The cost of each alternative is detailed in Appendix E. The investment criterion evaluates each alternative in terms of monetary investment required. The benefit of an alternative considers the most effective means of risk reduction for the cost required to perform the action. Table 6-9 provides the cost criteria of the four alternatives for the Southern Impact Region. The evaluation of each of these alternatives is presented below.

TABLE 6-9 COST CRITERIA EVALUATION – SOUTHERN IMPACT REGION

	COST				
ALTERNATIVE	COST	INVESTMENT	BENEFIT	SCORE	RANK
1. No DOD Action Indicated (NDAI)	$0	N/A	N/A	N/A	N/A
2. Institutional Controls	$1,421,285	1	3	4	1
3. Surface Clearance	$2,167,239	2	2	4	1
4. Clearance to Depth	$6,078,212	3	1	4	1

Note: Ranking from best to worst; best = 1.

6.3.8.3.1 Investment and Benefit

Alternatives 2, 3, and 4 are ranked equally based on their score. The Clearance to Depth of Detection alternative ranks 1 in benefit when considering the specific site conditions, and current and projected land use of the site, but 3 in investment. The cost associated with Institutional Controls is considerably lower than the two removal options and therefore receives a ranking of 1 in terms of investment and a rank of 3 when considering level of protection produced for the cost. Surface Clearance ranks 2 in investment and benefit producing the same benefit for the investment, because of the dynamic nature of the terrain and environment. NDAI is not considered an acceptable alternative due to the high hazard level associated with the site.

6.3.8.3.2 Overall Ranking of Alternatives

The overall ranking of the different alternatives in term of their effectiveness, implementatibility and cost is presented in Table 6-10. The alternative with the lowest score would be considered best for the combined criteria. However, as discussed in paragraph 6.3.8.1.1, Protection of Human Health is weighted more than the other effectiveness factors. On that basis, although the un-weighted scoring indicates that Institution Controls have the best score, weighted scoring indicates that a Surface Clearance or Clearance to Detectable Depth is the best remedial action alternative. Institutional Controls, based on the un-weighted scoring, should be considered a part of an effective munitions response action.

TABLE 6-10 ALTERNATIVE EVALUATION – SOUTHERN IMPACT REGION

ALTERNATIVE	ALTERNATIVE				
	EFFECTIVENESS RANK	IMPLEMENTABILITY RANK	COST RANK	OVER ALL SCORE	OVER ALL RANK
1. No DOD Action Indicated (NDAI)	N/A	N/A	N/A	N/A	N/A
2. Institutional Controls	1	1	1	3	1
3. Surface Clearance	1	2	1	4	2
4. Clearance to Depth	1	3	1	5	3

Note: Ranking from best to worst; best = 1.

6.3.9 Western Region

The overall MEC hazard level in this area is low, based on the results of the EE/CA field investigation and evaluation of the three risk factors (i.e., MEC Type, Site Characteristics, Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Small Arms was the most significant item found in this area, however, the historical impact area overlaps into this area. Using this information, Institutional Controls is considered an acceptable alternative for the Western Region because it meets the minimum threshold criterion for the protection of human health given the overall low hazard level associated with the site.

6.3.10 Mountainous Region

The overall MEC hazard level in this area is low, based on the results of the EE/CA field investigation and evaluation of the three risk factors (i.e., MEC Type, Site Characteristics, Site Demographics) defined in the qualitative risk assessment (Chapter 4.0). Neither MEC nor MD was discovered in this area, however, the historical impact area overlaps into this area. Using this information, Institutional Controls is considered an acceptable alternative for the Mountainous Region because it meets the minimum threshold criterion for the protection of human health given the overall low hazard level associated with the site.

6.4 ARARs

Specific ARARs for future work will be determined during the cleanup phase of the project.

7.0 INSTITUTIONAL CONTROL PLAN

7.1 GENERAL DESCRIPTION OF SITE BOUNDARIES

The former Waikane Valley Training Area is located on the windward side of the Island of Oahu, Hawaii. The Koolau Mountain Range bounds the project site on the north and west. On the north is Pu'u'ohulehule Mountain that rises 2,265 feet above sea level and the mountains on the west rise to over 1,300 feet. On the eastern boundary is the Marine Corps parcel, a 199-acre site that has been used by the U.S. Marine Corps as a training and artillery impact area, which is not fall under FUDS and is not covered by this EE/CA. The south is bordered by privately and City and County of Honolulu owned properties. The majority of the site is covered with deep gulches and very steep slopes covered with dense jungle vegetation. Over 80 percent of the area is covered by slopes steeper than 33 percent.

7.2 SPECIFIC INSTITUTIONAL CONTROLS

The Institutional Controls program for the former Waikane Valley Training Area includes a list of available controls that may be recommended and are designed to minimize the potential for members of the public and workers on site to be injured or killed as a result of encountering MEC. These are signage, informational pamphlets, annual site visits, and construction support. Engineering Controls specific to the physical site include monitoring of the upkeep of existing fencing and installation of new signs.

7.2.1 Fences

7.2.1.1 Fences are commonly used to restrict public access to a site that poses a threat to human safety. Fences physically restrict access to a site and vary in effectiveness based upon the type of fence installed. Fences are considered for use in areas where MEC is present and where public access would likely result in potential exposures. At sites where the risk of MEC exposure is low, fencing may not be necessary. A barbed-wire fence affixed with warning signs is considered an effective temporary measure to restrict access to MEC sites. This type of fence would prevent individuals from inadvertently accessing an MEC site.

7.2.1.2 Barricades are effective in closing roads or trails that access MEC sites. Forms of barricades include rock or timber barriers. As with fences, barricades are generally more effective when combined with warning signs.

7.2.1.3 As noted during the EE/CA investigation, fences enclose the northern impact area within the Marine Corps parcel on the northern side of Waikane Valley project site. There are no fences securing the area for investigation under this EE/CA. A locked gate across the main road currently secures access into Waikane Valley; however, there are paths and trails along the southeastern boundary that allows hikers, moto-cross and ATV riders, ect. into the area.

7.2.2 Signs

7.2.2.1 Warning signs provide notice and information regarding the MEC hazard present at a site. They can be installed at major access points and along perimeter fencing. Given the potential for public access to an area containing MEC, warning signs communicating a hazard to

the public are useful and have been proven effective at similar sites. The posted warning signs can inform the public of potential safety hazards and communicate the following information:

- Nature of the MEC hazard at the site;
- Why a safety hazard exists in the context of the history of the military installation or training area;
- How to avoid encountering an MEC item; and
- What to do and whom to contact if an MEC item is encountered.

7.2.2.2 As noted during the EE/CA investigation there are no signs currently in place to warn landowners, visitors and/or unauthorized personnel of the dangers associated with MEC. Signs are posted along the Marine Corps parcel fence line reading "No Trespassing" or "Danger Explosives". Warning signs should be added along the both sides of the main access road (except the location of the existing fence) and on both sides of the secondary roads to provide warnings on the dangers of MEC. The total access road that runs along the northern boundary of the Southern Impact Region is approximately 1.5 miles in length and placing signs every 400-feet along the road would total to 20 signs. The secondary roads are another 1.6 miles and staggering warning signs on both side of the road would require another 42 signs. Warning signs should also be affixed to the locked gate on the main access road entering Waikane Valley and at posted at strategic locations along trails, hiking paths, and the memorial where visitors congregate. A total of 80 warning signs are required.

7.2.2.3 A Memorandum of Agreement (MOA) must be prepared between USACE, the landowners and the City and County of Honolulu identifying the Institutional Controls and detailing their administration and inspection, and enforcement of the program.

7.2.3 Residual Risk Reduction

The hazard that exists from encountering MEC that may exist at the site and from subsequent actions that may cause harm is known as the Residual Risk. The ability of the controls to reduce residual risk is discussed individually in the following sections.

7.2.3.1 Zoning and Planning Controls Risk Reduction

Although no formal planning activities have been undertaken to protect Waikane Valley from development, the lack of such a plan is not seen as problematic, and development of such a formal plan is not seen as immediately necessary. In fact, the City and County of Honolulu has developed a master plan to develop approximately 500 acres of the valley as a nature center.

7.2.3.2 Education and Notification Controls

Producing and distributing an educational/awareness pamphlet would be a means of describing the types of MEC found within the Waikane Valley, and the actions to be taken upon discovering MEC items. Recognizing the hazard is essential for implementing appropriate responses to contain and dispose of MEC. Distinguishing between MEC and MD that may be encountered at the site will ensure that authorities are notified and actions can be taken to dispose of the MEC without harm to anyone involved. The pamphlets would be made available for distribution to the local residents and schools for distribution to any person, company, or agency planning to access the valley.

7.3 FIVE-YEAR REVIEWS AND ANNUAL REVIEWS (OTHER LONG TERM MANAGEMENT ACTIVITIES)

The site will be subject to Five-Year Reviews and visits by the DOD in accordance with the FUDS program to monitor the effectiveness of the Institutional Controls program. If the Institutional Controls are determined to be ineffective or not useful, changes can be made. A less detailed annual review (classified as Other Long Term Management Activities) and site visit should also take place and is warranted because of vandalism in the area. During EE/CA field efforts, site equipment was occasionally vandalized. Also, numerous stripped-out cars arrived and were plundered at the site over the duration of field operations, and regular illegal dumping occurs. Consequently, every year, CEPOH will make a visit to the site to ensure that institutional controls (i.e. signage) are still in place and effective. The site visit program will continue indefinitely until it is determined to be unnecessary. The recurrence interval may be changed if necessary.

7.4 AGENCIES INVOLVED WITH INSTITUTIONAL CONTROLS

USACE, the City and County of Honolulu, and current landowners, are the principal agencies for effective implementation of Institutional Controls. As the former owner of the property, the DOD has the responsibility to protect the public from MEC hazards for current and future land use. USACE will reproduce the MEC pamphlets and provide them to all agencies and landowners for distribution. Five-Year Reviews would be carried out by the USACE to assess the continued effectiveness of the periodic munitions response activities. Smaller-scale annual reviews with a site visit are recommended for years other than those in which a Five-Year Review is scheduled. The annual reviews will be programmed and budgeted by USACE and performed in cooperation with all concerned agencies.

7.5 INSTITUTIONAL CONTROLS FUNDING

7.5.1 Short-Term Costs

Short-term costs include the design and production of the MEC pamphlets, coordination and approval of the MOA, solicitation of public participation in the EE/CA process, and site visits to distribute the pamphlets. These costs for implementing Institutional Controls are already built into the EE/CA cost estimate, and are summarized in Appendix E of this EE/CA.

7.5.2 Long-Term Costs

Long-term costs include the costs for reproducing fact sheets, performing annual reviews, and upkeep of signage. These costs are summarized in Appendix E of this EE/CA.

7.5.3 Funding Sources

The Defense Environmental Restoration Account (DERA) funds the FUDS program, and will provide the USACE funding for future annual reviews. The funding is programmed annually and funded with congressional appropriations. Programming is also reviewed annually and can be modified if necessary. The only identified source of funding is the USACE. Future evaluation of the merit and the physical inspection of the proposed intuitional controls will take place during the Five-Year Reviews. During the review an assessment of the warning signs and their condition should be carried out. Depending on when this EE/CA is approved, these

controls should be implemented immediately. If a change is deemed necessary, the USACE will cease inspection of the warning signs.

7.6 REQUIREMENTS AND SCHEDULE

The EE/CA schedule includes the tasks of designing and producing a MEC educational/awareness pamphlet, as well as establishing an MOA between all concerned agencies and USACE.

7.7 DURATION OF INSTITUTIONAL CONTROLS

Institutional Controls will remain in effect until a recurring review determines that they are no longer necessary.

7.8 PROCEDURES FOR MODIFYING OR TERMINATING INSTITUTIONAL CONTROLS

7.8.1 Modifying or terminating the Institutional Controls for the former Waikane Valley Training Area will involve determining the need for changes in this plan during the five-year review process, then implementing them. The smaller-scale annual reviews will be performed by USACE, who will document the results of their findings in a report. USACE can recommend changes to the then-current Institutional Controls and provide the opportunity for stakeholder approval and modification.

7.8.2 The MEC pamphlet can be modified to add identification of new hazards or provide different response actions. Distribution of the fact sheet can be ceased at any time it is determined to be unnecessary.

7.8.3 Annual reviews can be discontinued any time that it is determined by the reviewers that a hazard from MEC no longer exists. This may include significant construction activities that uncover any MEC that may exist, or the use of new, currently non-existing technology that can reliably identify the presence or absence of subsurface MEC.

7.9 LAND USE

The land use for the entire site is light agricultural and recreational. Members of the public who participate in recreational activities may be exposed to MEC on the ground surface, but are not exposed to subsurface MEC because recreational activities are not intrusive. Light agricultural may expose MEC during the tilling of the soil and planting of native vegetation. Construction activities involving earth moving, however, could potentially expose MEC contained in the subsurface. Construction Support is recommended for future construction throughout the site. Land use is expected to remain the same for the next few years with the potential for change in the future when the nature park is constructed.

7.10 RESIDUAL RISK

The institutional controls identified in this plan are meant to supplement a removal action, in order to protect the human environment from MEC remaining within the former Waikane Valley Training Area from past DOD operations. Overall risk to humans from MEC exposure is high in two of the identified regions based on the density of MEC discoveries on the surface and subsurface, and the likelihood that many items remain. Effective institutional controls can ensure that future MEC discoveries, if any, would be responded to safely.

TABLE 7-1 WAIKANE VALLEY LAND USE MATRIX

RESPONSE ALTERNATIVES[A]	LAND USE FACTORS				REUSE POTENTIALS			
	COST	TIME REQUIRED	LAND USE RESTRICTIONS	BENEFIT	WILDLIFE HABITAT	RECREATIONAL	INDUSTRIAL	COMMERCIAL
No DOD Action Indicated (NDAI)	$0	*0*	No Development, Access Restricted	No Cost	•	○	○	○
Institutional Controls [1]	$1,421,285	2.5 weeks	No Development, Access Restricted	Public Cognizant of Danger	•	○	○	○
Surface Clearance with Institutional Controls	$7,627,289	26 weeks	Recreational Use, Activities Restricted	Public Cognizant of Danger, Danger Reduced	•	◎	◎	◎
Clearance to Detectable Depth with Institutional Controls	$18,551,104	22 months	Residential/Agricultural Use, Access Unrestricted within Cleared Areas	Public Cognizant of Danger, Danger Greatly Reduced	•	•	◎	◎

[a] All Response Alternatives except NDAI include Institutional Controls and Five-Year Reviews for 30 years.

[1] For ease of comparison, the total cost ($420,000) of six Five-Year Reviews (5, 10, 15, 20, 25 and 30 years from present) has been added to the cost of Institutional Controls, as well as the cost of 24 smaller-scale annual reviews to occur on all years other than those in which a Five-Year Review is scheduled, 30 years into the future ($828,000). The Five-Year Review and Annual Review processes, however, are not Institutional Controls. (This assumes a cost of $70,000 per Five-Year Review and $34,500 per Annual Review.)

•Most Acceptable

◎Moderately Acceptable

○Least Acceptable

8.0 RECOMMENDED MEC RESPONSE ACTION ALTERNATIVES

8.0.1 This chapter presents the recommendations for reducing MEC risk at the former Waikane Valley Training Area, Island of Oahu, Hawaii.

8.0.2 The OERIA evaluation areas developed in Chapter 5.0 to evaluate the level of MEC hazard were used in Chapter 6.0 to compare the effectiveness, implementability (including local agency and community acceptance), and cost of the four MEC response action alternatives identified in this EE/CA report. The MEC hazard level (determined in Chapter 5.0) and the best ranking MEC response action alternative (determined in Chapter 6.0) for each OERIA evaluation area were used to help develop and recommend the most appropriate MEC response actions for the former Waikane Valley Training Area. Although in some cases, the best ranking MEC response action alternative in Chapter 6.0 was identified as NDAI, Institutional Controls, or Surface Clearance, professional judgment was employed to determine whether a more protective MEC response action should be recommended (based on the presence of UXO and local agency and community acceptance) for a specific OERIA evaluation area. The OERIA evaluation areas and risk evaluation results are from Chapter 5.0.

8.0.3 The recommended MEC response actions were developed using the following: type, quantity, location, and depth of UXO, MD, and cultural scrap recovered during the EE/CA field investigation; documented records of previous MEC recovered at the sites; past, current, and future land use; input from local agencies, stakeholders, and the community (i.e., public meetings, interviews with local agencies, interaction with local communities and stakeholders); and the Institutional Analysis (Chapter 7.0). The primary goals of these recommendations are to provide: (1) the most effective protection to the public and the environment from MEC and (2) a plan for managing risk associated with exposures to and interaction with MEC at the former Waikane Valley Training Area. The CEPOH will maintain its responsibilities for the residual risk that remains once the recommended MEC response actions have been implemented by performing Five-Year Reviews, which involves returning to the site five years after the recommended MEC response actions have been initiated to assess their effectiveness and reliability. After the initial review has been conducted, recurring reviews will be performed at 5-year intervals. The need for Five-Year Reviews will be coordinated with regulators and stakeholders and justified in each Five-Year Review report.

8.0.4 Final recommendations for the sites will be documented in an Action Memorandum. A Removal Design will be prepared in accordance with the decisions documented in the Action Memorandum and will provide specific details on how the MEC response actions will be implemented. An Explosives Safety Submission document, which summarizes the Removal Design, will be prepared and submitted to the Department of Defense Explosives Safety Board (DDESB) for their review and approval prior to implementation of any MEC response actions. The Action Memorandum will also address the remedial process. To comply with current policy, a remedial process must take place prior to project close-out. Wil Chee Planning, under contract to CEPOH, is currently conducting a Focused Remedial Investigation (RI), in which they are conducting MC sampling. Wil Chee will combine the new MC characterization data and the MEC characterization data in the Focused RI.

8.1 GENERAL RECOMMENDATIONS

8.1.1 Institutional Controls are recommended for the Southeastern Region, Southern Impact Region, Western Region, and Mountainous Region. Removal Actions are recommended for the Southeastern Region and Southern Impact Region. Clearance to Detectable Depth is recommended for the Southeastern Region and a portion of the Southern Impact Region and a Surface Clearance is recommended for the remainder of the Southern Impact Region. The institutional controls include the following:

- Numerous warning signs positioned strategically within the former maneuver area where MEC has previously been recovered and along the access road that cuts through the site, with emphasis near local public gathering areas and primary access points.
- Distribution of informational pamphlets to residents and local businesses.
- Periodic community awareness meetings.
- Letter notifications to landowners.
- Worker/resident MEC safety awareness education by means of a training video.
- Pre-coordinated construction support.

