Historic Properties
Task Order Report

UXO Clearance Project
Kaho`olawe Island Reserve, Hawai`i
Contract No.: N62742-95-D-1369
Task Order: 0007

by

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Glossary of Terms

Anomaly Excavation	Excavation in search of buried ordnance identified by geophysical detection.
Archaeological/Historic District	A geographically definable area that possesses a significant concentration, linkage, or continuity of historic properties.
Area Preparation	Clearance of vegetation to allow visibility for subsequent clearance operations such as surface sweep and geophysical detection.
Artifact	In the broadest sense, any product or by-product of human activity.
BIP	Detonation of live ordnance in the place it is found. This is an abbreviation for "Blow in Place."
Clearance	The removal of unexploded ordnance and related compositions and remnants.
Data Recovery	Recovery and preservation of samples and data from historic properties.
Effect	The impact of an action upon historic properties. Effects can be direct and/or indirect.
Feature	A component of an historic property, such as a stone structure, firepit, or artifact scatter.
Geophysical Detection	Detection of subsurface geophysical anomalies to identify buried ordnance for subsurface clearance.
Grid Map Unit	A 100-meter square division of the work area to control and facilitate the clearance activities. The **Grid Map Unit** or groups of **Grid Map Units** will be the basic land-area for all activities.
Historic Preservation	Includes identification, evaluation, recordation, documentation, curation, protection, management, and/or stabilization of historic properties.
Historic Property	Any prehistoric or historic district, site, building, structure, object, or traditional cultural property included in, or eligible for, inclusion in the National Register of Historic Places (NRHP). This definition replaces previous usage as "Historical, Cultural, and Religious Sites and Artifacts" (HCR, AHCR with the addition of "Archaeological") introduced in the MOU to refer to the historic properties of Kaho`olawe.
Hummock	An elevated area that is the remnant of a former landscape.
Modern Cultural Site	A place or structure less than 50-years old which has been designated or built in conjunction with modern cultural practices.
OBOD	Open Burn Open Detonation Area.
Protective Works	Barriers constructed around unexploded ordnance or historic properties to protect the properties from damage during detonation.

Review Board	A board with representatives from the Navy, KIRC, and primary contractor that approves clearance work in grids.
Task Order	Work order given to the contractor by the Navy with a set schedule and budget.
Tier I Clearance	Removal of unexploded ordnance from the surface of the ground.
Tier II Clearance	Removal of unexploded ordnance from below the surface of the ground.
Traditional Cultural Property	Generally a property that is eligible for inclusion in the National Register because of it association with cultural practices or beliefs of a living community that: 1) are rooted in that community's history and (2) are important in maintaining the continuing cultural identity of the community. (National Register Bulletin 38) (See Reeve 1993 for designation of many of the cultural places on the island.)
Sweep Area or **Clearance Area**	The Grid Map Units undergoing active UXO clearance.
Surface Sweep	Removal of ordnance items, fragments, and other metal items from the ground surface as part of Tier I Clearance.
Work Area	A grouping of contiguous Grid Map Unit.

Section 1 Project Background

1.1 Introduction

This document is the summary historic preservation report for Task Order 7 of the Kaho`olawe Island Reserve Unexploded Ordnance (UXO) Clearance Project, hereafter referred to as Clearance Project. Task Order 7 consisted of GMU stake-out monitoring, pre-investigation and assessment of five designated work areas on Kaho`olawe: Base Camp, K-1 Road, OB/OD, Seagull, and Lua Makika (see Figure 1-1 and Figure 1-2). Pre-investigation and assessment are tasks designed to gather the necessary information to support the responsible and efficient execution of the Clearance Project. The activities of Task Order 7 provided the information needed to begin Tier I (surface) clearance of ordnance for the selected work areas.

The Kaho`olawe Island Reserve contains unique and diverse natural, archaeological, historical, and cultural resources. Historic preservation work during the Clearance Project consists primarily of identification, documentation, and protection in order that they may be used safely for cultural and educational purposes. The status of historic preservation proceedings has been documented in monthly and quarterly reports since the inception of Task Order 7. This is the first historic preservation summary for an entire Task Order of the Clearance Project.