8.1.2 The warning signs, distribution of informational pamphlets, periodic community awareness meetings, letter notifications to landowners, and worker/resident education will provide effective risk management by educating the local community and visitors concerning the dangers associated with MEC at the former Waikane Valley Training Area. It is recommended that informational pamphlets (detailing the types of ordnance used at the site, the hazards associated with these types of ordnance, and whom to contact if ordnance is found) be distributed to all residents and businesses in and around the Waikane Valley Area. Additional copies of the informational pamphlets should be distributed to all local police and fire departments and public libraries, where they will be available to the public. Letter notifications detailing the findings and recommendations of the EE/CA investigation should be mailed to landowners within the sites. It is recommended that community awareness meetings be conducted periodically in Waiahole-Waikane and that worker education training be given (by means of an MEC safety awareness training video) to all employees of local enterprises (e.g., construction companies) conducting business within the Waikane Valley.

8.1.3 Construction support, as defined in Section 6.1.2.4, can be a Clearance to Detectable Depth of limited footprints in areas where construction would occur. Construction support is only recommended as a pre-coordinated option in areas that have not been recommended for a subsurface clearance (Southern Impact Region, Western Region, and Mountainous Region). The recommended institutional controls (i.e., community outreach programs, educational media, and pre-coordinated construction support) sufficiently address the residual risk in these areas. Details concerning the procedures for pre-coordinated construction support are outlined in Section 6.1.2.6.

8.1.4 Data obtained during future construction support activities will be reviewed/evaluated on a continual basis to determine if any further risk management actions are necessary. It is recommended that a map be developed showing the areas where construction support has been implemented and that the map be filed with the County of Hawaii.

8.1.5 The estimated cost to implement this alternative is $1,421,285. The CEPOH will fund the initial set-up, development, and distribution of institutional controls (i.e., display cases, warning signs, informational pamphlets, notification letters, and OE safety awareness training video). Long-term implementation of institutional controls (with the exception of construction support) will be the responsibility of landowners and local agencies. Costing assumptions and costing backup for the recommended institutional controls are presented in detail in Appendix E.

8.2 RECOMMENDATIONS FOR SPECIFIC AREAS WITHIN WAIKANE VALLEY

The former Waikane Training Area footprint (933 acres) has been reduced and characterized with recommendations in Table 8-1, below.

TABLE 8-1 WAIKANE FOOTPRINT REDUCTION

Waikane Site (Acres)	Surface Clearance (Acres)	Subsurface Clearance (Acres)
933	78	163

8.2.1 Southeastern Region

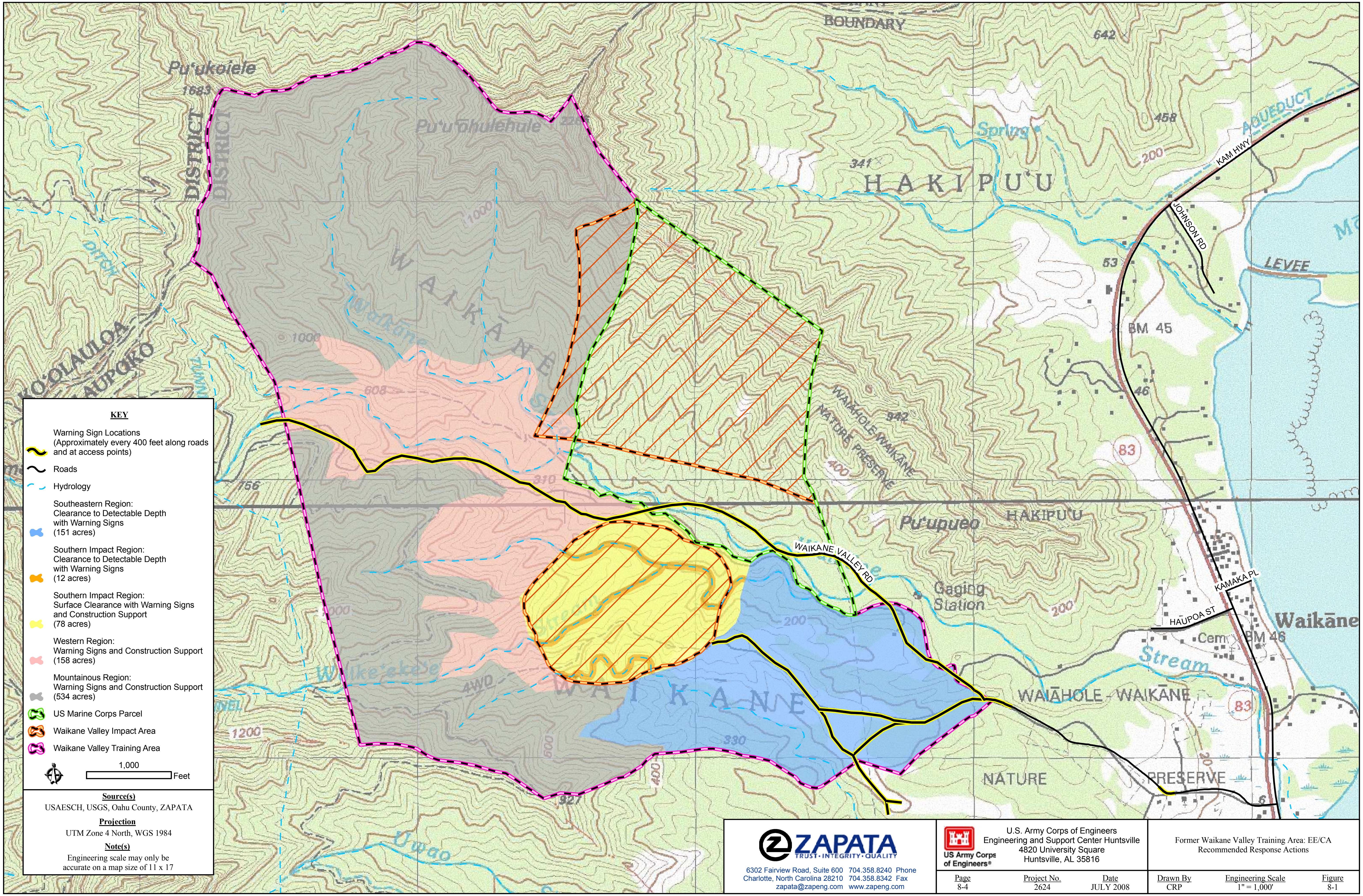
It is recommended that a Clearance to Detectable Depth be conducted on the Southeastern Region (151 acres) as this area is very accessible by the public and is regularly used for recreation, dumping of trash/debris, and for the congregation of local residents paying tribute to a Hawaiian memorial recently established in the area (Figure 8-1). Following the Clearance to Depth, it is recommended that Institutional Controls are established as directed by CEPOH.

8.2.2 Southern Impact Region

Even though there have been two previous Surface Clearance actions performed in the Southern Impact Region, it is recommended that another Surface Clearance be conducted to remove MEC that has been uncovered due to severe erosion in the area. Erosion has caused MEC items to be uncovered and migrate down the steep slopes into the gulches, canyons, and streambeds. In addition to the Surface Clearance (78 acres), Clearance to Depth is recommended for a 40-foot buffer around streams in the Southern Impact Area (12 acres) as seen in Figure 8-1. Following the Removal Actions, it is recommended that Institutional Controls be established as directed by CEPOH, as MEC will continue to surface and migrate year after year.

8.2.3 Western Region and Mountainous Region

Institutional Controls are recommended for the Western Region and Mountainous Region. While little more than small arms were found in this area during the EE/CA, the historical impact area overlaps into these Regions and there may be a potential that MEC is present. Signs placed along the access road that cuts through Waikane will affect both of these Regions because the road is the only vehicular access point to either area (see Figure 8-1).



KEY

- Warning Sign Locations (Approximately every 400 feet along roads and at access points)
- Roads
- Hydrology
- Southeastern Region: Clearance to Detectable Depth with Warning Signs (151 acres)
- Southern Impact Region: Clearance to Detectable Depth with Warning Signs (12 acres)
- Southern Impact Region: Surface Clearance with Warning Signs and Construction Support (78 acres)
- Western Region: Warning Signs and Construction Support (158 acres)
- Mountainous Region: Warning Signs and Construction Support (534 acres)
- US Marine Corps Parcel
- Waikane Valley Impact Area
- Waikane Valley Training Area

1,000 Feet

Source(s)
USAESCH, USGS, Oahu County, ZAPATA

Projection
UTM Zone 4 North, WGS 1984

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

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Former Waikane Valley Training Area: EE/CA
Recommended Response Actions

Page	Project No.	Date	Drawn By	Engineering Scale	Figure
8-4	2624	JULY 2008	CRP	1" = 1,000'	8-1

9.0 QUALITY CONTROL (QC)

9.0.1 ZAPATA is solely responsible for controlling product quality during the execution of this EE/CA. During this project, products met or exceeded contract requirements and were delivered safely, on time, and within budgetary constraints.

9.0.2 The purpose of the Quality Control (QC) Plan was to document the approach and procedures to ensure quality throughout the execution of the EE/CA at the former Waikane Valley Training Area. The plan included all aspects involving quality as required in DID OE-005-11.01, Quality Control Plan. Implementation of these polices ensured that ZAPATA followed its Quality Management System (ZAPATA, 2001) and consistently met the quality and performance requirements of the contract.

9.1 QC METHODS USED

ZAPATA maintains a project QC Team in its Charlotte, North Carolina office to provide QC review on this Waikane Valley EE/CA Report. Copies of the Pre-Draft version of the report were provided to individual reviewers for a peer review. These QC Team members provided comments that were tracked and incorporated into the Draft document for review by our project engineer. Individual reviewers included commentary on the Pre-Draft version of the document provided to them, and signed off on a tracking form. After the QC review, comment tracking forms and copies of the Draft EE/CA Report were again provided to the QC Team for back check regarding comment incorporation. The comment tracking forms are internal and are not included as part of the final document.

9.1.1 Quality Control Audit Procedures

9.1.1.1 Initial QC Audit

9.1.1.1.1 QC audits are performed periodically on MEC operational sites to ensure systems functioned as planned. By or under direction of the Quality Manager, management surveillance of the QC program ensures that operations are performed in accordance with approved work plans. The audits included a review of procedures, logs, records, etc. Management audits helped determine discrepancies in information collected or if conditions and practices created the potential for QC problems, so that proactive measures could be established.

9.1.1.1.2 NAEVA Geophysics, Inc. was subcontracted by ZAPATA to provide QC on the Geophysical Prove-Out (GPO). This QC ensured that Blackhawk was performing the proper procedures outlined in the approved Work Plan and identified opportunities for more effective ways of collecting and processing geophysical data.

9.1.1.2 Schedule

An initial QC and field surveillance audit was performed within ten days following the field investigation mobilization. Field surveillance was concentrated on sensor survey sweep procedures, proper documentation, and checks of survey data for completeness and accuracy. In addition, a daily check of the monitoring records and survey results was conducted.

9.1.1.3 Weekly QC Audit

Each week the UXO QC/SO conducted an audit equivalent in scope to the initial QC audit to ensure compliance with work plans and the SOW. If a noncompliance was discovered, it was documented in a report and given to the ZAPATA Project Manager. Corrective actions were selected, as applicable, and implemented. Selected corrective actions have been documented.

9.1.1.4 Field QC Management Audit

The ZAPATA UXO QC/SO conducted unannounced QC audits during field efforts to ensure compliance with QC protocols and field investigation procedures. QC audits were performed on UXO operational site to ensure systems were functioning as planned. The audit included a review of procedures, logs, records, etc. Audit results were documented and discussed with the ZAPATA Project Manager.

9.1.1.5 Inspection of Completed Work

The ZAPATA SUXOS notified the UXO QC/SO when investigative digs were completed. Thereupon, in an initial grid/transect, the UXO QC/SO, using similar type instruments employed during the intrusive investigation, checked for anomalous response that could be caused by the minimum MEC item of interest. This process included 100% of the grids/transects, to include all of the anomalies selected by the Project Geophysicist. The anomaly QC check included excavating a hole to the estimated clearance depth and radius. All excavations were left open by the dig teams for QC inspection. The excavation floor was checked with three separate hand held instruments for an anomalous response below the depth of clearance. Once the ZAPATA UXO QC/SO determined that the target anomalies have been satisfactorily investigated, he documented the QC inspection in the QC logbook and QC form and notified ZAPATA's Project Manager.

9.1.1.6 Comparative Review of Recovered Items and Geophysical Instrument Readings

To verify that excavated anomalies represent the target item(s) identified during interpretation of the geophysical data, ZAPATA's Senior Geophysicist compared the description(s) of recovered items to the associated instrument response obtained during the geophysical survey. This review verified that the recovered item(s) was (were) appropriate in size, shape, weight, composition, depth, and location at which discovered to have generated the survey instrument reading. The geophysicist carefully evaluated the dig sheets and items that did not favorably match the data or vary significantly from the on-site interpretation was recorded and the excavation was revisited and checked once again to ensure no discrepancies existed.

9.1.1.7 Process Modifications

The geophysicist documented whether the collection and interpretation processes needed to be modified, if corrective actions were necessary, or if the processes were being performed to their optimal capabilities. If it was found that the interpretation processes needed to be modified, or corrective actions were identified, all data processed previously was re-evaluated.

9.2 CORRECTIVE/PREVENTIVE ACTION PROCEDURES

Guidelines were established to assure conditions adverse to quality such as malfunctions, deficiencies, deviations and errors were promptly investigated, documented, evaluated and corrected. When a significant condition adverse to quality was noted in the field or at

subcontractor locations, the cause of the condition was determined and corrective action taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned was documented and reported to the UXO QC/SO, the ZAPATA Project Manager, and involved subcontractor management. Implementation of corrective actions was verified by documented follow-up action. All project personnel had the continuing responsibility to identify problem areas promptly, solicit approved corrective actions, and report any condition adverse to quality. In general terms, corrective/preventive actions were initiated at a minimum:

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

9.3 DATA MANAGEMENT

Data generated during the project was stored in hard copy and electronic form by ZAPATA on the OE Website (http://oe.zapeng.com). Data deemed critically important was sent back to the corporate office in Charlotte.

9.3.1 Geophysical Data

To ensure the quality of the geophysical data interpretation, ZAPATA performed independent reviews of the processed data. The ZAPATA Senior Geophysicist and UXO QC/SO reviewed selected target anomalies, performed detailed inspections of completed grids/transects and conducted post-excavation comparisons of the recovered items against the output from the geophysical survey instruments. Post-excavation comparisons focused on verifying that the recovered item was appropriate to have generated the survey instrument reading. Items that did not favorably match the data or vary significantly from the on-site interpretation were recorded and reinvestigated to resolve the discrepancy. There were over 7,000 DGM anomalies exceeding a threshold of 7mV of which approximately 825 were intrusively investigated. The 7mV threshold was set as an initial screening level based on the GPO.

9.3.2 Other Field Data

All other data generated in the field (dig sheets, photographs, survey coordinates, etc.) was collected, reviewed for accuracy and maintained by the Project Manager. Pertinent data to be reviewed by USAESCH and CEPOH was posted on the ZAPATA OE Website

9.4 DIGITAL GEOPHYSICAL OPERATIONS

To ensure high-quality geophysical data, the data collection and processing steps was monitored during data collection, with the following steps followed for quality control:
A warm-up time, typically five minutes, but dependent on ambient temperatures, was allowed for the geophysical sensors prior to data collection.

- After the warm-up period, data was recorded in a stationary mode for a minimum of three minutes to aid in identifying equipment problems and determining instrument drift. Static noise acceptance criterion was +/- 2.5 mV for the EM61, same for channel 3 of the EM61 Mk II, +/- 1 nT for magnetometers.

- Before and after data collection each day a metal standard was placed in exactly the same position on or beneath the EM coils and data was recorded. Instrument readings of the standard was within a range of +\- 20 % of the average of all readings taken. This was done before and after data collection each day.
- ZAPATA's Senior Geophysicist conducted an independent evaluation of raw and post-processed geophysical data to ensure the geophysical data met quality standards set forth in the SOW.

9.4.1 Data Processing Quality Control Steps Include:

- Monitoring for time gaps in sensor data, which indicate sensor failure.
- Checking data coverage of areas. Areas with data point gaps greater than 15 feet were resurveyed.

9.4.2 Quality Control (QC)

ZAPATA tracked data processing steps to ensure all data were consistently processed. ZAPATA also performed independent reviews and suggested additional processing (e.g., filtering) which may be useful in data analysis and target identification.

9.5 ANOMALY ACQUISITION AND REACQUISITION

ZAPATA reacquired geophysical anomalies identified on the dig sheets using the same surveying methods as the production survey. The anomalies' actual field locations as designated on the dig-sheet were flagged with high-visibility stakes or flags. All discrepancies between the mapped anomaly locations and the actual field anomaly locations were recorded and reported. Any anomaly that was not reacquired was reported.

9.6 FIELD OPERATIONS

The ZAPATA Technical Manager, Project geophysicist, UXO QC/SO, and/or SUXOS were present for all field operations.

9.6.1 Equipment Calibration/Maintenance Program

All equipment used on-site was calibrated and/or used and maintained in accordance with manufacturer's specifications. Records of any repairs performed on equipment are included in the field logbooks with an explanation of problem diagnosis and repair.

9.6.1.1 General Equipment Calibration/Maintenance Requirements

Equipment requiring calibration was calibrated daily or as required by the operation manual. The instruments and general equipment received proper maintenance and care to ensure quality performance. Measurement equipment used on-site was checked at the time of use for operational reliability and calibration before use. Before intrusive activities, instrument manufacturer's specifications were verified for equipment accuracy. Records of these equipment checks were maintained in the QC activity log. If equipment field checks indicated equipment was not operating properly and field repairs could not be made, the equipment was tagged and removed from service. The Project Manager was notified and a request for replacement equipment was expedited. Replacement equipment met the same specifications for accuracy and sensitivity as the equipment removed from service.

9.6.1.2 Geophysical Instruments (Digital and Analog)

Analog geophysical instruments were operationally tested on a test plot to ensure adequate settings for their tasks. The geophysical sensors were field checked twice daily on a test site to ensure they were functioning properly and instrument sensitivity was adequate to detect MEC items of interest. Following these checks, settings (i.e., sensitivity) for each applicable analog instrument was recorded in the team logbook and any equipment that was found unsuitable was immediately removed from service. UXO technicians visually verified handheld instrument settings before, during and after an investigation within a grid or transect. The UXO QC/SO conducted unannounced instrument checks in the field to verify the settings on an instrument agreed with the results from the daily operational tests. If an instrument was found to exhibit improper settings, the affected lines were repeated.

9.6.1.3 Site Communication Equipment

Site communication equipment was checked daily for sufficient battery power. If equipment was damaged, it was replaced immediately.

9.6.1.4 Vehicles and Machinery

Vehicles and machinery were used correctly per manufacturer's warranty. All vehicles and machinery operation were checked daily.

9.6.1.5 Air Monitoring Equipment

Air monitoring was not required.

9.6.1.6 Personal Protective Equipment

The UXO QC/SO and Technical Manager were responsible for checking to make sure each employee had appropriate PPE.

9.6.1.7 Post-Operational Checks

Daily, upon completion of field operations, all equipment was inspected to ensure it is was complete and serviceable and shut down in accordance with the procedures identified by the manufacturer. Operators reported any damaged equipment, unusual wear or missing components. Batteries were removed from battery-powered equipment and charged (if rechargeable). Equipment, instruments, tools, gauges, and other items requiring preventative maintenance were serviced in accordance with the manufacturer's recommendations.

9.6.2 Maintenance Procedures

The manufacturer's written maintenance schedule was followed to minimize downtime of the measurement system. It was the operator's responsibility to adhere to this maintenance schedule and to arrange promptly any necessary service. At a minimum, equipment used daily was cleaned at the end of each workday and kept in good operating condition. Service to the equipment, instruments, tools, etc. was performed by qualified personnel.

9.6.2.1 Maintenance Records

Logs were established to record and control maintenance and service procedures and schedules. All maintenance records were documented and traceable to the specific equipment, instruments, tools and gauges. Records produced were reviewed, maintained and filed by the geophysical

equipment operators and/or UXO technicians when this equipment is used at the site. The UXO QC/SO audited these records to verify complete adherence to these procedures.

9.6.2.2 Equipment Spare Parts

An extra battery pack for each type of geophysical instrument will be on-site at all times. Because of cost considerations, a back-up geophysical instrument will not be kept on-site. However, arrangements will be made with an equipment vendor so that replacement equipment or any spare parts can be delivered to the site by overnight delivery or equivalent means.

9.7 PASS/FAIL CRITERIA FOR ALL QUALITY AUDITS

Any nonconformance to the work or to contractual requirements was documented. Nonconformance included, but was not limited to the following:

- If an instrument response at an anomaly not selected for intrusive action indicated the presence of an item the size of a 37-mm projectile or larger during QC or QA, a failure of the Pass/Failure criteria occurred. The Senior Geophysicist and Technical Manager evaluated the data for possible adjustments in target selection or location.
- Horizontally, 95-percent of all excavated items must lie within a one-meter radius of their original surface location as marked on the dig sheet. Horizontally, 95-percent of all excavated items must lie within a 35 cm radius of their mapped surface location as marked in the field after reacquisition. If this goal was not achieved, a re-evaluation of the data and field procedures, detection methods, positioning system and QC was performed. Positional failures were corrected and a written response explaining the reason and corrective actions was submitted.
- Delivery of items or services that did not meet the contractual requirements of ZAPATA or any of its subcontractors.
- Errors made in following work instructions, or improper work instructions.
- Unforeseeable or unplanned circumstances, which resulted in items or services that did not meet quality, contractual, and/or technical requirements.
- Technical modifications to the project by individuals without the requisite responsibility and authority.
- A QA failure was deemed to have occurred if delivery of items or services have not passed ZAPATA's QC pass/fail metrics and a root cause analysis and corrective action assessment have not been performed.

9.8 QC RESULTS

9.8.1 Records Generated

All personnel used bound field logbooks with consecutively numbered pages. Field logbooks were maintained on-site for the duration of the fieldwork.

9.8.2 Daily Logs

- Date and recorder of field information
- Start and end time of work activities including breaks, lunch and down-time
- Visitors
- Weather conditions
- Relevant events

- Changes from approved or planned work instructions
- Signature of the ZAPATA Project Manager or UXO QC/SO

9.8.3 Safety Log

- Date and recorder of field information
- Daily and tailgate safety briefings (time conducted and by whom)
- Weather conditions
- Significant site events relating to safety
- Accidents
- Stop work because of a safety hazard or deficiency. Documentation will include the hazard or deficiency found, the action taken to correct it and the time lost (if any).
- Safety audits
- Signature of the ZAPATA Project Manager or UXO QC/SO

9.8.4 Training Log

- Date and recorder of log
- Nature of training
- Visitor training
- Signature of both the ZAPATA UXO QC/SO and the SUXOS

9.8.5 QC Activity Log

- Date and recorder of log
- Equipment calibration/testing
- Equipment monitoring results
- QC audits
- Nonconformance reports
- Signature of both the ZAPATA UXO QC/SO and the SUXOS

9.8.6 Ordnance Accountability Log

- Date and recorder of log
- Assigned identification number
- Type, condition and location
- Disposition
- Signature of both the ZAPATA UXO QC/SO and the SUXOS

9.8.7 Meeting Minutes

ZAPATA will provide a record of the proceedings of any specified meeting as directed in DID OE-045.01. The minutes include the purpose of the meeting, information covered during the meeting, specific statements relating to changes or modifications of the project, any actions to be carried out and the names all meeting attendees.

9.8.8 Inventory Forms

There was no Government Furnished Equipment for this project, therefore the Project Manager did not maintained a government property log on-site.

9.9 PROJECT SUMMARY REPORTS

9.9.1 Daily Quality Control Reports

Daily QC Reports were maintained during field activities documenting field measurements, calibration and maintenance of field instruments and management procedures. Corrective actions taken were documented in the Daily QC Reports and the ZAPATA Project Manager was notified immediately.

9.9.2 Weekly Progress Reports

Each week, ZAPATA 's Project Manager submitted a progress report, per DID OE-085.01, to the USAESCH identifying accomplishments, noting deficiencies and describing corrective actions associated with the project. Information from the Daily QC Reports was summarized in the Weekly Progress Report. The weekly report summarized ZAPATA's (including subcontractor), schedule, progress, equipment, personnel and demolition information, as described in the DID.

9.9.3 Monthly Progress Reports

Each month, ZAPATA's Project Manager submitted a progress report, per DID OE-080.01, to the USAESCH identifying accomplishments, noting deficiencies and describing corrective actions associated with the project. Information from the Weekly Progress Reports was summarized in the Monthly Progress Reports. The percentage of the contract amount consumed by each task was identified. In case of schedule changes, an updated schedule (in bar chart form) will be included.

9.10 LESSONS LEARNED

After field activities were completed, Daily QC Reports and Monthly Progress Reports were compiled and summarized in the Quality Control Summary Report (QCSR). ZAPATA compiled the QCSR for this project and identified the following lessons learned as the result of an After Action Review:

- Brush Cutting – should be bid out per acre (with time reference) instead of daily rate. No site visit prompted the subcontractor to provide a daily rate for vegetation clearance as the vegetation density and terrain was unknown.
- Surveyors – surveying should be continuously monitored for accuracy and completeness. A site visit would have shown that GPS surveying was not possible.
- Instruments – flexibility. Terrain, vegetation, weather conditions and ferrous contamination may favor one instrument over another from grid to grid. Survey team should be able to choose (from work plan approved list) based on conditions, and document reasons.
- Team Dig Sheets – could have commentary block to define overall grid/transect conditions to include vegetation, terrain, and surface/subsurface non-target characterizations (i.e., auto debris, maneuver debris, etc.). Also add commentary block for instrument used for grid/transect.

10.0 REFERENCES

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EP 1110-1-24, Establishing and Maintaining Institutional Controls for Ordnance and Explosives (OE) Projects, December 2000.

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11.0 GLOSSARY OF TERMS AND ACRONYMS/ABBREVIATIONS

11.1 GLOSSARY OF TERMS

Anomaly. A significant deviation from the background geophysical response indicative of a buried item that might be MEC.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Federal law (Public Law 96-510 and codified as 42 U.S. Code [U.S.C.] 9601 et. seq.; and 26 U.S.C. 4611, 4612, 4661, 4662, 4671, and 4672) passed on 11 December 1980 that provides a series of programs to address clean up of hazardous waste disposal and spill sites. CERCLA has been modified several times, most significantly in 1986 by the Superfund Amendments and Reauthorization Act (SARA).

Cultural resources. Prehistoric and historic districts, sites, buildings, objects, or any other physical evidence of human activity considered important to a culture, subculture, or a community for scientific, traditional, religious, or any other reason.

Dig team. A team of UXO specialists that search for and excavate geophysical anomaly sources below the ground surface.

Electromagnetic (EM). A geophysical survey instrument that utilizes the rate at which electromagnetic signals in the ground decrease to detect and map metallic objects that are buried near ground level (less than 10 feet below ground surface).

Explosive Ordnance Disposal (EOD). The detection, identification, field evaluation, rendering safe, recovery, evacuation, and disposal of explosive ordnance that has been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material.

Explosive Soil. Explosive soil refers to mixtures of explosives in soil, sand, clay, or other solid media at concentrations such that the mixture itself is explosive: (a) The concentration of a particular explosive in soil necessary to present an explosion hazard depends on whether the particular explosive is classified as "primary" or "secondary"; (b) Primary explosives are those extremely sensitive explosives (or mixtures thereof) that are used in primers, detonators, and blasting caps. They are easily detonated by heat, sparks, impact, or friction. Examples of primary explosives include lead azide, lead styphnate, and mercury fulminate; (c) Secondary explosives are bursting and boostering explosives (i.e., they are used as the main bursting charge or as the booster that sets off the main bursting charge). Secondary explosives are much less sensitive than primary explosives. They are less likely to detonate if struck or when exposed to friction or to electrical sparks. Examples of secondary explosives include trinitrotoluene (TNT), Composition B, and ammonium picrate (Explosive D); (d) Soil containing 10 percent or more by weight of any secondary explosive or mixture of secondary explosives is considered "explosive soil"; (e) Soilcontaining propellants (as opposed to primary or secondary high explosives) may also present explosion hazards.

Exposure. An "exposure" to MEC is defined as occurring when the person traversing or working on the site is in "close proximity" to ordnance, whether or not the person knows the ordnance is present (it could be buried). An accident or injury is not necessarily assumed to occur when an exposure takes place. The definition of "close proximity" varies depending on the specific activity.

Fuze. A device with explosive components designed to initiate a train of fire or detonation in an item of ammunition by an action such as hydrostatic pressure, electrical energy, chemical action, impact, mechanical time, or a combination of these.

Inert. Ordnance, or components thereof, that contains no explosives, pyrotechnic, or chemical agents.

Live. A slang term indicating ordnance containing explosives or active chemicals.

Memorandum of Agreement. A record between government agencies agreeing upon a specific action item.

Military munitions. A term used to define all types of both conventional and chemical ammunition products and their components, produced by or for the military for national defense and security.

Minimum Separation Distance (MSD). A safety area surrounding an MEC excavation site from which all but UXO-qualified personnel are excluded while excavation activities are being performed. Excavation operations halt once unauthorized personnel enter the MSD area and resume once those individuals exit the area. The MSD may vary in size depending on the suspected MEC under investigation.

National Oil and Hazardous Substance Pollution Contingency Plan (NCP). The NCP is the Environmental Protection Agency's (EPA's) blueprint for implementing a Superfund law that addresses the legal requirements for responding to a potential hazard at a CERCLA site. The plan defines responsibilities and activities of affected parties within the site (which could include a Superfund site). The NCP is also the process used to address non-Superfund contaminated sites.

Non-MEC. Items that are non-ordnance-related including, but not limited to, wooden boxes, wire, banding material, trash, auto parts, rocks, and nails. Geological and terrain features causing geophysical anomalies are non-MEC items.

MEC clearance. The surface or subsurface removal of identified MEWC from a defined area.

MEC scrap. Includes those items which are fragments of functioned ordnance, as designed or intentionally destroyed, and which contain no explosive or other items of a dangerous nature. MEC scrap is inert and does not pose a safety risk.

Ordnance and explosives (OE). OE is now referred to as MEC by new terminology. MEC consists of either (1) or (2): (1) Ammunition, ammunition components, chemical or biological warfare material or explosives that have been fired, armed or deployed, or abandoned, expelled from demolition pits or burning pads, lost, discarded, or buried. Such ammunition, ammunition components, and explosives are no longer under accountable record control of any Department of Defense organization or activity; (2) Explosive Soil (see definition under "Explosive Soil").

Risk. Exposures to the chance of injury or loss, or a function of the probability that an accident (or adverse situation) will occur within a certain time, as well as the accident's consequences to people, property, or the environment.

Small arms. Small arms ammunition consists of cartridges and shells used in rifles, pistols, machine guns, and shotguns.

State plane coordinates. A mapping system that measures in distance the position or coordinates of objects north and east of a known position in any given state.

Subsurface MEC investigation. Consists of excavating to a prescribed depth to identify potential subsurface MEC.

Surface clearance. The process in which MEC are visually searched for and removed from the ground surface, without conducting any intrusive activities, and properly disposed of.

Time-Critical Removal Action (TCRA). A TCRA is a clean-up or stabilization action to a release (in this case, MEC) that must be initiated to reduce the risk to public health and/or the environment posed by the release.

Unexploded Ordnance (UXO). Military munitions that have been primed, fuzed, armed, or otherwise prepared for action, and have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installation, personnel, or material and remain unexploded either by malfunction, design, or any other cause.

11.2 ACRONYMS/ABBREVIATIONS

A/E	Architect/Engineer
ARAR	Applicable or Relevant and Appropriate Requirement
ARPA	Archaeological Resources Protection Act
bgs	Below Ground Surface
Blackhawk	Blackhawk GeoServices, Inc. (owned by Zapata Incorporated)
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CEPOH	US Army Corps of Engineers, Honolulu District, Pacific Ocean Division
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
DDESB	Department of Defense Explosives Safety Board
DERP	Defense Environmental Restoration Program

DOD	Department of Defense
EE/CA	Engineering Evaluation/Cost Analysis
EOD	Explosive Ordnance Disposal
FUDS	Formerly Used Defense Sites
GPS	Global Positioning System
InPR	Inventory Project Report
MEC	Munitions and Explosives of Concern
Mk	Mark
mm	millimeter
NDAI	No DOD Action Indicated
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NEPA	National Environmental Policy Act
OE	Ordnance and Explosives (now called MEC)
OERIA	Ordnance and Explosives Risk Impact Assessment
OSHA	Occupational Safety and Health Administration
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SOW	Scope Of Work
TBC	To Be Considered
USA	US Army
USACE	US Army Corps of Engineers
USAESCH	US Army Engineering and Support Center, Huntsville
USEPA	US Environmental Protection Agency
UXO	Unexploded Ordnance

APPENDIX A
SCOPE OF WORK

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STATEMENT OF WORK (SOW)
ORDNANCE & EXPLOSIVES (OE) RESPONSE ACTION
Waikane Valley, Island of Oahu, Hawaii
Project No. H09HI035401
22 December 2003

1.1 OBJECTIVE: The objective of this task order is to perform all phases of an ordnance and explosives (OE) response action for the former Waikane Training Area. The contractor shall perform activities to characterize the site, provide a risk-based analysis, recommendations for follow on activities and perform follow-on activities. The United States Army Corps of Engineers Huntsville Center (CEHNC) and the South Pacific, Honolulu District (CEPOH) shall approve all actions.

2.1 BACKGROUND: The work required under this Statement of Work (SOW) falls under the Defense Environmental Restoration Program - Formerly Used Defense Sites (DERP-FUDS). Ordnance and Explosives (OE) may exist on property formerly owned or leased by the Department of Army.

2.1.1 OE is a safety hazard and may constitute an imminent and substantial endangerment to site personnel and the local populace. All personnel on site shall adhere to the applicable provisions of 29CFR 1910.120.

2.1.2 Work Week: Due to the inherent risk in UXO operations, the contractor shall be limited to 40 hours of UXO related tasks during the workweek (either four 10 hour days or five eight hour days). Two consecutive workweeks shall be separated by 48 hours of rest.

2.1.3 Chemical Warfare Materiel. The site is not suspected to contain Chemical Warfare Materiel (CWM). However, if suspect CWM is encountered during any phase of site activities the Contractor shall withdraw upwind from the work area, secure the site and contact the Corps of Engineers, CEHNC OE Safety.

2.2 Location. Waikane Valley is located on the eastern shore of the Island of Oahu, Hawaii, District of Koolaupoko. It is located roughly at 157° 52.61' W longitudes and 21°30.14' N latitudes. Location of the site is shown in Inventory Project Report for Site No. H09HI035400, Waikane Valley, Island of Oahu, Hawaii.

2.2.1 History. In 1942, the Department of the Army entered into a lease agreement with Lincoln L. McCandless heirs and Waiahole Water Company, Ltd. for the right to use approximately 1,061 acres in Waikane Valley for advanced offensive warfare training due to the valley's geographical location and rugged terrain. Authorization for the Army to use Waikane Valley continued until July 1953 when the Marine Corps was substituted as lessee. Waikane Valley was formerly used as a training and artillery impact area from 1942 to 1976. Of the 1,061 acres, only 874 acres are considered eligible under DERP-FUDS. Marine Corps property, consisting of 187 acres formerly known as the Kamaka parcel, will not be investigated under this scope of

work.

2.3 Potential OE:

2.3.1 The type of potential ordnance items at Waikane Valley are listed as the types that found in previous clearance activities. Those items are 37- and 75-mm HE rounds, 60-mm mortars, 2.36- and 3.5-inch HEAT rockets, M28 HEAT grenades, and M9A1 AT rifle grenades, as well as misc. practice ordnance.