The field work reported here was conducted from the start-up of the Clearance Project in May 1998 through February 1999. All field tasks were performed under the direction of Historic Preservation Field Director William Folk, B.A., with overall guidance provided by Historic Preservation Manager Hallett H. Hammatt, Ph.D. Field personnel included Historic Preservation Field Supervisors, Katharine Brown, M.A., Tom Devereux, B.A., James Head, B.A., Gerald Ida, B.A., Joseph Jimenez, M.A., Tim Lawrence, B.A., and Mathew McDermott, B.A.; Historic Preservation Field Technicians, Kaipo Akana, Holly Formolo, B.A., Valerie Hafford, B.A., Koa Hodgins, B.A., Missy Kamai, B.A., and Tanya Lee, M.A.; and Historic Preservation Field Assisstant Dave Dillon.

The clearance contract requires a report for each Task Order and specifies that this report shall be in accordance with the Secretary of the Interior's Standards and Guidelines for Archaeological Documentation (*Federal Register, Vol. 48, N. 190*, 1983). This document will be based on the following:

> The final report shall identify and discuss the historic preservation tasks performed and the results of those tasks. The report shall present the protection procedures used for all historic properties potentially affected by project activities and the results of those protection efforts. The report shall also present all information obtained on the historic properties of Kaho'olawe, such as site descriptions, location data, significance evaluations, site conditions, and recommendations for long-term management (The Contract, Section C, Part 5.6.5, p. C-37).

1.2 Project Background

Kaho'olawe Island (Figure 1-1 and Figure 1-2) was used as a weapons range by the armed services of the United States and its allies from 1928 to 1990. During that period the island was used extensively as a Naval artillery target, an aircraft bombing and strafing target, and for ground troop maneuvers. Kuykendall and Day (1961:261) point out that Kaho'olawe "... was the most fiercely battered island in the Pacific, for it was the target grounds for all the naval artillery practice in these waters during the war (World War II), including full-scale rehearsals for Pacific invasion tactics." Between 1939 and 1941 the Department of the Navy (Navy) sublet a portion of

Figure 1-1: Map of the State of Hawai`i; Kaho`olawe Island (After PBR Hawai`i *et al.* 1995: Figure 4)