2.3.2 Two EOD sweeps of artillery impact areas therein recovered as much as 40,000 pounds of demilitarized practice ordnance as well as 37- and 75-mm HE rounds, 60-mm mortars, 2.36- and 3.5-inch HEAT rockets, M28 HEAT grenades, and M9A1 AT rifle grenades which were summarily destroyed. An archaeological survey of property south and west of the 187.356-acre DoD-condemned parcel performed subsequent to the OOD sweeps revealed the continued presence of dud rounds as mortars and grenades.

3.0 SPECIFIC REQUIREMENTS

3.1 TASK 1 ENGINEERING EVALUATION COST ANALYSIS (EE/CA) SOW - This field effort for this SOW will include general reconnaissance for the 874 acres, and a total of 45 acres of recon transects, 10 acres of geophysical sampling, and 10 acres of Mag and Flag. The location of the 10 acres of geophysical sampling, and 10 acres of Mag and Flag will be based upon the findings in the reconnaissance phase, along with other known information about the site at the time field effort are being accomplished.

3.1.1 (TASK 1A) SITE VISIT (FFP) Not Used
A stand-alone site visit will **not** take place for this site. The activities normally associated with a site visit shall be conducted during the first or a subsequent Technical Project Planning (TPP) meeting. The Contractor will be allowed 3 extra days during a TPP meeting to perform site visit activities. The Contractor shall notify the CEHNC-OE-DC PM (Mr. Bob Nore 256-895-1507) 14 days before the planned visit. The Contractor shall prepare an Abbreviated Site Safety and Health Plan (ASSHP) before visiting the site. The ASSHP shall be submitted to Contracting Officer for review and approval prior to the site visit. The Contractor shall ensure that all members of the site visit team maintain compliance with the ASSHP. An example ASSHP may be obtained from CEHNC-OE-S (Mr. Greg Parsons at 256-895-1589).

3.1.2 (TASK 1B) TECHNICAL PROJECT PLANNING (TPP) (FFP) In coordination with the Government, the Contractor shall implement the Technical Project Planning (TPP) process IAW EM 200-1-2, *Technical Project Planning (TPP) Process* http://www.usace.army.mil/publications/eng-manuals/em200-1-2/toc.htm and Interim Guidance Document 01-02, *Implementation of Technical Project Planning (TPP) For Ordnance and Explosives (OE) Formerly Used Defense Sites (FUDS) Projects* http://www.hnd.usace.army.mil/oew/intguidocs.asp. The Contractor shall anticipate 2 meetings to be conducted in Honolulu or Kaneohe, Hawaii, to facilitate the TPP process. The contractor shall identify and involve all stakeholders to be included in the TPP process. The Government

does not expect the length of this document to exceed 30 pages. The Contractor shall submit "Draft" and "Final" versions of the document. These submissions shall be in accordance with 4.0 (SUBMITTALS AND CORRESPONDENCE) of this SOW.

3.1.3 (TASK 1C) - GEOPHYSICAL PROVE-OUT (GPO) (FFP)

Based on the data quality objectives (DQOs) developed during the TPP process, the Contractor shall perform a Geophysical Prove-Out (GPO) IAW DID OE-005-05A.01. The Contractor shall submit a "Draft" and "Final" version of the GPO Plan. Along with the GPO Plan, the Contractor shall also submit for approval a Site Safety and Health Plan (SSHP). The Contractor shall not begin field operations on the GPO plot or plots until the government has accepted the GPO Plan and SSHP. The Final GPO Plan shall be inserted in the Final EE/CA Work Plan per DID OE-001.01. The Contractor shall submit a Draft and Final GPO Letter Report, and shall insert the approved Final GPO Letter Report in the EE/CA Work Plan per DID OE-001.01.

3.1.4 (TASK 1D) EE/CA WORK PLAN (FFP)

The Contractor shall prepare an EE/CA Work Plan in accordance with DID OE-001.01, Type I EE/CA Work Plan. The Contractor shall submit a "Draft" and "Final" version of the Work Plan in accordance with Section 4.0 (SUBMITTALS AND CORRESPONDENCE) of this SOW.

3.1.5 (TASK 1E) BRUSH CLEARING(FFP)

Based on the methodology proposed the Contractor shall perform brush clearing necessary to perform project activities. Brush clearing requirements and/or restrictions shall be determined during the TPP process.

3.1.6 (TASK 1F) LOCATION SURVEYS AND MAPPING (FFP)

Location surveying and mapping shall be in accordance with DID OE-005-07.01 and the approved Work Plan. All data submitted, shall be in the Universal Transverse Mercator (UTM) coordinate system, which is a base 1,000 or 10,000-meter grid system. Setting of control monuments and/or location of any property boundaries shall be performed by a Professional Land Surveyor licensed in the State of Hawaii. Contractor personnel who are knowledgeable and competent in land surveying and use of surveying equipment may perform grid and/or transect location and layout. OE locations shall be measured to the nearest 1-foot. The Contractor shall locate and/or establish a minimum of 2 (two) control monuments for each site. Survey data shall be submitted as follows:

Control Monument Data	With weekly status report following completion of work
Site grid Data	With weekly status report following completion of work
OE location data	With weekly status report following completion of work

Survey data may be submitted by CD or electronically via email. Other methods of submittal must be proposed to and approved by the contracting officer. The site data shall include a map of the entire site with grids and/or transects shown and other pertinent features. A tabulated list of corners, starting, ending, turning points or any pertinent survey data shall be submitted in UTM coordinates in a Microsoft Excel Spreadsheet version 98 or higher. OE location data shall be submitted in a Microsoft Excel Spreadsheet version 98 or higher. The list shall also include all network reference points used in performing all surveys. Data shall include grid number where found, item number assigned, type of item, location in UTM coordinates to nearest 1-foot, and

depth below ground surface. All survey data shall be included in the EE/CA Report.

3.1.7 (TASK 1G) GEOPHYSICAL INVESTIGATION AND EVALUATION (FFP)

The Contractor shall implement geophysical investigations, in the areas outlined in the table below, as described in the approved Work Plan and in accordance with DID OE-005-05.01, Geophysical Investigation Plan. All geophysical teams shall be established from personnel who have successfully demonstrated their qualifications on the geophysical prove-out plot for skill, ability, technique and procedure.

SITE	TOTAL ACREAGE	MINIMUM INVESTIGATION ACREAGE
Total	873.6	**10 acres**

3.1.7.1 Investigation. The Contractor shall propose and discuss the methodology by which geophysical investigation shall occur. To properly characterize OE at the site transect/meandering path, grid-based geophysical mapping, or a combination of the two methods may be used. The areas for this investigation are shown in the table above along with the recommended acreage and recommended investigation acreage. Actual number and size of grids and/or transects may increase or decrease based upon conditions encountered in the field. The Contractor shall produce maps of the site that show major geophysical features. A GIS map layer generated in Arcview/Arcinfo (ESRI format) that includes physical (human-made) features overlaid onto the geophysical data results shall also be included. Items to be annotated on this map include but are not limited to, all known or visible pipes & power lines, manhole covers, buildings, inaccessible areas such as brush piles, fence lines, areas of bare rock, etc. All geophysical data shall be sent to CEHNC, on a CD ROM, for verification and Quality Assurance check, IAW DID OE 005-05.01. When a USACE geophysicist is on site the geophysical data shall be available to the geophysicist on a daily basis. This task is meant to solicit proposals for the best technical geophysical detection strategy and OE removal methodology.

3.1.7.2 Evaluation and Anomaly Selection. If digital geophysical re-acquisition is proposed, anomalies shall be excavated in order to characterize the site and to provide information necessary to estimate location, concentration and nature of OE present at the site. A strategy for selecting anomalies shall be proposed by the Contractor, which can best document the procedure and provide the best coverage of the site. The selection for excavation of anomalies shall be based on geophysical detection techniques chosen for the site. A specific number of excavations, anomaly size, signature pattern, statistical approaches such as UXO calculator, or a combination of approaches may be used. As soon as a grid and/or transect is complete, a qualified geophysicist shall check and evaluate the geophysical data collected. The geophysicist shall select anomalies, clearly mark the selections on the geophysical maps, and provide a "dig-sheet" showing predicted location and character of all suspected anomalies to the CEHNC Project Manager. The contractor shall resubmit the dig sheets to CEHNC with the weekly status report after excavation results become available and are recorded on the dig sheets. In addition, the Contractor shall continually compare predicted results with actual results so that the

Contractor's geophysical evaluation methodology is constantly refined over the life of the project.

3.1.8 (TASK 1H) ESTABLISHMENT AND MANAGEMENT OF GIS (FFP) The Contractor shall establish and manage a Geographical Information System (GIS) Plan IAW DID OE-005-14.01. The Contractor shall submit the GIS data in a format compatible to the ESRI (ArcView/ArcInfo) system, version 8.x. The GIS shall be assembled and used to direct daily geophysical investigative activities, and to compile and analyze the daily digital data and incorporate it into the GIS. The contractor shall incorporate layers that overlay on maps of the site that identify physical, cultural, biological and ordnance related items found during the investigation. Examples include: real estate parcel boundaries, streets, highways, flora, fauna, and other sensitive habitats, OE positively identified, positively identified archeological sites, environmental samples, and community structures. All changes from the standard shall be fully documented into a manual specifically tailored for this project.

3.1.9 (TASK 1J) INTRUSIVE INVESTIGATIONS (FFP) The Contractor shall, utilizing UXO qualified personnel as outlined in DID OE-025.01, implement site OE intrusive sampling as specified in the approved Work Plan, and perform OE destruction and ordnance related scrap removal from the site.

3.1.9.1 Anomaly Reacquisition The Contractor shall reacquire all selected geophysical target anomalies identified on the dig sheet. The contractor's proposal shall detail the technical approach that will be implemented to reacquire target anomalies.

3.1.9.2 OE Disposal The Contractor shall be responsible for the destruction of all OE encountered during site activities utilizing qualified personnel and in accordance with all aspects of the approved Work Plan. The Contractor shall establish in the Work Plan a method of disposal for all OE.

3.1.9.3 Backfilling Excavations All access/excavation/detonation holes shall be backfilled by the Contractor. The Contractor shall restore such areas to their prior condition. The Contractor shall take the necessary precautions to prevent erosion on the site resulting from intrusive activities which may include, but is not limited to, reseeding, sodding, installing erosion control matting or other means to prevent erosion. Erosion control methods shall be specified in the WP.

3.1.9.4 OE Accountability The Contractor shall maintain a detailed accounting of all OE items/components encountered. This accounting shall include the amounts of OE, nomenclature and condition, location and depth of OE, and disposition. The accounting system shall also account for all demolition materials utilized to detonate OE on site. This accounting shall be a part of an appendix to the EE/CA Report. The contractor shall take digital photographs of identifiable OE found during the investigation.

3.1.9.5 Disposal of OE Scrap All OE scrap shall be disposed of at a foundry and/or recycler where it will be processed through a smelter or furnace prior to resale or release. It is the intent that the OE scrap is disposed of permanently. Disposal in a landfill or to a scrap dealer where it

may sit in a scrap pile is unacceptable. The contractor shall document the transport of the scrap and the transfer of the scrap to the next responsible party. All OE scrap shall be secured in a lockable container as soon as possible after discovery. All containers shall remain locked until such time as it is delivered to, and signed for by a foundry/recycler. The method/location of disposal shall be detailed in the WP. The Contractor shall also include in the WP a written statement from the dealer that the scrap will be processed through a smelter, or furnace, prior to resale or release.

3.1.9.6 DD Form 1348-1A The Contractor shall complete a DD Form 1348-1A as turn-in documentation. The following statement shall be included on the form.

> **"This certifies and verifies that the AEDA residue, Range Residue, and/or Explosive Contaminated Property listed has been 100 percent properly inspected and to the best of our knowledge and belief, are free of explosive hazards."**

(Note: AEDA is defined as ammunition, explosives and dangerous articles) Instructions for completing this form are contained in the Defense Utilization and Disposal Manual, DoD 4160.21-M. The DD 1348-1A shall be signed with dual signatures. The first signature (certifier) shall be the Senior UXO Supervisor (SUXOS). The second signature (verifier) shall be the USACE OE Safety Specialist.

3.1.9.7 Quality Control The Contractor shall develop a Quality Control (QC) Plan IAW DID OE-005-11.01 that shall ensure a quality product from all aspects of the project to include any work performed by a subcontractor on the project. The Contractor shall develop QC procedures and submit those procedures, for all phase and types of work, in the project work plan(s). The Contractor shall ensure that documentation is maintained and provided in the EE/CA report that supports the QC process. In addition to the QC process by the contractor, the Government may perform Quality Assurance (QA) on all phases and types of work performed. Areas that have been geophysically mapped are subject to 100% anomaly reacquisition for QA purposes. Any work that fails the Government QA process shall be re-done by the Contractor at no cost to the Government. The Contractor shall provide full documentation to the USACE detailing what failed the QA process, why it failed, and how the problem was corrected.

3.1.10 (TASK 1K) EE/CA REPORT (FFP) The Contractor shall prepare an EE/CA report in accordance with DID OE-010.01. The Contractor shall use "Ordnance and Explosives Risk Impact Assessment" (OERIA) for risk assessment on this site. This methodology is detailed in CEHNC OE-CX Interim Guidance document, 01-01, 27 March 2001, "Ordnance and Explosives Risk Impact Assessment". The Contractor shall submit a "Draft", "Draft Final", and "Final" version of the EE/CA Report in accordance with Section 4.0 of this SOW. The "Draft" version of the EE/CA Report shall be sent to the CEHNC and CEPOH only. The Contractor shall address comments from the public in a Responsiveness Summary that will be included as an Appendix in the Final EE/CA Report per DID OE-010.01.

3.1.11 (TASK 1L) PREPARE ACTION MEMORANDUM (FFP) The Contractor shall, based upon close consultation with the Contracting Officer, prepare an Action Memorandum in accordance with EP 1110-1-18, Ordnance and Explosives Response and the approved

recommended alternative. The Contractor shall submit a "Draft" and "Final" version of the Action Memorandum in accordance with Section 4.0 of this SOW.

3.1.12 (TASK 1M) PROJECT MANAGEMENT(T&M) The Contractor shall perform project management activities necessary to maintain project control and to meet reporting requirements, which include but not limited to the following.

3.1.12.1 Schedule. The Contractor shall submit a proposed Project Schedule in Microsoft Project seven days after contract award. The schedule shall be adjusted and refined during the TPP process. The contractor shall update the schedule in accordance with DID OE-085.01 Project Status Report. A final schedule shall be submitted a minimum of 30 days before commencing field work (i.e. GPO plot).

3.1.12.3 Public Meetings. The Contractor shall be prepared to attend and participate in public meetings. The Contractor shall be prepared to make presentations and answer questions concerning project activities at the former Waikane Training Area. The Contractor shall anticipate two public meetings in Kaneohe, Hawaii. These meetings are different from and in addition to the TPP meetings.

3.1.12.4 Reports/Minutes, Record of Meetings. The Contractor shall prepare and submit a report/minutes of all meetings attended in accordance with DID OE-045.01.

3.1.12.5 Telephone Conversations/Correspondence Records. The Contractor shall keep a record of each phone conversation and written correspondence concerning this Task Order in accordance with DID OE-055.01. A copy of this record shall be attached to the Weekly Status Report.

3.1.12.6 Monthly Status Report. The Contractor shall prepare and submit a monthly status report in accordance with DID OE-080.01 and include any other items required in the SOW.

3.1.12.7 Project Status Reports. The Contractor shall prepare and submit weekly status report in accordance with DID OE-085.01 and include any other items required in the SOW.

3.1.12.8 Project Website. The Contractor shall create and maintain a password secured website for this project. The Contractor shall post on the website the Final EE/CA Report, the signed Action Memorandum, the Work Plan and Work Plan review comments. This site shall be maintained through project delivery order close out date. The website shall also make available to the Government and supporting Contractors for this project all supporting geophysical, surveying and mapping, and all other removal action data generated as part of the field activities.

3.1.13 (TASK 1N) COMMUNITY RELATIONS PLAN (NOT USED IN THIS SOW).

3.1.14 (TASK 1P) ADMINISTRATIVE RECORD – (FFP) The Contractor shall establish and maintain an Administrative Record for the on-going project in accordance with the guidance given in EP 1110-3-8, Chapter 4 (Establishing and Maintaining Administrative Records). This task requires close coordination with the CEPOH and

CEHNC to secure all required documents to support the Administrative Record. The Contractor will secure a place to establish and house the Admin Record in the local city or community of the project. The Contractor shall provide all final documents in the Administrative Record on CD to the USACE Rock Island District for placement onto the Project Information Retrieval System (PIRS), and CEHNC and CEPOH for archival purposes.

3.1.15 (TASK 1Q) GROUND RECONNAISSANCE – (FFP)

The Contractor shall prepare a plan for conducting an instrument assisted Ground Reconnaissance (Recon) at the project site. This recon can be conducted during any phase of the project, but prior to the geophysical investigation, and the additional data and information used to support the OE characterization of the site. The recon will cover 45 acres of area, and will be used to provide supporting data for the entire site and provide confirmation of assumptions made in the characterization of the site. The plan shall follow the general guidance as given in EP 1110-1-18. The plan shall describe the approach that the contractor will use to perform the recon to obtain supporting information relating to OE. The recon outline will propose areas to be checked, routes to be taken, procedures for looking for OE evidence, procedure for documenting findings or data, equipment to be used, and use of the data collected. The recon plan shall be included in the project Work Plan. During the recon, the contractor shall use GPS(s), digital camera and magnetometers to assist in gathering data and shall be prepared to deal with any OE found in accordance to the work plan procedures. All data and information obtained from the recon shall be included in the GIS database, and digital images shall be hyperlinked (cross referenced) to GPS recon points along the investigation path. For estimating and bidding purposes, this task is considered to include 45 acres of recon. Investigation path width and length will be determined by crew size, but shall allow a minimum investigation area of 45 acres spread throughout the site.

3.1.16 (TASK 1S) – ENVIRONMENTAL SAMPLING AND ANALYSIS – (NOT USED IN THIS SOW)CULTURAL RESOURCES SURVEY The Corps will perform the required cultural resources studies either with in-house staff or with a Corps archeological contractor. If safety permits, cultural resources will be identified in advance of the implementation of any fieldwork required under this SOW. If safety permits, archeologists may accompany contract personnel in the performance of surface and subsurface investigations. The contractor will work with the archeologists for the purpose of completely avoiding all important cultural resources. The Corps will archeologically clear proposed staging and disposal areas, and has the right to inspect non-lethal debris collected from the surface. Neither the contractor nor any persons hired by the contractor will remove artifacts under penalty of law. Corps archeologists will clear all anomaly locations prior to subsurface investigation. An anomaly may be cancelled for investigation if it falls within and important cultural resource. If grids are employed, Corps archeologists will clear each grid. Grid locations may be moved to avoid cultural resources. If human remains are encountered, work shall halt immediately and the Corps and local Coroner's office will be contacted. The results of the cultural surveys and coordination with SHPO will be incorporated in the environmental protection plan.

3.1.17 BIOLOGICAL ASSESSMENT The Corps will perform the required biological assessment (BA) studies either with in-house staff or with a Corps biological contractor. The coastal Hawaii Gnatcatcher is an endangered bird indigenous to the Elliot project area. Unless determined otherwise by the BA, no fieldwork shall be performed during the breeding period of

15 February to 15 August. The contractor will work with the biologist for the purpose of completely avoiding or impacting any endangered species. If grids are employed, Corps biologists will clear each grid or identify areas to be avoided. Grid locations may be moved to avoid biological resources. The results of the BA and coordination with USFWS will be incorporated in the environmental protection plan of the EE/CA work plan.

The following tasks are a continuation of this SOW to include recommended follow-on activities (if needed). Upon completion of the EE/CA phase of this OE response action the contractor shall develop a proposal for recommended follow-on activities. If the EE/CA portion of the contract does not meet the quality criteria of the government or if follow-on proposals are not within the independent government estimate (IGE) and/or government standards, the remaining tasks may be opened for competitive bidding.

3.2 TASK 2 (OPTIONAL) OE RESPONSE ACTION SOW

3.2.0 OBJECTIVE The objective of task 2 is for the contractor to safely perform an OE response action IAW with the approved action memorandum generated from the EE/CA investigation.

3.2.1 (TASK 2A) - REMOVAL WORK PLAN (FFP) The Contractor shall prepare a Conventional OE Removal Type II Work Plan in accordance with (IAW) DID OE-005-01.01 and the approved USACE action memorandum.

3.2.2 (TASK 2B) BRUSH CLEARING (FFP)
The Contractor shall perform necessary brush clearing.

3.2.3 (TASK 2C) LOCATION SURVEYS AND MAPPING (FFP) Location surveying and mapping shall be IAW DID OE-005-07.01 and the approved Work Plan. The coordinate system used for the Task Order shall be the UTM coordinate system. All data submitted shall be in the UTM Coordinate system. All survey work shall be performed under the direction of a Professional Land Surveyor licensed in the State of Hawaii. OE locations shall be located to the nearest 1 foot. The Contractor shall locate and/or establish a minimum of 2 (two) control monuments for the site. Survey data shall be submitted as follows:

Control Monument Data	With project status report following completion of work
Site grid Data	With project status report following completion of work
OE location Data	With project status report following completion of work

Survey data may be submitted by CD or electronically via email. Other methods of submittal must be proposed to and approved by the contracting officer. The site grid data shall include a map of the entire site with grids shown and other pertinent features. A tabulated list of grid corners in UTM coordinates shall be submitted in a Microsoft Excel Spreadsheet version 98 or higher. OE location data shall be submitted in a Microsoft Excel Spreadsheet version 98 or higher. Data shall include a grid number where found, item number assigned, type of item, location in UTM coordinates to nearest foot, and depth below ground surface. All survey data shall be included in the Site Specific Final Report.

3.2.4 (TASK 2D) REMOVAL ACTION (FFP) The Contractor shall, utilizing UXO qualified personnel as outlined in DID OE-025.01, implement the removal action as specified in the approved action memorandum, approved Work Plan, approved ESS and perform OE destruction and scrap removal from the site.

3.2.4.1 OE Removal The contractor shall perform an OE removal of areas H, G, and D IAW with the approved action memorandum. Removal methodology will be approved in the work plan review prior to intrusive fieldwork and shall be IAW all relevant DIDs. The anomalies shall be identified through approved OE identification methodologies and reported on the "dig sheet" that shall be included in the final report.

3.2.4.2 OE Disposal
The Contractor shall be responsible for the destruction of all OE encountered during site activities utilizing qualified personnel and in accordance with all aspects of the approved Work Plan. The Contractor shall establish in the Work Plan a method of disposal for all OE.

3.2.4.3 Backfilling Excavations All access/excavation/detonation holes shall be backfilled by the Contractor. The Contractor shall restore such areas to their prior condition. Erosion on the slope area is a concern of the stakeholders. The Contractor shall take the necessary precautions to prevent erosion on the site resulting from intrusive activities, which may include but not limited to, reseeding, sodding, installing erosion control matting or other means to prevent erosion. Erosion control methods shall be specified in the WP.

3.2.4.4 OE Accountability The Contractor shall maintain a detailed accounting of all OE items/components encountered. This accounting shall include the amounts of OE, the nomenclature and condition, depth located, disposition and location. The accounting system shall also account for all demolition materials utilized to detonate OE on site. This accounting shall be a part of an appendix to the Final Report.

3.2.4.5 Disposal of OE Scrap All OE scrap shall be disposed of at a foundry and/or recycler where it will be processed through a smelter or furnace prior to resale or release. It is the intent that the OE scrap is disposed of permanently. Disposal in a landfill or to a scrap dealer where it may sit in a scrap pile is unacceptable. The contractor shall document the transport of the scrap and the transfer of the scrap to the next responsible party. All OE scrap shall be secured in a lockable container as soon as possible after discovery. All containers shall remain locked until such time as it is delivered to, and signed for by a foundry/recycler. The method/location of disposal shall be detailed in the WP. The Contractor shall also include in the WP a written statement from the dealer that the scrap will be processed through a smelter, or furnace, prior to resale or release.

3.2.4.6 DD Form 1348-1A The Contractor shall complete a DD Form 1348-1A as turn-in documentation. The following statement shall be included on the form.

> **"This certifies and verifies that the AEDA residue, Range Residue, and/or Explosive Contaminated Property listed has been 100 percent properly**

inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related material."

(Note: AEDA is defined as ammunition, explosives and dangerous articles) Instructions or completing this form are contained in the Defense Utilization and Disposal Manual, DoD 4160.21-M. The DD 1348-1A shall be signed with dual signatures. The first signature (certifier) shall be the Senior UXO Supervisor (SUXOS). The second signature (verifier) shall be the USACE OE Safety Specialist.

3.2.4.7 Quality Control The Contractor shall develop a Quality Control (QC) Plan IAW DID OE-005-11.01 that shall ensure a quality product from all aspects of the project to include any work performed by a subcontractor on the project. The Contractor shall develop QC procedures and submit those procedures, for all phase and types of work, in the project work plan(s). The Contractor shall ensure that documentation is maintained and provided in the final report that supports the QC process. In addition to the QC process by the contractor, the Government may perform Quality Assurance (QA) on all phases and types of work performed. Any work that fails the Government QA process shall be re-done by the Contractor at no cost to the Government. The Contractor shall provide full documentation to the USACE detailing what failed the QA process, why it failed, and how the problem was corrected.

The criterion for accepting grids that have been completed by the contractor is (criteria subject to change based on the results of the EE/CA):

Sectors to be determined during the EE/CA Phase of the investigation.

3.2.4.8 UXO Quality Control (QC) Specialist The individual performing the UXO QC shall not be involved in the performance of other OE field tasks. UXO QC shall be a separate function. The UXO QC Specialist shall meet the requirements as shown DID OE-025.01. The Contracting Officer must approve any exceptions.

3.2.5 (TASK 2E) ESTABLISHMENT AND MANAGEMENT OF GIS (FFP) The Contractor shall update the GIS established from the EE/CA IAW DID OE-005-14.01 Geographical Information System Plan. The Contractor shall submit the GIS data in a format compatible to the ESRI (Arcview/Arcinfo) system.

3.2.6 (TASK 2F) SITE SPECIFIC FINAL REPORT (FFP) The Contractor shall prepare and submit a Site Specific Final Report in accordance with CEHNC guidance documents and DID OE-030.01.

3.2.7 (TASK 2G) PROJECT MANAGEMENT (FFP) The Contractor shall perform project management activities necessary to maintain project control, to include but not limited to the following.

3.2.7.1 Schedule The Contractor shall submit a proposed Project Schedule in Microsoft Project. The schedule shall be adjusted and refined during project planning meeting(s). The contractor shall update the schedule IAW DID OE-085.01 Project Status Report. A final schedule shall be submitted a minimum of 30 days before commencing field work (i.e. GPO plot).

3.2.7.2 Telephone Conversations/Correspondence Records The Contractor shall keep a record of each phone conversation and written correspondence concerning this Task Order IAW DID OE-055.01. A copy of this record shall be attached to the Project Status Report.

3.2.7.3 Monthly Status Report The Contractor shall prepare and submit a monthly status report IAW DID OE-080.01 and include any other items required in the SOW.

3.2.7.4 Project Status Reports During fieldwork the Contractor shall prepare and submit weekly status report IAW DID OE-085.01 and include any other items required in the SOW. The CEHNC TM shall be included on the distribution list for the Project Status Report. Others may be added during the duration of the project.

3.2.7.5 Meetings The Contractor shall be prepared to attend and participate in 2 project meetings to be held in Kaneohe. Contractor personnel shall not exceed 2 people plus travel for each meeting.

3.2.8 (TASK 2H) CONVENTIONAL EXPLOSIVES SAFETY SUBMISSION (ESS) (FFP)
The contractor shall develop a Conventional Explosives safety submission IAW DID OE-060.01 and EP 385-1-95b. The ESS shall describe, in detail, the safety criteria involved in an OE removal operation. The ESS shall be approved prior to site mobilization. The Contractor shall coordinate with CEHNC OE-CX Wayne Shaw (256-895-1513) for ESS approval. The Contractor shall keep the CEHNC PM informed of any correspondence concerning the ESS.

3.2.9 (TASK 2J) INSTITUTIONAL CONTROLS The contractor shall implement institutional controls IAW the approved action memorandum and the approved work plan.

The following tasks are a continuation of this SOW to include a time critical removal action (TCRA) (if needed).

3.3 (TASK 3) (OPTIONAL) TIME CRITICAL REMOVAL ACTION (TCRA)

3.3.0 OBJECTIVE Safely locate, identify and dispose of all OE and OE related scrap one inch square in size or larger as rapidly as possible from the surface of the area referenced in the approved action memorandum.

3.3.1 (TASK 3A) - REMOVAL WORK PLAN (FFP) The Contractor shall prepare a Conventional OE Removal Type II Work Plan in accordance with (IAW) DID OE-005-01.01.

3.3.2 (TASK 3B) BRUSH CLEARING (FFP)
The contractor shall perform necessary brush clearing.

3.3.3 (TASK 3C) LOCATION SURVEYS AND MAPPING (FFP) Location surveying and mapping shall be IAW DID OE-005-07.01 and the approved Work Plan. The coordinate system used for the Task Order shall be the UTM coordinate system. All data submitted shall be in the UTM Coordinate system. All survey work shall be performed under the direction of a Professional Land Surveyor licensed in the State of Hawaii. OE locations shall be located to the nearest 1 foot. The Contractor shall locate and/or establish a minimum of 2 (two) control monuments for the site. Survey data shall be submitted as follows:

Control Monument Data	With project status report following completion of work
Site grid Data	With project status report following completion of work
OE location Data	With project status report following completion of work

Survey data may be submitted by CD or electronically via email. Other methods of submittal must be proposed to and approved by the contracting officer. The site grid data shall include a map of the entire site with grids shown and other pertinent features. A tabulated list of grid corners in UTM coordinates shall be submitted in a Microsoft Excel Spreadsheet version 98 or higher. OE location data shall be submitted in a Microsoft Excel Spreadsheet version 98 or higher. Data shall include a grid number where found, item number assigned, type of item, location in UTM coordinates to nearest foot, and depth below ground surface. All survey data shall be included in the Removal Report.

3.3.4 (TASK 3D) REMOVAL ACTION (T&M) The Contractor shall, utilizing UXO qualified personnel as outlined in DID OE-025.01, implement the removal action as specified in the approved action memorandum, the approved Work Plan, approved ESS and perform OE destruction and scrap removal from the site.

3.3.4.1 OE Removal The contractor shall provide all necessary personnel and equipment to visually locate, identify, and make final disposition of all surface OE and OE related scrap one inch square and larger from the sites. A planned systematic effective approach shall be utilized to search, visually locate, and clear the project site that will result in optimum search effectiveness. The procedures shall comply with the guidance contained in EP 385-1-95a. Clearance methodology will be approved in the work plan review prior to intrusive fieldwork and shall be IAW all relevant DIDs. The anomalies shall be identified through approved OE identification methodologies and reported on the "dig sheet" that shall be included in the final report.

3.3.4.2 OE Disposal The Contractor shall be responsible for the disposal of all OE encountered during site activities utilizing qualified personnel and in accordance with all aspects of the approved Work Plan. The Contractor shall establish in the Work Plan a method of disposal for all OE.

3.3.4.3 Backfilling Excavations All access/excavation/detonation holes shall be backfilled by the Contractor. The Contractor shall restore such areas to their prior condition. Erosion on the slope area is a concern of the stakeholders. The Contractor shall take the necessary precautions to prevent erosion on the site resulting from intrusive activities, which may include but not

limited to, reseeding, sodding, installing erosion control matting or other means to prevent erosion. Erosion control methods shall be specified in the WP.

3.3.4.4 OE Accountability The Contractor shall maintain a detailed accounting of all OE items/components encountered. This accounting shall include the amounts of OE, the nomenclature and condition, depth located, disposition and location. The accounting system shall also account for all demolition materials utilized to detonate OE on site. This accounting shall be a part of an appendix to the Final Report.

3.3.4.5 Disposal of OE Scrap All OE scrap shall be disposed of at a foundry and/or recycler where it will be processed through a smelter or furnace prior to resale or release. It is the intent that the OE scrap is disposed of permanently. Disposal in a landfill or to a scrap dealer where it may sit in a scrap pile is unacceptable. The contractor shall document the transport of the scrap and the transfer of the scrap to the next responsible party. All OE scrap shall be secured in a lockable container as soon as possible after discovery. All containers shall remain locked until such time as it is delivered to, and signed for by a foundry/recycler. The method/location of disposal shall be detailed in the WP. The Contractor shall also include in the WP a written statement from the dealer that the scrap will be processed through a smelter, or furnace, prior to resale or release.

3.3.4.6 DD Form 1348-1A The Contractor shall complete a DD Form 1348-1A as turn-in documentation. The following statement shall be included on the form.

> **"This certifies and verifies that the AEDA residue, Range Residue, and/or Explosive Contaminated Property listed has been 100 percent properly inspected and to the best of our knowledge and belief, are inert and/or free of explosives or related material."**

(Note: AEDA is defined as ammunition, explosives and dangerous articles) Instructions or completing this form are contained in the Defense Utilization and Disposal Manual, DoD 4160.21-M. The DD 1348-1A shall be signed with dual signatures. The first signature (certifier) shall be the Senior UXO Supervisor (SUXOS). The second signature (verifier) shall be the USACE OE Safety Specialist.

3.3.4.7 Quality Control The Contractor shall develop a Quality Control (QC) Plan IAW DID OE-005-11.01 that shall ensure a quality product from all aspects of the project to include any work performed by a subcontractor on the project. The Contractor shall develop QC procedures and submit those procedures, for all phase and types of work, in the project work plan(s). The Contractor shall ensure that documentation is maintained and provided in the final report that supports the QC process. In addition to the QC process by the contractor, the Government may perform Quality Assurance (QA) on all phases and types of work performed. Any work that fails the Government QA process shall be re-done by the Contractor at no cost to the Government. The Contractor shall provide full documentation to the USACE detailing what failed the QA process, why it failed, and how the problem was corrected.

No criterion has been developed. A criterion will be developed prior to the award of task 3.

3.3.4.8 UXO Quality Control (QC) Specialist The individual performing the UXO QC shall not be involved in the performance of other OE field tasks. UXO QC shall be a separate function. The UXO QC Specialist shall meet the requirements as shown DID OE-025.01. The Contracting Officer must approve any exceptions.

3.3.5 (TASK 3E) ESTABLISHMENT AND MANAGEMENT OF GIS (FFP) The Contractor shall establish and manage a Geographical Information System (GIS) Plan IAW DID OE-005-14.01. The Contractor shall submit the GIS data in a format compatible to the ESRI (Arcview/Arcinfo) system.

3.3.6 (TASK 3F) SITE SPECIFIC FINAL REPORT (FFP) The Contractor shall prepare and submit a Site Specific Final Removal Report in accordance with CEHNC guidance documents and DID OE-030.01. The Contractor shall also prepare a recurring review plan in accordance with DID OE-110.01. This plan shall be included in the Final Removal Report as an appendix.

3.3.7 (TASK 3G) PROJECT MANAGEMENT (T&M) The Contractor shall perform project management activities necessary to maintain project control, to include but not limited to the following.

3.3.7.1 Schedule The Contractor shall submit a proposed Project Schedule in Microsoft Project. The schedule shall be adjusted and refined during project planning meeting(s). The contractor shall update the schedule IAW DID OE-085.01 Project Status Report. A final schedule shall be submitted a minimum of 30 days before commencing field work (i.e. GPO plot).

3.3.7.2 Telephone Conversations/Correspondence Records The Contractor shall keep a record of each phone conversation and written correspondence concerning this Task Order IAW DID OE-055.01. A copy of this record shall be attached to the Project Status Report.

3.3.7.3 Monthly Status Report The Contractor shall prepare and submit a monthly status report IAW DID OE-080.01 and include any other items required in the SOW.

3.3.7.4 Project Status Reports During fieldwork the Contractor shall prepare and submit weekly status report IAW DID OE-085.01 and include any other items required in the SOW. The CEHNC TM shall be included on the distribution list for the Project Status Report. Others may be added during the duration of the project.

3.3.7.5 Meetings The Contractor shall be prepared to attend and participate in 2 project meetings to be held in Kaneohe. Contractor personnel shall not exceed 2 people for 1 plus travel for each meeting.