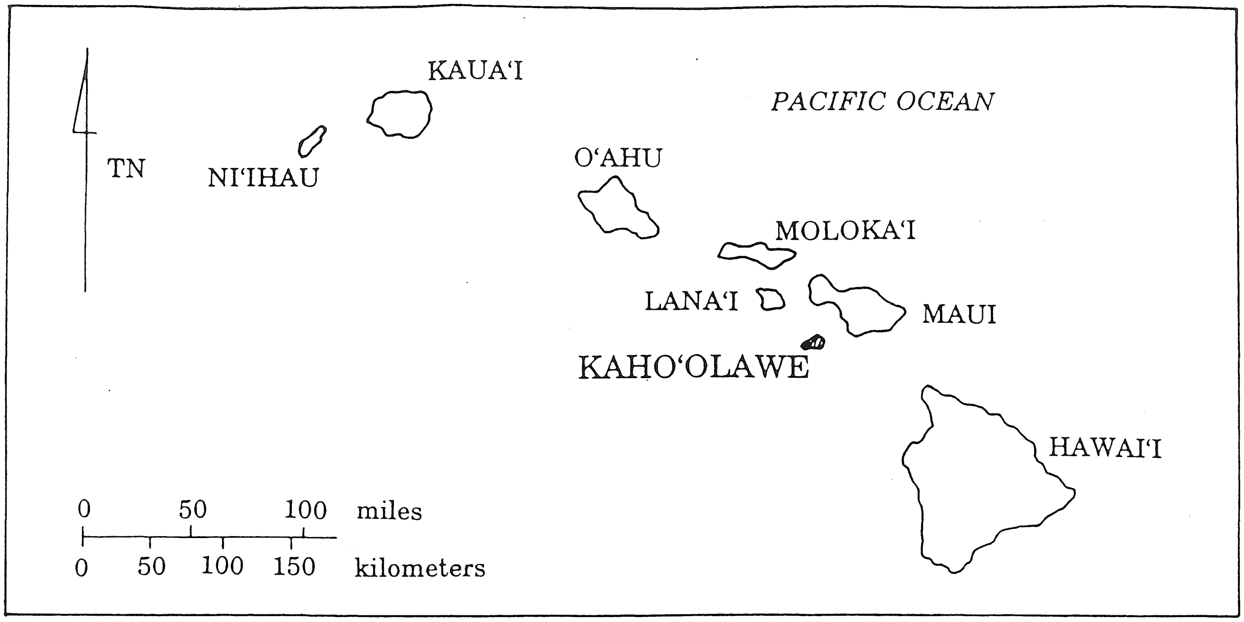


FIGURE **1a**
Map of the State of Hawai'i