3.3.8 (TASK 2H) CONVENTIONAL EXPLOSIVES SAFETY SUBMISSION (ESS) (FFP)
The contractor shall develop a Conventional Explosives safety submission IAW DID OE-060.01 and EP 385-1-95b. The ESS shall describe, in detail, the safety criteria involved in an OE removal operation. The ESS shall be approved prior to site mobilization. The Contractor shall

coordinate with CEHNC OE-CX Wayne Shaw (256-895-1513) for ESS approval. The Contractor shall keep the CEHNC PM informed of any correspondence concerning the ESS.

4.0 SUBMITTALS AND CORRESPONDENCE

4.1 Format of Engineering Reports. Any and all reports and/or plans not covered by a specific DID shall be prepared according to the following guidelines. The front cover of the report or plan shall be prepared in accordance with Attachment 1 of DID OE-030.01 and shall bear the following statement in addition to other requirements. "*The views, opinions, and/or findings contained in the report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentations."* The cover shall also denote which version of the report/plan presented (e.g. Draft, Draft Final or Final). When drawings are required, data may be combined to reduce the number of drawings. All drawings shall be of engineering quality in drafted form with sufficient detail to show interrelations of major features. The contents and format of the engineering reports shall be arranged in accordance with all pertinent guidance documents. The report/plan shall be typed on standard size of 8-1/2 inch by 11 inch white paper, with drawings other than the construction drawings folded, if necessary, to this size. Chapters shall be numbered sequentially. Within each chapter the paragraphs shall be numbered sequentially starting with the chapter number. Within each chapter any figures, tables, and charts shall be numbered sequentially starting with the chapter number. Appendices shall be lettered alphabetically and shall be identified and referenced in the text of the report/plan. Within each appendix, each page shall be numbered sequentially starting with the appendix letter. Every page of the report/plan shall contain a date footer, contract number, task order number and version (e.g. draft, final, original, change 1, etc). The report/plan shall be legible and suitable for reproduction. The final version of the report/plan shall also be submitted on CD-ROM in accordance with the other paragraphs of section 4.0. All data, including raw analytical and electronic data, generated under this task order are the property of the DoD and the government has unlimited rights regarding its use.

4.2 Computer Files. All final text files generated by the Contractor under this contract shall be furnished to the Contract Officer in Microsoft Word 6.0 or higher software. Spreadsheets shall be in Microsoft EXCEL. All final CADD drawings shall be in Microstation 95 or higher. All GIS data shall be in ESRI (Arcview/Arcinfo) format. All laboratory data for samples analyzed by commercial laboratories shall be submitted in the Automated Data Review (ADR) software electronic data deliverable (EDD) format as provided in ADR Version 4.0 Specifications. Tables A1 and A3 are mandatory submittals. Table A2 should be provided if the laboratory is capable.

4.3 PDF Deliverables. In addition to the paper and digital copies of submittals, the final version of any and all reports and/or plans shall be submitted, uncompressed, on CD ROM in PDF format along with a linked table of contents, linked tables, linked photographs, linked graphs and linked figures, all of which shall be suitable for viewing on the Internet.

4.4 Review Comments. Various reviewers will have the opportunity to review submittals made by the Contractor under this contract. The Contractor shall review all comments received through the CEHNC Project Manager and evaluate their appropriateness based upon their merit and the requirements of the SOW. The Contractor shall issue to the Project Manager a formal, annotated response to each in accordance with the established schedule in this SOW. If the Contractor does not concur with a comment, the issue shall be discussed and resolved with the CEHNC PM. If the PM is not available then the Contractor shall contact the Technical Manager (Jason Burcham 256-895-1289).

4.5 Identification of Responsible Personnel. Each report shall identify the specific members and title of the Contractor's staff and subcontractors that had significant and specific input into the reports' preparation or review.

4.6 Public Affairs. The Contractor shall not publicly disclose any data generated or reviewed under this contract. The Contractor shall refer all requests for information concerning site conditions to the local Corps of Engineers CEPOH with a copy furnished to the CEHNC Project Manager. Reports and data generated under this contract are the property of the DoD and distribution to any other source by the Contractor, unless authorized by the Contracting Officer, is prohibited.

4.7 Submittals: The contractor shall furnish copies of the plans, maps, and reports as identified in paragraph 4.8, or as specified in this SOW, to each addressee listed below in the quantities indicated. The Contractor shall submit 4 copies on CD of the Final versions of all submittals (WPs, Reports, Plans, etc) in accordance with section 4.2. The Contractor shall submit 1 copy on CD of the Final Versions of all submittals (WPs, Reports, Plans, etc) in accordance with section 4.3. For purposes of the SOW all days are considered calendar days.

ADDRESSEE	COPIES
US Army Engineering and Support Center, Huntsville ATTN: CEHNC-OE-DC (Mr. Bob Nore) PO BOX 1600 Huntsville, Alabama 35807-4301	4
Commander US Army District, Los Angeles ATTN: CEPOH-PP-E (Mr. Helene Takemoto) Bldg. 252 Ft. Shafter, HI. 96858-5440	10

4.8 Submittals and Due Dates:

EE/CA PHASE SUBMITTAL	DUE DATES
ASSHP	14 days prior to site visit
Proposed schedule	7 days after award

Draft TPP document	TBD
Final TPP document	14 Days after comments
Draft Community Relations Plan	TBD
Final Community Relations Plan	14 days after receipt of comments
Draft GPO Plan	TBD
Final GPO Plan	7 days after receipt of comments
Draft GPO Report	7 days after completion of fieldwork
Final GPO Report	7 days after receipt of comments
Draft Work Plan	TBD
Final Work Plan	14 days after receipt of comments
Draft EE/CA Report	30 days after completion of fieldwork
Draft Final EE/CA Report	14 days after receipt of comments
Final EE/CA Report	14 days after receipt of comments
Draft Action Memorandum	14 days after acceptance of EE/CA
Final Action Memorandum	7 days after receipt of comments
Daily Quality Control Report for Environmental Sampling	Daily during Environmental Sampling Activities
Analytical Data Submittal for QA Evaluation	30 days after completion of fieldwork
Electronic Laboratory Data Submittal	60 days after completion of fieldwork

FOLLOW-ON PHASE	**DUE DATES**
Draft ESS	TBD
Final ESS	14 days after receipt of comments
Proposed schedule	7 days after award
Draft Type II Work Plan	TBD
Final Type II Work Plan	14 days after receipt of comments
Draft Removal Report	30 days after completion of fieldwork
Draft Final Removal Report	14 days after receipt of comments
Final Removal Report	14 days after receipt of comments

5.0 REFERENCES

5.1 EE/CA PHASE REFERENCES:

5.1.1 Basic Contract

5.1.2 Inventory Project Report for Site No. H09HI035400, Waikane Valley, Island of Oahu, Hawaii.

5.1.3 Federal Acquisition Regulation (FAR) Clause 52.236.13, Accident Prevention

5.1.4 Data Item Descriptions -

The Data Item Descriptions are part of this contract and are available at the following URL: http://www.hnd.usace.army.mil/oew/policy/dids/didindx.html

5.1 FOLLOW-ON ACTIVITY REFERENCES

5.2.1 Federal Acquisition Regulation (FAR) Clause 52.236.13, Accident Prevention

5.1.5 Data Item Descriptions are part of this contract and are available at the following URL: http://www.hnd.usace.army.mil/oew/policy/dids/didindx.html

END of SOW.

APPENDIX B
SCRAP DISPOSITION DOCUMENTATION

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Zapata Engineering
Waikane Valley Training Area
OE Related Scrap Disposition

March 15, 2006

I certify that the approximately 50 lbs of Ordnance Related Scrap discovered and collected during the Intrusive Phase of the Waikane EE/CA, (1/06 through 3/06), have been physically inspected and are Certified to be Free of Explosive Hazards. Subsequently this scrap is to be turned over to the Zapata Schofield Barracks Project for inclusion into that projects Scrap Collection and Turn-In.

Danny P. ~~Paul~~
Quality Control Officer
Zapata Engineering

Christopher Rose
Senior UXO Specialist
Zapata Engineering

I Certify that the above referenced Scrap has been recieved and is Free of Explosive Hazards.

Schofield Project Representative

March 16, 2006
Date

APPENDIX C
DEMOLITION ACTIVITY SUMMATION TABLE

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WAIKANE VALLEY EE/CA
DEMOLITION ACTIVITY SUMMATION TABLE

DATE DISCOVERED	UXO ITEM	LOCATION	DATE DESTROYED	HE/INERT	HAWAIIAN BLASTER	COMMENTS
23 Jan 06	37mm Projectile	Transect B6G-I1	27 Jan 06	HE	E. Brundage	
24 Jan 06	81mm Mortar Shell	Grid 55	27 Jan 06	HE	E. Brundage	
24 Jan 06	2.36-Inch Rocket	Grid 98	27 Jan 06	Inert (Practice)*	E. Brundage	Explosively Demilled
25 Jan 06	81mm Mortar Shell	Grid 145	27 Jan 06	HE	E. Brundage	
1 Mar 06	60mm Mortar Shell	Grid 115	8 Mar 06	HE	E. Brundage	
1 Mar 06	60mm Mortar Shell	Grid 115	8 Mar 06	HE	E. Brundage	
7 Mar 06	37mm Projectile	Grid 62	8 Mar 06	HE	E. Brundage	
7 Mar 06	3.5-Inch Rocket	Grid 168	8 Mar 06	Inert (Practice)*	E. Brundage	Explosively Demilled
14 Mar 06	60mm Mortar Shell	Grid 103	15 Mar 06	HE	E. Brundage	

* The positive identification of these items (whether HE or practice) could not be determined by visual observation. They were disposed of by detonation and because post inspection of the blast area or ordnance item indicated that there was no additional contribution of energetics to the donor charge used for disposal and after a post-detonation inspection, they were considered practice munitions.

APPENDIX D
INSTITUTIONAL ANALYSIS REPORT

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INSTITUTIONAL ANALYSIS REPORT
FORMER WAIKANE VALLEY TRAINING AREA

1.0 PURPOSE OF STUDY

This Institutional Analysis Report has been prepared to support the recommendations presented in the Engineering Evaluation/Costs Analysis (EE/CA) addressing the former Waikane Valley Training Area, Oahu, Hawaii. This analysis presents the opportunities to implement an institutional control program and identifies that it may be available to assist with implementation and/or maintenance of the Institutional Control Program. This report identifies the agencies having jurisdiction over ordnance-contaminated land and to assess their appropriateness, willingness and capability to assert this control.

1.1 INSTITUTIONAL CONTROLS

As presented in the EE/CA, the proposed recommendations for all four areas include additional signs and continued authorized personnel only access. Current controls already in place include restricted access through locked gates, fences and natural barricades. Institutional controls such as signage and letters of notice were recommended because they provided the most effective controls available to limit public exposure to the possible ordnance that is located within the areas identified during the EE/CA site characterization.

1.2 STUDY APPROACH

This report has been prepared by Zapata Incorporated (ZAPATA) to detail the institutional controls in accordance with the guidance developed by the United States Army and Engineering Support Center Huntsville (USAESCH). Local and private interests cooperation is required for these institutional controls to be effective. The US Army Corps of Engineers, Honolulu District (CEPOH) has developed a whole suite of institutional controls for Hawaii properties which can be built upon to accommodate the former Waikane Valley Training Area and as such, no State or Federal agencies were interviewed as to their concerns and capabilities to exercise these institutional controls over the property.

1.3 STUDY OVERVIEW

This study outlines which agencies have jurisdiction over the former Waikane Valley Training Area and assesses their capabilities and willingness to support and enforce the institutional controls set forth in the EE/CA

2.0 SITE LOCATION

Waikane Valley is located on the eastern shore of the Island of Oahu, Hawaii, District of Koolaupoko. Its coordinates are approximately 157° 52.61’ W longitudes and 21° 30.14” N latitude (Figure 1-1). The Waikane Valley Training Area covers approximately 933 acres located on the coastal plain adjacent to Kaneohe Bay and on the slopes of the Koolau Mountain Range.

2.1 PHYSICAL DESCRIPTION

2.1.1 Most of this site is covered with dense jungle vegetation including the densely forested coastal plain and thick grasses and shrubs in the higher elevations. There are several gulches

throughout the parcel as well as areas with steep slopes. Elevation above sea level ranges from 90 feet to over 2,090 feet. The Island of Oahu is the result of varied geologic processes, including volcanism, subsidence, weathering, and sedimentation (USGS, 1996). The Hawaiian Islands are sub-aerial peaks of large volcanic mountain ranges, most of which are submerged beneath the sea. The geologic conditions at the site are presented in detail in Section 3.4.3 of this Work Plan. According to the Western Regional Climate Center, this location receives an average of 76.03 inches of precipitation each year, with most of this rainfall occurring in October through March. The average maximum temperature for this area is 79.8° F and the average minimum temperature is 68.8° F

2.2 SITE HISTORY

In 1942, the Department of the Army entered into a lease agreement with Lincoln L. McCandless heirs and Waiahole Water Company, Ltd. This lease agreement established the right to use approximately 1,132 acres in Waikane Valley for advanced offensive warfare training due to the valley's geographical location and terrain. Authorization for the Army to use Waikane Valley continued until July 1953 when the Marine Corps was substituted as lessee. Waikane Valley was formerly used as a training and artillery impact area from 1942 to 1976. Of the 1,132 acres, only 933 acres are considered eligible under DERP-FUDS. Marine Corps property, consisting of 199 acres formerly known as the Kamaka parcel, was not investigated under this scope of work. Due to its geographic location and rugged terrain, Waikane Valley was utilized for advanced training in offensive warfare and air-to-ground practice bombing during World War II. Per its lease, the Marine Corps was authorized continued use of Waikane Valley as a training area from 1953 to 1976. However, due to its potential as a fire hazard, no tracer ammunition or incendiary shells were to be used at any time on the leased premises, and all weapons in excess of .50-caliber were to be fired into the designated impact areas.

In May 1998, the City and County of Honolulu purchased approximately 500 acres of undeveloped land in the ahupua'a (land between the mountains and the ocean) of Waikane on Oahu's windward side for use as a nature park. Some of the land was previously used for agricultural pursuits, such as growing bananas, cucumbers, and for pasturing livestock. The land was previously owned by Azabu USA Corporation, Inc., who was intending to develop a golf course on the property. Azabu, a Japanese based company, had obtained all the required permits, but then encountered economic troubles trying to obtain the financing to develop their proposed golf course. The purchase of the land by the City prevented possible golf course development, which many people in the area were not eager to see happen.

3.0 METHODOLOGY

3.1 RESPONSE STRATEGIES

Three general response categories for ordnance remaining on former training sites include:

- Removal
- Access Control
- Behavior Modification

The removal of all ordnance from a former training site is the ultimate goal, however, on certain sites this cannot be guaranteed. Some sites many be too large to identify all the possible ordnance, site access may be another issue for some sites.

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

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

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

3.2 ANALYSIS METHODOLOGY

In order to determine the correct institutional controls for the former Waikane Valley Training Area, the following issues were considered:

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

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

4.0 SCOPE OF EFFORT

4.1 INTERVIEW SELECTION

Interviews with the CEPOH have occurred through electronic mailing (emails) and telephone conversations. CEPOH has developed an extensive suite of institutional controls for Hawaii properties and will perform the Institutional Control Survey to obtain the needed information from these contacts. Therefore surveys are not attached to this report.

4.2 INTERVIEW CATEGORIES

CEPOH will identify individuals and agencies were identified that best represent the former Waikane Valley Training Area and conduct interviews. During the interviews, additional agencies may become relevant for the institutional controls to work. These agencies will also be contacted by CEPOH for future interviews.

4.3 INTERVIEW SUMMARY

4.3.1 Interview Questions

Twelve questions concerning the interviewees are represented on the Institutional Control Survey. The following were included in each interview:

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

4.3.2 Interview Results

None. CEPOH will conduct interviews.

5.0 SELECTION CRITERIA

The selection criteria include jurisdiction, authority and mission.

6.0 ACCEPTANCE OF JOINT RESPONSIBILITY

CEPOH will provide the names of the agencies interviewed that expressed interest in participating in the Institutional Controls Program.

7.0 TECHNICAL CAPABILITY

Based on the site recommendations, the most technically complex aspect is placement of signs. Current controls in place require no additional technical capability.

8.0 INTERGOVERNMENTAL RELATIONSHIPS

Applicable intergovernmental relationships exist between the Hawaii Department of Natural Resources, USFWS, and USACE.

9.0 STABILITY

CEPOH will interview all parties to determine stability..

10.0 FUNDING SOURCES

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

11.0 RECOMMENDATIONS

CEPOH will determine recommendations.

12.0 INSTITUTIONAL CONTROL ALTERNATIVES ANALYSIS

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

- Presence of Ordnance
- Access to Ordnance
- Behavior with Ordnance

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

Institutional Control Alternatives and recommendations presented in this report are based on the assumption that public access to the former Waikane Valley Training Area site will be restricted to authorized personnel only.

12.1 INSTITUTIONAL CONTROL BREAKDOWN

There are many ways to protect the public from ordnance related accidents. The institutional controls provided in the EE/CA are the best way to protect the public and other personnel, while still maintaining the sites day-to-day operations. The following sections breakdown and briefly describe the proposed actions and controls for the former Waikane Valley Training Area.

12.1.1 Warning Signs

Signs are an effective way to inform personnel of the hazards in the area. They can also keep unauthorized personnel from entering a hazardous area. Warning Signs should be placed on the outer boundary of the site warning the public of the possible danger if they come closer to the site. The cost of this alternative can be found in the EE/CA report.

12.1.2 Educational Programs

The use of educational programs is an effective means to reduce risk from public exposure to munitions and explosives of concern (MEC). Education can be tailored to meet site-specific needs. Examples of educational programs include public notices and formal education sessions.

Educating the local community is an important aspect of any institutional control program. Public awareness of the hazards associated with a site will encourage the public to take the necessary precautions to avoid exposure. Educational programs may be audience specific and can be performed as often as necessary to educate those with the greatest risk for exposure to MEC, e.g., local homeowners, farmers, children, and developers. Educational efforts can be a stand-alone institutional control, but it can also improve the effectiveness of other controls.

12.1.2.1 Public Notices

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

12.1.2.2 Community Awareness Meetings

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

- How this information was evaluated in the EE/CA report;
- MEC previously recovered at the site;
- Options available to remove ordnance (if required) and enhance public safety; and
- Recommendations being made to address a particular site.