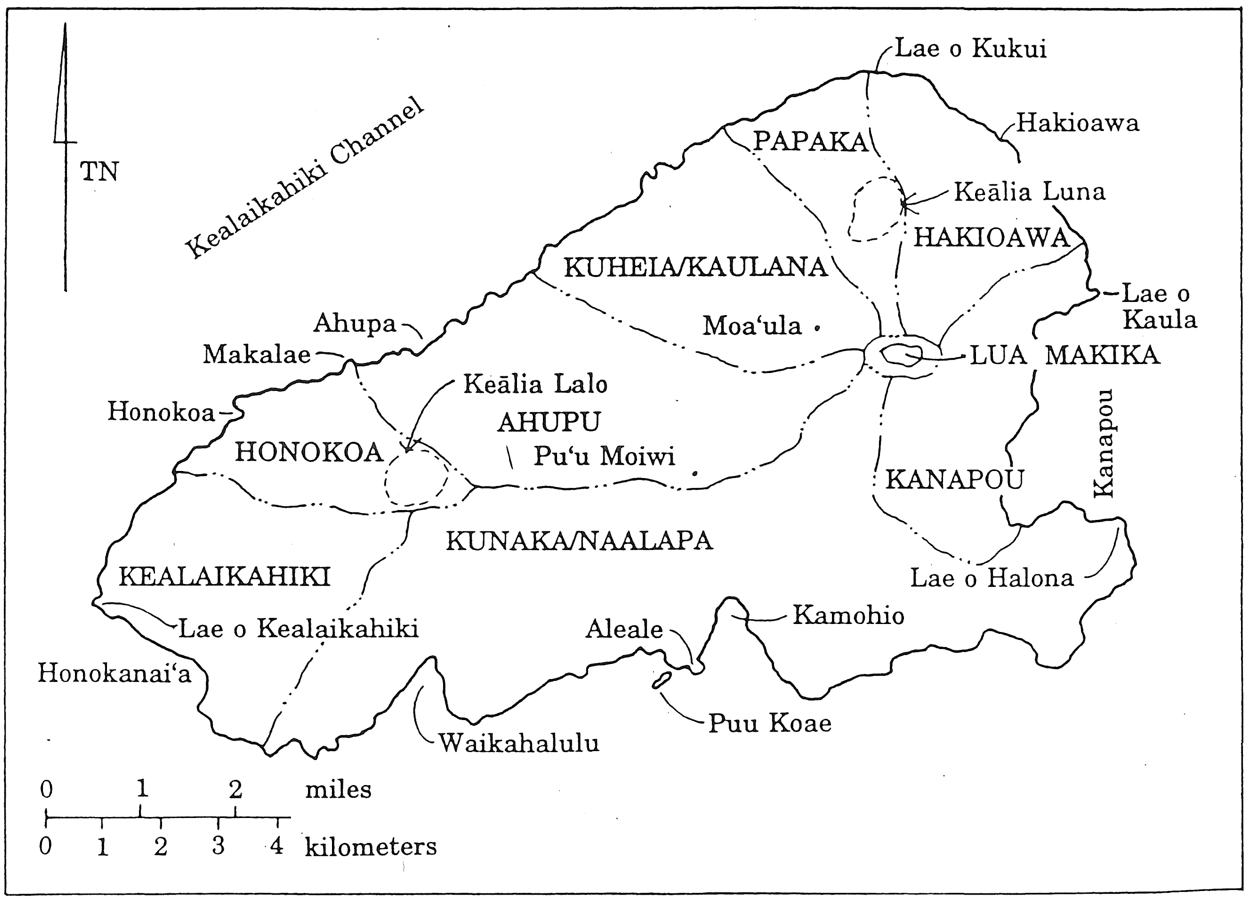
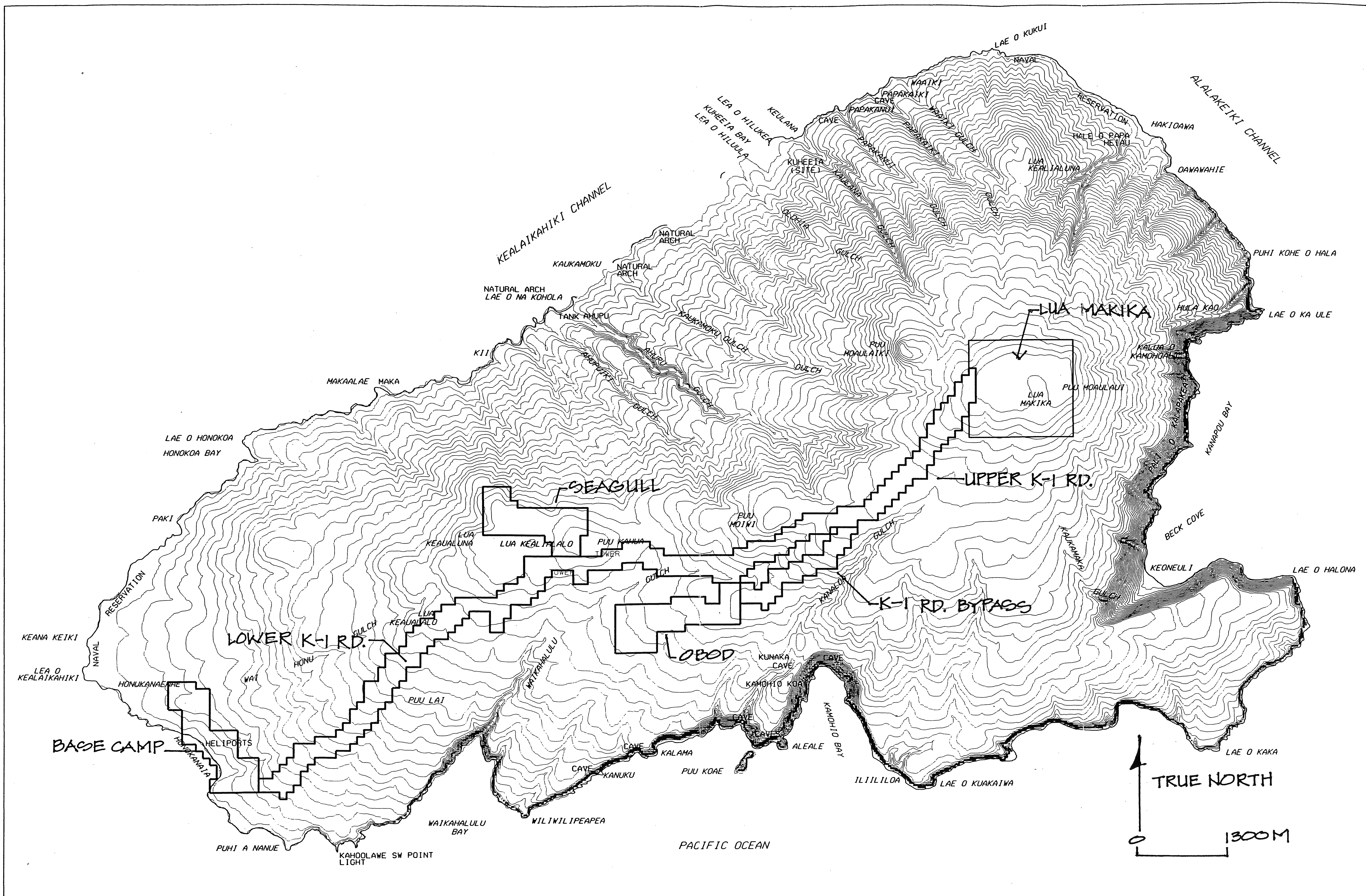


FIGURE **1b**
Kaho'olawe Island (After PBR Hawaii *et al.* 1995:Figure 4)

Figure 1-2. Task Order 7 Work Areas on Kaho'olawe Island



the island for practice purposes. With the outbreak of World War II and the establishment of martial law in Hawaii on December 8th 1941, the U.S. Army took over complete control of the island. Although officially sublet to the Army until 1953, the island was effectively under the control of the Navy since 1941. Executive Order 10436, issued by President Eisenhower in 1953, confirmed the Navy's jurisdiction over the island. In both Executive Order 10436 and the later Hawaiian statehood legislation, it is clear that Kaho`olawe was to be conveyed to the State of Hawaii once Navy use of the island was no longer necessary (Graves and Abad 1993:12-13).

As a federal agency in the early 1970's the Navy was required to comply with federal environmental and historic resource protection legislation, i.e. the National Historic Preservation Act (1966) and the National Environmental Policy Act (1969). The Navy's initial Environmental Impact Statement (EIS) (United States Department of the Navy 1972) failed to include descriptions and evaluations of the historic, cultural, and archaeological resources of the island. Under the guidance of the Advisory Council on Historic Preservation, the Navy agreed to supplement the initial EIS with an evaluation of the historic resources of the island, based on an intensive reconnaissance survey (*Ibid.*). This survey, conducted from 1976 to 1980, eventually encompassed the entire island. Five hundred forty-four archaeological sites were identified (Hommon 1980:7) and eventually nominated and accepted for inclusion in the National Register of Historic Places.

Through the 1980s Kaho`olawe continued to be used by U. S. Armed Forces for ordnance training. During this period attempts were made to preserve historic properties that were threatened by the impact of military use and erosion (Hommon 1981; Rosendahl *et al.* 1987). The military use of Kaho`olawe for ordnance training was halted by the October, 1990 memorandum from President Bush to the Secretary of Defense and the 1991 Defense Appropriations Act. The Appropriations Act established the Kaho`olawe Island Conveyance Commission (KICC) to recommend terms and conditions for the conveyance of the island from the federal government to the State of Hawaii. The KICC findings and recommendations were submitted to Congress in March of 1993 (Ogden 1995:8).

Title X of the FY 94 Defense Appropriations Act authorized the conveyance of Kaho'olawe to the State of Hawaii, and the clearance of unexploded ordnance from Kaho'olawe. The island and its surrounding waters were designated a reserve and the Kaho'olawe Island Reserve Commission (KIRC) was created to manage the island (Chapter 6K, Hawaii Revised Statutes).

A first step in the island-wide clearance of unexploded ordnance from Kaho`olawe was the UXO Model Clearance Project. The Model Clearance Project was carried out in 1995-96 as a trial to develop procedures and strategies and to identify problem areas for the Omnibus Clearance Project that was to follow (Hammatt, *et al.* 1996).

In 1997 the Kaho`olawe Island Reserve UXO Clearance Project (Project N62742-95-D-1369) was begun. The U.S. Navy, State of Hawaii, and private entities are working together to successfully complete UXO clearance and environmental restoration of the Kaho`olawe Island Reserve. The principle entities are the Commander Naval Base Pearl Harbor (COMNAVBASE); Pacific Division Naval Facilities Engineering Command (PACNAVFACENGCOM); Naval Explosive Ordnance Disposal Technology Division (NAVEODTECHDIV); Kaho`olawe Island Reserve Commission (KIRC), and Parsons-UXB Joint Venture (PUXB). Parsons UXB Joint Venture is the primary contractor to the Navy for the Clearance Project, with Cultural Surveys Hawaii, Inc. providing historic preservation services.