12.1.2.3 Letter Notifications, Informational Pamphlets, and Fact Sheets

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

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

12.1.2.4 Formal Education Sessions

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

12.2 COST

The cost for each of these institutional controls can vary greatly. The cost analysis of the proposed institutional controls (signage and meetings) is provided, in detail, in the EE/CA report.

13.0 RECOMMENDATIONS

Local agencies have expressed concern with the ordnance on the site. The parties have agreed to cooperate with the applicable institutional controls that ZAPATA has suggested in this report, where applicable. This section summarizes recommended institutional control recommendations and describes each individually.

13.1 WARNING SIGNS

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

13.1.2 As noted during the field activities, warning signs reading “No Trespassing” or “Danger Explosives” are currently in place along the fence surrounding the Marine Corps property (formerly known as the Kamaka Parcel). Additional warning signs should be added along the road traversing across the Waikane Valley site. The total roadway distance is approximately four miles in length. Placing signs every 400-feet along the roads (on both sides) would total to 80 signs.

13.2 EDUCATIONAL PAMPHLETS

13.2.1 Producing and distributing an educational/awareness pamphlet would be a means of educating individuals in the recognition of MEC, describing the types of MEC found at the former Waikane Valley Training Area, and the actions to be taken upon discovering MEC items. Recognizing the hazard is essential for implementing appropriate responses to contain and

dispose of MEC. Distinguishing between MEC and other debris that may be encountered at the site will ensure that authorities are notified and actions can be taken to dispose of the MEC without harm to anyone involved.

13.2.2 The pamphlets would be distributed to any person, company, or agency planning to work within the Waikane Valley. In addition, the pamphlets would be available to anyone upon request. The cost analysis of each institutional control is provided, in detail, in Appendix E of the EE/CA report.

ATTACHMENT A
INSTITUTIONAL ANALYSIS SURVEY

INSTITUTIONAL CONTROLS ANALYSIS SURVEY
FORMER WAIKANE VALLEY TRAINING AREA

Date:

Agency:

Point of Contact:

Phone:

Agency Authority and Basis of Authority:

Agency Origin:

Agency Mission:

Sunset Provision:

Geographic Jurisdiction:

Public Safety Function:

Land Use Control Function (knowledge of current controls):

Ability to partner with other agencies (which ones):

Financial Capability:

Desire to participate in institutional control program:

Constraints to Institutional Effectiveness:

APPENDIX E
COST BREAKDOWNS AND ASSUMPTIONS

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COST ESTIMATE SUMMARY

1.0 INTRODUCTION

1.0.1 Under the Task Order for this EE/CA, a field investigation was conducted on approximately two percent (2%) of the area. As such, Zapata Incorporated (ZAPATA) based its evaluation on the data collected during the field activities, archival data, and information gathered during the Technical Project Planning (TPP) Process. ZAPATA then prepared qualitative MEC risk evaluation based on this available information. The ZAPATA project team encouraged, promoted, and documented stakeholder involvement throughout the EE/CA process.

1.0.2 The costs provided in this EE/CA represent rough order of magnitude estimates prepared by ZAPATA from data collected during this EE/CA and using results from two previous range clearances at the site, best professional judgment, and experience with similar projects.

1.0.3 Due to the size of the Waikane Valley, varying terrain, accessibility by the public, and future development potential, ZAPATA proposes using a combination of various alternatives for areas within the valley.

1.0.4 Alternative 2, Institutional Controls (IC) is being proposed for approximately 158 acres of the Western Region and 534 acres of the Mountainous Regions. IC is recommended because historical documentation indicates the presence of an impact area and a lack of data in inaccessible areas.

1.0.5 Alternative 3, Comprehensive Surface Clearance followed by Alternative 2, Institutional Controls (IC) is being proposed for the 78-acre Southern Impact Region. This section within Waikane Valley has had two previous Surface Clearances; however, due to torrential rains and soil erosion another Surface Clearance is warranted due to MEC being uncovered and washed down into the canyons and gullies. This area has limited accessibility to the public and low potential for future development.

1.0.6 Alternative 4, One-Time Clearance to Depth to Detectable Depth, with Alternative 2, Institutional Controls is proposed for the approximately 151-acre Southeastern Region. This area is highly accessible to the public and is a gathering place for recreational activities. The area is crisscrossed with roads and trails that are used by the public for dumping household and construction debris, hunters, and All-Terrain Vehicles. The County of Honolulu has a master plan for developing this area as a nature park. A One-Time Clearance to Depth to Detectable Depth is also recommended for areas of drainage within the Southern Impact Region (12 acres) as they are a natural collection point for munitions exposed by erosion and landslides.

1.0.7 The cost estimates for Alternatives 3 and 4 assume an average accessibility of 100% throughout the entire project area. Surface Clearance efforts assume the use of handheld magnetometers/electromagnetometers to assist the Surface Clearance, while Clearance to Detectable Depth assumes the use of digital geophysical surveying techniques for the 151-acre Southeastern Region. Clearance to Detectable Depth efforts within the Southern Impact Region

(12 acres) assumes the use of handheld magnetometers/electromagnetometers. Extensive brush clearing of dense jungle vegetation will be required in the area.

1.0.8 Based on previous DGM operations, ZAPATA estimates that 1,046 anomalies per acre (157,946 total) will be present within the Southeastern Region and 903 anomalies per acre (10,836 total) in the Southern Impact Region where Clearance to Detectable Depth is recommended. ZAPATA estimates that the initial Subsurface Clearance could address just under one-half acres per day containing 444 subsurface anomalies.

1.0.9 Road closure and evacuation of individuals will occur in areas falling within the minimum separation distance (MSD) for the Most Probable Munition (MPM), which is a 75mm M48 High Explosive (HE) projectile. More than 3,000 MEC items, including 22 UXO items, were found during Surface Clearance of 27 acres (29 grids) on the property in 2002. Therefore, evacuation will be assumed, and will not be contingent on discovery of additional (new) UXO items. Evacuation areas may be reduced by employing engineering controls (e.g., sand bag enclosures) during demolition (intentional detonation) activities.

2.0 ALTERNATIVE 1 – NO DEPARTMENT OF DEFENSE (DOD) ACTION INDICATED

There are no actions and therefore no costs associated with implementation of this alternative.

TABLE 2-1 ALTERNATIVE 1, NO DOD ACTION INDICATED

Item	Unit	Rate	Quantity	Cost
No work associated with this task				$ 0
TOTAL				$ 0

3.0 ALTERNATIVE 2 – INSTITUTIONAL CONTROLS (IC)

The estimated cost to implement Alternative 2 is $1,421,285. Institutional control costs ($80,304) are included in this alternative. For ease of comparison, however, a line item representing the cost ($420,000) of six recurring reviews (5, 10, 15, 20, 25 and 30 years from present) has been added to the cost of Institutional Controls. In addition, a line item is included representing the cost of 24 smaller-scale annual reviews to occur on all years other than those in which a Recurring Review is scheduled, 30 years into the future ($828,000). The Recurring Review and Annual Review processes, however, are not Institutional Controls. (This assumes a cost of $70,000 per Recurring Review and $34,500 per Annual Review. The cost estimate is based on the following assumptions.

- The project design will be conducted by a Task Manager and is estimated to take approximately 56 man-hours for fieldwork, coordination with landowners and meetings.
- The project implementation will be conducted by a Task Manager and is estimated to take approximately 80 man-hours (48 for public meeting and travel and 32 for project coordination).
- A Project Manager will provide approximately 24 man-hours of project oversight.

- A Contracts Officer will use approximately 16 man-hours to generate any necessary contractual agreements.
- A UXO Safety Officer will supervise project site work and provide anomaly avoidance support using an estimated 96 man-hours, which includes four eight-hour travel days and eight eight-hour workdays, plus participation in a one-day public meeting.
- Mobilization, demobilization and subsistence costs include;
  - Fieldwork – one airfare, ten days of a rental vehicle with fuel, twelve days at a hotel and an estimated twelve per diem allowances (two 75% travel days and ten full days) for the UXO Safety Officer.
  - Public Meeting – two airfares, three days of a rental vehicle with fuel, two nights at a hotel for two people and an estimated five days per diem allowances (two 75% travel days and one full day) for the Task Manager and the UXO Safety Officer.
- Field equipment includes a digital camera ($300), a Schonstedt® Magnetometer for ten days @ $9 day plus $75 shipping and prep each ($175), two hand-held radios at $200 each ($388), and other small miscellaneous hand tools and equipment ($150).
- Under UXO escort, 80 each 7" x 10" custom warning signs will be posted in selected locations by two local laborers (ZAPATA's laborer rate of $21.12 per man-hour). Sign establishment will take 96 man-hours per laborer.
- A hand-held metal detector will be used by the on-site UXO technician to assist in safe installation of the signposts.
- Estimated annual cost for sign maintenance is $1,212 per year, assuming replacement of ten signs per year. This cost is based on four hours coordination time for a Task Manager, ten replacement signs, and 24 hours of local labor for inspection, repairs and replacement of signs. The cost of this expenditure over a 30-year period is $36,360.
- Cost for producing and distributing an educational/awareness pamphlet that describes the types of MEC found at the site and details the actions to take upon discovering them. ($8,000)
- Cost for the equipment assumes no Government-Furnished Equipment (GFE).

TABLE 3-1 ALTERNATIVE 2, INSTITUTIONAL CONTROLS (IC)

Item	Unit	Rate	Quantity	Cost
Project Design	Man-hours	$55.70	56	$3,119
Project Implementation	Man-hours	$55.70	80	$4,456
Project Oversight	Man-hours	$103.60	24	$2,486
Contract Management	Man-hours	$99.01	16	$1,584
UXO Safety Officer (4% differential)	Man-hours	$52.73	28	$1,476
UXO Safety Officer (no differential)	Man-hours	$50.86	72	$3,662
Airfare – Charlotte, NC to Honolulu, HI	Round trip	$1,200.00	3	$3,600
Rental Vehicle	Day	$75.00	15	$1,125
Hotel Stay	Day	$156.00	14	$2,184
Per Diem	Day	$96.00	16.5	$1,584
Field Equipment	Lump sum	$1,128.00	1	$1,128
Custom Warning Signs[1]	Each	$68.55	80	$5,484
Sign Establishment – (Two local laborers)	Man-hours	$21.12	192	$4,055
Annual Sign Maintenance for 30 Years [2]	N/A	N/A	N/A	$36,360
Produce and distribute awareness pamphlet	Each	$1.00	8000	$8,000
			Subtotal	$80,304
5-Yr. Recurring Reviews Over 30 Years [3]	LS	$70,000	6	$420,000
Annual Reviews [4]	NA	$34,500	24	$828,000
SUM				$1,328,304
TOTAL (including 7% fee)				$1,421,285

[1] R.S. Means 02890/700/0900
[2, $] 1,200 per year is estimated for maintenance of signs.
[3] Assumed cost of each Recurring Review is $70,000. Assume Recurring Reviews at 5, 10, 15, 20, 25 and 30 years from present.
[4] 24 smaller-scale annual reviews to occur on all years other than those in which a Recurring Review is scheduled, 30 years into the future. Assumed cost of each Annual Review is $34,500.

4.0 ALTERNATIVE 3 – COMPREHENSIVE SURFACE CLEARANCE WITH IC

4.1 INITIAL SURFACE CLEARANCE WITH INSTITUTIONAL CONTROLS

The estimated capital cost to implement Alternative 3 is $3,588,497. Institutional control costs ($80,304) are included in this alternative. For ease of comparison, however, a line item representing the total cost ($420.000) of six recurring reviews (5, 10, 15, 20, 25 and 30 years from present) has been added to the cost of Institutional Controls. In addition, a line item is included representing the cost of 24 smaller-scale annual reviews to occur on all years other than those in which a Recurring Review is scheduled, 30 years into the future ($828,000). The Recurring Review and Annual Review processes, however, are not Institutional Controls. Initial fieldwork is estimated to last approximately 26 weeks (104 workdays), based on removing 100% of the total assumed surface anomalies (21,130 anomalies) at a rate of 0.75 acres per day, four ten-hour days a week. (These figures are based on an assumed 271 anomalies per acre over 78 acres. A Senior UXO Supervisor will supervise three four-man UXO teams during the initial Surface Clearance activities. The cost estimate is based on the following assumptions.

- Institutional control (Alternative 2) costs ($80,304) are included in this alternative.
- Review costs including the sum of the costs of six recurring reviews to occur 5, 10, 15, 20, 25 and 30 years in the future ($420,000), and the cost of 24 smaller-scale annual reviews to occur on all years other than those in which a Recurring Review is scheduled, 30 years into the future ($828,000).
- The project design will be conducted by a Task Manager and is estimated to take approximately 180 man-hours.
- The project implementation will be conducted by a Task Manager and is estimated to take approximately 1100 man-hours.
- A Project Manager will provide approximately 106 man-hours of project oversight.
- A Contracts Officer will use approximately 32 man-hours to generate any necessary contractual agreements.
- Workweek will not exceed 40 hours per week. No stand-down time is assumed for weather, natural disasters, federal holidays, or denied access to any areas.
- Per Diem and lodging are based upon the peak-season rates established in the revised edition of the Joint Travel Regulations for Honolulu, Hawaii.
- A UXO Safety Officer will support site work using an estimated 1088 man-hours, which includes two eight-hour travel days and approximately 104 ten-hour workdays, four days a week for 26 weeks. In addition, the UXOSO will attend two eight-hour site meetings, with 32 hours of associated travel.
- A Senior UXO Supervisor will supervise three four-man UXO teams (one UXO Tech III and three UXO Technician II) while conducting the Surface Clearance. Each person is estimated at 1088 man-hours, which includes two eight-hour travel days and approximately 104 ten-hour workdays, four days a week for 26 weeks.) In addition, the SUXOS will attend an eight-hour initial site visit, with 16 hours associated travel time.
- A local explosives distributor will make ten explosives deliveries to the site so that any UXO items discovered during the Surface Clearance can be destroyed.
- Cost for the equipment assumes no GFE including vehicles and explosives for demolition purposes.

- Cost for equipment assumes rental of portable explosives magazine.
- Security cost includes nighttime monitoring at 20 hours per week for 26 weeks.
- Mobilization, demobilization and subsistence costs include;
  - Initial Site Visit – three airfares, three days of a rental vehicle with fuel, two nights at a hotel for three people and an estimated 7.5 per diem allowances (two 75% travel days and one full day) for the Task Manager, SUXOS and the UXO Safety Officer.
  - Fieldwork – 15 airfares, 182 days of a rental vehicle with fuel (five vehicles for 26 weeks), 2,730 nights at a hotel (15 men) and an estimated 2,745 per diem allowances (two 75% travel days and 182 full days for the 15-person team).
  - Site Meeting – two airfares, three days of a rental vehicle with fuel, two nights at a hotel for two people and an estimated 5 days per diem allowances (two 75% travel days and one full day) for the Task Manager and the UXO Safety Officer.
- Field equipment includes an ARMAG 5' x 4' x 7' explosives magazine @ 590/month for six months plus $1,750 shipping ($5,290), digital camera ($400), 18 Schonstedt® Magnetometers $900 each plus $173 shipping and prep each ($19,314), eight hand-held radios at $200 each ($1,600), and other small miscellaneous hand tools and equipment ($500) totaling $27,104.
- The costs for the Work Plan, Health and Safety Plan, and Evacuation Plan are included in the cost of the Surface Clearance.
- All recovered munitions debris and cultural debris will be removed, collected, and recycled through a local scrap dealer at no cost to the Government.
- If necessary, noise monitoring will be conducted to ensure that safe noise levels are maintained during demolition operations.
- Road closures and evacuation of local residents will not be necessary during the Comprehensive Surface Clearance in areas falling within the minimum separation distance (MSD) for the Most Probable Munition (MPM), which is a 75mm HE projectile M48 or when demolition activities (Intentional Detonations) are required. The 75mm M48 was the largest munition encountered during previous EOD sweeps.
  - It will be assumed that all demolition operations will take place on the property, which will reduce the extent of required road closures.
  - Local police and fire departments will be notified approximately 60 days prior to commencement of field activities. These agencies will be briefed on the anticipated field schedule, the specific areas/addresses to be impacted on a particular day, and the general withdrawal and relocation procedures, including site security.
  - No evacuations are anticipated.
  - At present, no businesses are known to exist within the area influenced by the clearance.
  - If a business exists within the area at the time of the clearance, Surface Clearance activities will be coordinated in such a manner as to minimize fiscal impacts to local businesses (if possible, Surface Clearance activities will be conducted during lunch time/around business hours).
- A Task Manager will generate a project report at the conclusion of the site work.
- A Project Manager will review the project report.

TABLE 4-1 ALTERNATIVE 3, COMPREHENSIVE SURFACE CLEARANCE WITH INSTITUTIONAL CONTROLS

Item	Unit	Rate	Quantity	Cost
Project Design (WP, SSHP, Road Closure Plan)	Man-hours	$55.70	180	$10,026
Project Implementation	Man-hours	$55.70	1100	$61,270
Project Oversight	Man-hours	$103.60	106	$10,982
Contract Management	Man-hours	$91.45	32	$2,926
UXO Safety Officer (8% differential)	Man-hours	$54.61	653	$35,649
UXO Safety Officer (4% differential)	Man-hours	$52.73	218	$11,474
UXO Safety Officer (no differential)	Man-hours	$50.86	218	$11,067
Senior UXO Supervisor (8% differential)	Man-hours	$54.14	653	$35,343
Senior UXO Supervisor (4% differential)	Man-hours	$50.28	218	$10,941
Senior UXO Supervisor (no differential)	Man-hours	$48.48	218	$10,549
3 - UXO Supervisor (8% differential)	Man-hours	$54.14	1958	$106,028
3 - UXO Supervisor (4% differential)	Man-hours	$52.27	653	$34,122
3 - UXO Supervisor (no differential)	Man-hours	$50.42	653	$32,914
9 - UXO Technician II (8% differential)	Man-hours	$45.10	5875	$264,972
9 - UXO Technician II (4% differential)	Man-hours	$43.58	1958	$85,347
9 - UXO Technician II (no differential)	Man-hours	$42.05	1958	$82,351
Security Guard (Nightime Magazine Security)	Man-hours	$24.25	520	$12,610
Airfare – Charlotte, NC to Cleveland, OH	Round trip	$1,200.00	19	$22,800
Rental Vehicles (5 vehicles for 2.5 months)	Month	$1,600.00	31.25	$50,000
Hotel Stay (assume Peak season)	Day	$149.00	2740	$408,260
Per Diem	Day	$100.00	2757.5	$275,750
Explosives Delivery	Each	$1,000.00	10	$10,000
Equipment, Supplies and Storage Magazine	Lump sum	$27,104.00	1	$27,104
Brush Clearing including Escort	Acre	$5,000.00	78	$390,000
Surveyor (Estimate 500 Points @ 50 points/day)	Day	$1,500.00	10	$15,000
Project Report	Man-hours	$71.44	84	$6,001
Project Report Review	Man-hours	$81.10	24	$1,946
			subtotal	$2,025,432
		Total Removals		$2,025,432
Institutional Control Costs (from Alt. 2)	Lump sum		1	$80,304
5-Yr. Recurring Reviews Over 30 Years [2]		$70,000.00	15	$420,000
Annual Reviews [3]		$34,500	24	$828,000
SUM				$3,353,736
TOTAL (including 7% fee)				$3,588,497

[2] Assumed cost of each Recurring Review is $70,000. Assume Recurring Reviews at 5, 10, 15, 20, 25 and 30 years from present.
[3] 24 smaller-scale annual reviews to occur on all years other than those in which a Recurring Review is scheduled, 30 years into the future. Assumed cost of each Annual Review is $34,500.