The primary purpose of historic preservation work on Kaho'olawe during the unexploded ordnance clearance and environmental restoration activities is the preservation of historic properties to ensure their eventual safe use for cultural and educational purposes. Historic protection work supports the efficient execution of the UXO Clearance Project by emphasizing as the highest priority the avoidance of any adverse effects on historic properties. This priority is accomplished through:

- Pre-investigative research
- Historic property identification, location, mapping and recording
- Historic property significance evaluation
- Determination of potential effect on historic properties
- Development of recommendations
- Review and approval protocols
- Monitoring
- Other mitigative measures as presented to and reviewed by the Review Board

Archaeologists and cultural experts are a continuous integral part of the clearance process, performing historic property protection through identification, recording, monitoring, and mitigation. These steps provide the basis for decisions on long-term management and stewardship of the historic properties of Kaho`olawe. There are a number of important documents that provide guidelines and objectives for the historic preservation aspect of the Kaho`olawe Island Reserve UXO Clearance Project:

1) The Kaho`olawe Use Plan (prepared for the KIRC, December 1995), in its broadest sense, endeavors to "reestablish the life and spirit of Kaho`olawe." The plan provides an overall vision and identifies appropriate uses and specific activities consistent with that vision. The Kaho`olawe Use Plan served as a guide for the development of the Kaho`olawe Island Reserve Cleanup Plan by identifying the proposed purposes of specific areas of the island.
2) Title X of the Fiscal Year 1994 Defense Appropriations Act, PL 103-139, 107 STAT 1479-1484 provided that the Secretary of the Navy enter into a Memorandum of Understanding (MOU) with the State of Hawaii regarding the means for protecting historical, cultural, and religious sites and artifacts from intentional destruction, harm, and vandalism during UXO clearance activities.
3) Act 340 of the Session Laws of Hawaii, 1993, established Chapter 6K of the Hawaii Revised Statutes creating the Kaho`olawe Island Reserve and the Kaho`olawe Island Reserve Commission (KIRC) to oversee State departments and agencies in the management of the Reserve.
4) The MOU provided for the KIRC and the Navy to establish procedures for protecting Historic Properties within a Regulatory Framework (RFW) (1996) in the context of the cleanup of the island. The RFW establishes the KIRC as the single point of contact with the State regarding all issues that may arise out of the MOU and the Site Protection Agreement (SPA; Appendix B of the RFW 1996).
5) The SPA, pursuant to Title X and the MOU, is a mandatory requirement intended to meet the substantive requirements of the National Historic Preservation Act (NHPA) and Chapter 6E of the Hawaii Revised Statutes for protecting the historic properties potentially affected by the Cleanup.
6) The Historic Preservation Plan (Kaho`olawe Island Reserve UXO Clearance Plan, Appendix D 1998) was developed through careful consideration of the above documents, as well as the results of previous archaeological, historical, and cultural

research on Kaho`olawe. This document guides the historic preservation program of the UXO Clearance Project and consists of two parts. The Historic Preservation Implementation Plan addresses how the relevant information will be collected. The Historic Preservation Research Design presents research questions, summarizes the current knowledge and opinions in light of the research questions, and identifies the information to be collected that is relevant to these questions.

1.3 Project Area Description

1.3.1 Kaho'olawe Island

Kaho'olawe island "...is estimated to be early Pleistocene - perhaps about 1.5 million years" in age (Macdonald and Abbott 1974:337). The caldera of this single shield volcano is about 3 miles in diameter and is located at the eastern end of the island, extending from the sea cliffs at Kanapou to an area west and south of Lua Makika. Rift zones tend north, east, and southwest from the caldera area. The southwest rift (especially at Pu`umo`iwi) and the caldera filling lavas at the summit of the island (marked by Lua Makika) provided dense, fine-grained basalt for Native Hawaiian tool manufacture.

The island's northeast tip and northwest facing coastline is comprised of low sea cliffs with beaches presently dominated by terrestrial sands and silts in small bays at the gulch mouths. Extending inland from this coastline are several named gulches (Ahupu, Kaulana, Papakanui, Papakaiki, and Hakioawa from southwest to northeast) that have been carved by intermittent streams. The western tip and southwest facing shore give way to wider bays with long beaches of white coralline sand, hiding boulder ramps. The bays are interrupted by rocky peninsulas with very low sea cliffs. Sand dunes are found inland of the beaches. The character of the western shore is due more to the topography of the ancient lava flows and the ocean than to stream cutting. These ancient lava flows are responsible for the rugged terrain and exposed boulder fields inland from the western shore. Unlike the north and west shorelines, the south and eastern shores of Kaho'olawe are towering sea cliffs over 30 meters (100 feet) high. Prominent embayments along these towering coasts include Waikahalulu Bay, Kamohio Bay, and, on the eastern shore, Kanapou Bay. The 800-foot high cliffs at Kanapou Bay are coincident with the eastern edge of the island's caldera (Macdonald and Abbott 1974:337). The southern portion of Kanapou Bay has an extensive sand dune deposit beneath its cliffs. The shoreline areas extending from Hakioawa at the northeast and westward to the southwest facing shores at Kealaikahiki and Honokanai`a were favored for house sites by the island's former inhabitants.

There are three pronounced crater features on Kaho`olawe. Kealialalo, in the western central portion of the island, and Pu`u o Moa`ulanui, at the island's eastern summit, are both lava cones, while Kealialuna, in the northeast, is a weathered cinder cone remnant (Macdonald and Abbott 1974:336). These natural features collect rainfall and runoff and have been observed holding standing water for months at a time. The interiors of the craters contain alluvial deposits that appear, at least near their surface, to be historical (Spriggs 1991:94, Carter 1983:2-3). There are four smaller cinder cones on the island, Pu`u Kamama, Pu`umo`iwi, Pu`u o Moa`ulaiki, and Pu`u Kolekole, from southwest to northeast (Macdonald and Abbott 1974:336).

Average annual rainfall along Kaho'olawe's shoreline is approximately 250 mm (10 inches). At the 450.2 m (1477-foot) island summit, it is estimated at 635 mm (25 inches) (Armstrong 1973:56); however, much of this is probably from a few storms dumping large quantities of water in short periods of time. Stream cuts in the Kaho'olawe shield are shallow due to the low rainfall, but the rocks are weathered to depths of 30 to 50 feet (9 to 15 m.), thus the estimated Pleistocene age of the volcano (Macdonald and Abbott 1974:336).

The effects of severe wind erosion on Kaho'olawe are visible on the uplands of the island. Large areas have been denuded of their soil layer, probably to depths of more than one point five meters (five feet), exposing the lateritic B-horizon and, in some places, the saprolitic C-horizon. The power of the wind is derived from Kaho`olawe's location west of Haleakala on Maui at the western edge of the `Alenuihaha channel. The predominant northeast tradewinds, blocked by Haleakala on Maui and Mauna Kea on Hawai`i, are funneled through the gap between these great mountains producing a significant increase in velocity. Kaho`olawe, lying on the west edge of this venturi effect is subject to constant wind speeds of 25 knots or more. These winds sweep over the island summit principally from the east.

Many factors have contributed to the near total deforestation and severe erosion of the island. Late prehistoric accounts (18th century) describe purposefully set fires on the island, the result of inter-island warfare (Spriggs 1991). The attempts to maintain cattle-ranching and sheep-station operations on the island in the second half of the 19th and the first half of the 20th centuries degraded the island environment. Herds of feral goats roamed the island until recently, preventing forest rejuvenation and contributing to erosion. Twentieth-century uses of the island for bombing and naval target practice contributed to the near complete removal of the forest cover of the island. Surface erosion is less apparent at lower elevations on Kaho'olawe where the introduced, xerophytic *kiawe* (*Prosopis pallida*) tree is established as dense thickets in places where its deep roots can reach ground water, or as open savanna in the drier land away from the shore. Stands of *kiawe* are also spotted though the denuded uplands and in the riparian zones along streambeds.

The soils on the island reflect this history of erosion. The inland plateau, located on the eastern end of the island near Lua Makika from about 213 meters (700 feet) elevation to the summit, consists predominantly of severely wind and water-eroded soils (Pu`umo`iwi and Kaneloa series). These are largely bare of vegetation. Downwind of the plateau, to the west where the wind velocity decreases, the soils have a mantle of aeolian material (Kealialalo, Pu`u Lai, and Wai Honu series). Kaho`olawe's coastline has mainly shallow soils (Ustorthents) and rock outcrops (Nakamura and Smith 1995:1-2).