4.2 SURFACE CLEARANCE WITH INSTITUTIONAL CONTROL SUMMARY

Table 4-2 below, summaries Surface Clearance costs, days in field, and number of anomalies for the Southern Impact Region and Southeastern Region. Southeastern Region costs are presented for comparison purposes and represent a rough order of magnitude. The Southeastern Region costs are based on the number of days in field and an equivalent production rate as the Southern Impact Region.

TABLE 4-2 SURFACE CLEARANCE SUMMARY

Region (Acres)	Surface Anomalies (30% Total Anomalies)	Field Days	Field Costs	Administrative Costs	Surface Clearance Cost with ICs	Surface Clearance Cost without ICs
Southern Impact Region (78ac)	21,130	104	$1,565,750	$2,022,747	$3,588,497	$2,167,239
Southeastern Region (151ac)	46,387	228	$3,437,297	$2,022,747	$5,460,044	$4,038,786
Total for Southern Impact (78ac) and Southeastern Regions (151ac)	67,517	332	$5,003,048	$4,045,494	$7,627,257	$6,206,026

5.0 ALTERNATIVE 4 – ONE-TIME CLEARANCE TO DETECTABLE DEPTH WITH INSTITUTIONAL CONTROLS

5.0.1 Estimated capital cost to implement Alternative 4 is $12,472,892. The project is estimated to last approximately 22 months (380 workdays), based on removing 100% of the total estimated anomalies (157,946 anomalies) in 151 acres within the Southeastern Region and (10,836 anomalies) in 12 acres within the Southern Impact Region. Institutional control (Alternative 2) costs ($80,304) are included in this alternative. Also included are the sum of the costs of six recurring reviews to occur 5, 10, 15, 20, 25 and 30 years in the future ($420,000), and the cost of 24 smaller-scale annual reviews to occur on all years other than those in which a Recurring Review is scheduled, 30 years into the future ($828,000). Productivity is based on the following assumptions:

5.0.2 A Senior UXO Supervisor will supervise the three seven-man UXO teams during the Clearance to Detectable Depth activities. The cost estimate is based on the following assumptions.

- The project design will be conducted by the Project Manager and Task Manager and is estimated to take approximately 320 man-hours.
- Cost is based on working four 10-hour days per week.
- The project implementation will be conducted by a full time Task Manager (Site Manager) and is estimated to take approximately 3,632 man-hours. This includes 160 hours per month for 22 months of fieldwork (3,520 hours) and 64 hours fieldwork travel, plus 48 hours of related travel.
- A Project Manager will provide approximately 1,760 man-hours of project oversight for the life of the project.
- A Contracts Officer will use approximately 100 man-hours to generate any necessary contractual agreements over an 18 month period.
- Per Diem and lodging are based upon the peak-season rates established in the revised edition of the Joint Travel Regulations for Honolulu, Hawaii.
- A three-man geophysical team will mobilize all geophysical equipment to the site and necessary support equipment.
- One three-man geophysical team will collect data over the entire 151-acre area using grid methodology at a rate of 1.9 acres a day due to the difficult terrain and large trees over three inches in diameter. A total of 80 workdays would be required.
- Geophysical data will be processed, interpreted, and check for quality (QC'd) offsite by a Project Geophysicist at a rate equal to the geophysical survey of 1.9 acres a day for 80 eight-hour days.
- A UXO Safety Officer will support site work using an estimated 3,560 man-hours, over 22 months, which includes 40 hours of travel time, for the project including excavation of the 151 acres DGM anomalies and 12 acres of analog investigated anomalies.
- A UXO QC Specialist will support site work using an estimated 3,560 man-hours, over 22 months, which includes 40 hours of travel, for the project including excavation of the 151 acres DGM anomalies and 12 acres of analog investigated anomalies..

- A Senior UXO Supervisor will supervise the three seven-man reacquisition and intrusive investigation teams (one UXO Team Leader and six UXO Technician II). The three seven-man teams are estimated at 3,552 man-hours per person for 22 months of field activities, which includes four eight-hour travel days, one eight-hour day for site preparation, and approximately 380 ten-hour workdays. In addition, the SUXOS will attend two eight-hour site meetings, with 32 hours of associated travel, for the project including excavation of the 151 acres DGM anomalies and 12 acres of analog investigated anomalies.
- Cost for equipment assumes no GFE including vehicles and explosives for demolition purposes.
- Cost for equipment assumes rental of portable explosives magazine.
- Security cost includes nighttime monitoring for duration of clearance action. This is approximately 120 hours per week for 96 weeks (11,520 hours).
- A local explosives distributor will make eight explosives-deliveries to the site so that any UXO items discovered during the Surface Clearance can be destroyed.
- The costs for the Work Plan, Health and Safety Plan, and Evacuation Plan are included in the cost of the clearance.
- All recovered MEC-related scrap and munitions debris and cultural related scrap will be removed, collected, and recycled through a local scrap dealer at no cost to the Government.
- If necessary, noise monitoring will be conducted to ensure that safe noise levels are maintained during demolition operations in the vicinity of occupied structures.
- Mobilization, demobilization and subsistence costs include;
  - Initial Site Visit – three airfares, three days of a rental vehicle with fuel, two nights at a hotel for three people and an estimated 7.5 per diem allowances (three 75% travel days and one full day) for the Task Manager, SUXOS, and the UXO Safety Officer.
  - Fieldwork –151 airfares, 154 months of rental vehicles with fuel (three SUVs and four pickup trucks), 15,960 nights at a hotel and an estimated 16,048 per diem allowances.
  - Site Meetings – two airfares, three days of a rental vehicle with fuel, two nights at a hotel for two people and an estimated five days per diem allowances (two 75% travel days and one full day per trip) for the Task Manager and the UXO Safety Officer.
- Field equipment includes an ARMAG 5’ x 4’ x 7’ explosives magazine @ $590/month for 18 months plus $1,750 shipping ($10,620), four digital camera ($1,200), purchase of 18 Schonstedt® Magnetometers @ $800.00 each ($14,400) plus $373 shipping and prep, eight hand-held radios at $200 each ($1,600), and other small miscellaneous hand tools and equipment ($3,650). (Total = $ 31,843).
- Road closures and evacuation of local residents will not be necessary during the clearance or when demolition activities (Intentional Detonations) are required. The 75mm High Explosive (HE) projectile M48 was used as the MPM during the EE/CA investigation.
  - It will be assumed that all demolition operations will take place on the property, which will reduce the extent of required road closures.

  - Local police and fire departments will be notified approximately 60 days prior to commencement of field activities. These agencies will be briefed on the anticipated field schedule, the specific areas/addresses to be impacted on a particular day, and the general withdrawal and relocation procedures, including site security.
  - No evacuations are anticipated.
  - At present, no businesses are known to exist within the area influenced by the clearance.
  - If a business exists within the area at the time of the clearance, Surface Clearance activities will be coordinated in such a manner as to minimize fiscal impacts to local businesses (if possible, Surface Clearance activities will be conducted during lunch time/around business hours).
- A Task Manager will generate a project report at the conclusion of the site work.
- A Project Manager will review the project report.

TABLE 5-1 ALTERNATIVE 4, ONE-TIME CLEARANCE TO DETECTABLE DEPTH WITH INSTITUTIONAL CONTROLS

Item	Unit	Rate	Quantity	Cost
Project Design (WP, SSHP, Evacuation Plan)	Man-hours	$55.70	320	$17,824
Project Implementation	Man-hours	$55.70	3520	$196,064
Project Oversight	Man-hours	$103.60	1760	$182,336
Contracts Management	Man-hours	$91.45	100	$9,145
Site Geophysicist	Man-hours	$57.95	840	$48,678
Geophysics Operator	Man-hours	$46.41	816	$37,871
Geophysical Data Interpretation	Man-hours	$46.41	640.0	$29,702
UXO Safety Officer (8% differential)	Man-hours	$54.61	2461.0	$134,395
UXO Safety Officer (4% differential)	Man-hours	$52.73	384	$20,248
UXO Safety Officer (no differential)	Man-hours	$50.86	715	$36,365
Senior UXO Supervisor (8% differential)	Man-hours	$54.14	2461	$133,239
Senior UXO Supervisor (4% differential)	Man-hours	$50.28	384	$19,308
Senior UXO Supervisor (no differential)	Man-hours	$48.48	715	$34,663
1 - UXO QC (8% differential)	Man-hours	$54.14	2461.0	$133,239
1 - UXO QC (4% differential)	Man-hours	$50.28	384	$19,308
1 - UXO QC (no differential)	Man-hours	$48.48	715	$34,663
3 - UXO Supervisor (8% differential)	Man-hours	$54.14	9800	$530,572
3 - UXO Supervisor (4% differential)	Man-hours	$52.27	353	$18,451
3 - UXO Supervisor (no differential)	Man-hours	$50.42	2215	$111,680
18 - UXO Technician II (8% differential)	Man-hours	$45.10	58800	$2,651,880
18 - UXO Technician II (4% differential)	Man-hours	$43.58	3083	$134,357
18 - UXO Technician II (no differential)	Man-hours	$42.05	2117	$89,020
6 - UXO Technician II Reacquisition (4% diff.)	Man-hours			$0
6 - UXO Technician II Reacquisition (no diff.)	Man-hours			$0
Security Guard (Nightime Magazine Security)	Man-hours	$24.25	11,520	$279,360
Airfare – Charlotte, NC to Honolulu	Round Trip	$1,200.00	156	$187,200
Rental Vehicles	Month	$1,600.00	154	$246,400
Hotel Stay	Day	$149.00	15970	$2,379,530
Per Diem (Two 75% travel days, one full day)	Day	$100.00	16061	$1,606,100
Explosives Delivery	Lump Sum	$1,000.00	8	$8,000
Equipment, Supplies and Storage Magazine	Lump Sum	$31,843.00	1	$31,843
Surveyor Subcontractor	Lump Sum	$95,000.00	1	$95,000
Brush Clearing including Escort	Acre	$5,000.00	163	$815,000
Surveyor (Estimate 1000 Points @ 50 points/day)	Day	$1,500.00	20	$30,000
Project Report	Man-hours	$74.75	320	$23,920
Project Report Review	Man-hours	$81.10	40	$3,244
		Total Removal	subtotal	$10,328,605
Institutional Control Costs (from Alt. 2)	Lump sum	$80,304.00	1	$80,304
5-Yr. Recurring Reviews Over 30 Years [1]		$70,000.00	6	$420,000
Annual Reviews [2]		$34,500.00	24	$828,000
SUM				$11,656,909
TOTAL (including 7% fee)		474784		$12,472,892

[2] Assumed cost of each Recurring Review is $70,000. Assume Recurring Reviews at 5, 10, 15, 20, 25 and 30 years from present.
[3] 24 smaller-scale annual reviews to occur on all years other than those in which a Recurring Review is scheduled, 30 years into the future. Assumed cost of each Annual Review is $34,500.

5.1 CLEARANCE TO DETECTABLE DEPTH WITH INSTITUTIONAL CONTROL SUMMARY

Table 5-2, below, summaries Clearance to Detectable Depth, days in field, and number of anomalies for the Southern Impact Region and the Southeastern Region. The costs for the remaining Southern Impact Region (78ac) are presented for comparison purposes and represent rough order of magnitude. The additional Southern Impact Region costs are based on the number of days in field and an equivalent production rate as the Southeastern Region.

TABLE 5-2 CLEARANCE TO DETECTABLE DEPTH SUMMARY

Region (Acres)	Total Anomalies	Field Days	Field Costs	Administrative Costs	Subsurface Clearance Cost with ICs	Subsurface Clearance Cost without ICs
Southern Impact Region (78ac)	81,270	196	$5,271,374	$2,228,123	$7,499,497	$6,078,212
Southern Impact (12ac) and Southeastern Regions (151ac)	157,946	380	$10,244,769	$2,228,123	$12,472,892	$11,051,607
Totals for the Southern Impact (90ac) and Southeastern Regions (151ac)	239,216	576	$15,516,143	$4,456,246	$18,551,104	$17,129,819

APPENDIX F
RESPONSIVENESS SUMMARY

(DOCUMENT PENDING)

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APPENDIX G
DRAFT RECURRING REVIEW PLAN

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Draft Recurring Review Plan

1.1 INTRODUCTION

1.1.1 In 2004, Zapata Incorporated. was contracted by the USAESCH to conduct an EE/CA site investigation for the Former Waikane Valley Training Area on the Island of Oahu, Hawaii.

1.1.2 The primary objective of the Recurring Review Plan is to ensure the MEC response actions implemented as a result of the EE/CA remain effective and continue to provide protection against MEC. Because this is an EE/CA report, this is a draft Recurring Review Plan. Any new information generated while following up on a recommended action should be included in the final Recurring Review Plan.

1.2 SITE DESCRIPTION

1.2.1 The Waikane Valley Training Area covers approximately 933 acres located on the coastal plain adjacent to Kaneohe Bay and on the slopes of the Koolau Mountain Range. Most of this site is covered with dense jungle vegetation including the densely forested coastal plain and thick grasses and shrubs in the higher elevations. There are several gulches throughout the parcel as well as areas with steep slopes. Elevation above sea level ranges from 90 feet to over 2,090 feet. The Island of Oahu is the result of varied geologic processes, including volcanism, subsidence, weathering, and sedimentation (USGS, 1996). The Hawaiian Islands are sub-aerial peaks of large volcanic mountain ranges, most of which are submerged beneath the sea. The geologic conditions at the site are presented in detail in Section 3.4.3 of this Work Plan. According to the Western Regional Climate Center, this location receives an average of 76.03 inches of precipitation each year, with most of this rainfall occurring in October through March. The average maximum temperature for this area is 79.8° F and the average minimum temperature is 68.8° F.

1.2.2 In 1942, the Department of the Army entered into a lease agreement with Lincoln L. McCandless heirs and Waiahole Water Company, Ltd. for the right to use approximately 1,132 acres in Waikane Valley for advanced offensive warfare training due to the valley's geographical location and terrain. Authorization for the Army to use Waikane Valley continued until July 1953 when the Marine Corps was substituted as lessee. Waikane Valley was formerly used as a training and artillery impact area from 1942 to 1976. Of the 1,132 acres, only 933 acres are considered eligible under DERP-FUDS. Marine Corps property, consisting of 199 acres formerly known as the Kamaka parcel, was not investigated under this scope of work.

1.2.3 The 1996 Inventory Project Report (InPR) states that the source of the MEC in the Waikane Valley is infantry jungle training, artillery firing, and practice bombing that took place from the onset of WWII to 1976. The UXO and MD encountered within the valley results from the firing of artillery weapons (75mm), shoulder fired anti-tank weapons (2.36-inch and 3.5-inch HEAT rockets), mortars (60mm and 81mm), small arms, and aerial practice bombing exercises conducted by the military. During the Ground Reconnaissance, only MD was located in Waikane Valley. All items were open and exposed for inspection and verification that they were free of the potential for an explosive hazard. The MD included fragmentation and fuze fragments, without energetics.

1.3 SCHEDULE OF RECURRING REVIEW

1.3.1 The recurring review process is consistent with Section 121(c) of CERCLA, as amended by SARA, and Section 300.430 (f) (4) (ii) of the NCP. Recurring review, as outlined by these statutes, require that periodic (at least every five years) reviews be conducted for sites where hazardous substances, pollutants or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure following the completion of all remedial actions.

1.3.2 Based on specific site conditions, an annual recurring review with site visit should be sufficient to evaluate the effectiveness of the response actions recommended for this area.

1.3.3 Documents that should be reviewed at the time of the recurring review include:

- Inventory Project Report, *Waikane Training Area, Waikane Valley, Island of Oahu, Hawaii, Site No. H09HI035400*, dated 31 May 1996;
- Final EE/CA Report, Former Waikane Valley Training Area, 2008.

1.3.4 The recurring review process that the CEPOH will implement to assess the continued effectiveness of the implemented MEC response actions includes, but is not limited to:

- Evaluate if changes have occurred in current and/or future land uses and their effect, if any, on selected MEC response actions;
- Investigate reported MEC encounters that may have occurred since completion of the MEC response actions;
- Conduct visual inspections at the site to evaluate erosion effects and the status of community awareness outreach programs and educational media;
- Consider new technology or techniques that have become available and may warrant reconsideration of the EE/CA recommendations;
- Evaluate the effectiveness of the response actions implemented for reducing risk.

1.4 RECOMMENDATIONS REGARDING THE NUMBER OF RECURRING REVIEWS

1.4.1 Recurring reviews will be conducted until the site is deemed satisfactory. At that time, recurring reviews may be terminated.

1.4.2 The initial recurring review will be scheduled by the Government after the completion of the recommended surface clearance to address the issues and evaluate data as described above. The estimated cost for the first review with site visit is $70,000.

APPENDIX H
FIELDWORK DAILY JOURNALS

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APPENDIX I
GEOPHYSICAL DATA

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APPENDIX J
GPO DOCUMENTATION

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APPENDIX K
GROUND RECON

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APPENDIX L
PHOTOGRAPHS

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