Erosion has exposed many archaeological features in the caldera area and at Pu`umo`iwi on the southwest rift, removing everything except the basalt stone flakes and a few marine shells. A few isolated hummocks are evidence of the former soil cover, attesting to its composition and depth. Within a few of these hummocks, parts of some archaeological sites also remain. Sites along the shorelines exhibit fewer effects of erosion, in part, due to protection from their architectural remnants and, in part, because the wind is less severe than on the island summit area.

Military use of the island has left a number of landmarks that will be used in this text as reference points. The K-1 Road is the unimproved jeep road that runs from Base Camp, at Honokanai`a Bay on the island's west shore, up through the center of the island to the summit at Lua Makika. Base Camp dates to 1986, when the majority of the current structures and facilities were erected. The Rocky Road extends from Base Camp northwest to Keanakeiki and southeast to the Southwest Point Lighthouse. Southeast of Base Camp along the shore lies the Sailor's Hat detonation crater, a remnant of the 1960's Cold War experimentation that has become a man-made habitat for aquatic life. Northwest of Base Camp is a two-story concrete observation tower that dates to the 1950's. A similar observation tower, along with several other structures and a helicopter landing mat are located at Landing Zone (LZ) Seagull, in the vicinity of Lua Kealialalo northeast of Base Camp. LZ Seagull is reached via an access road that branches off of K-1 Road. The vicinity of LZ Seagull was used extensively for bombing practice and ground troop maneuvers. Remnants of this activity include a mock airstrip, a mock missile-launching site, and a mock vehicle convoy. Ground troops have left their mark with numerous excavated fighting positions in the hard pan and within the alluvial sediments of Lua Kealialalo itself. Southeast of LZ Seagull is a wooden observation tower at LZ Eagle. K-1 Road's northeastern terminus is at the U.S.G.S. survey marker known as Blow 2 on the northeastern rim of Lua Makika crater at the island's summit. The prominent landing zone at Lua Makika is known as LZ-1, which is just southwest of the crater. Within the last 30 years the vicinity of LZ-1 was the site of a reforestation/erosion control experiment. Generally north-south oriented linear alignments of tamarisk and ironwood trees were planted approximately 100 meters apart in the hard pan in an effort to reduce surface wind velocity. The resulting tree columns are a dominant feature of the LZ-1/Lua Makika landscape. Two foot-trails connect Lua Makika to the northeast coast at Hakioawa.

1.3.2 Task Order 7 Work Areas

1.3.2.1 Base Camp

All work concerned with the UXO Clearance Project, including assessment and historic property discovery, is performed in 100-by-100 meter Grid Map Units (GMU) (see Section 3.3.3.2 of the Cleanup Plan [Parsons-UXB Joint Venture 1998b: 113] for detailed information on the Grid Map Unit system). The Base Camp Work Area consists of 90 GMU located on the southwestern tip of Kaho'olawe island in the *'ili* of *Kealaikahiki* (Figure 1-2). The Base Camp facilities are located in the central portion of the work area and comprise seven of the GMU. The terrain in these seven GMU has been completely modified by the construction of the facilities and other land modification activities associated with the Base Camp. The terrain of the rest of the work area ranges from flat sandy beaches and vertical sea cliffs at the shore to semi-undulating *a'a* with shallow valleys and intermittent streambeds in the inland portions of the work area. Elevation ranges from 0 to approximately 16 meters (0-50 ft) above mean sea level (AMSL).

Rainfall in the work area is estimated to be approximately 10 inches per year (Nakamura and Smith 1995:1). Vegetation is classified as Pili Lowland, Dry Grassland, and Kiawe Forest (Parsons-UXB Joint Venture 1998a: C-17). Within the Base Camp facilities and along the coastal cliffs, this vegetation is sparse, and limited to small patches of *kiawe* and grasses. Elsewhere in the work area, the vegetation is consistently more dense with thick stands of *kiawe* and high grass. There is a small wetland area in the southern corner of Honokonai`a beach, where the dominant vegetation is pickleweed (*Batis maritima*).

Soil types found inland of the shore include Lualualei, extremely stony clay, Pu`u Lai Rock outcrop complex, and other rock outcrops (Nakamura and Smith 1995). These soil areas can be nearly level or as steep as 20 percent and the surface 20 to 50 percent covered with cobbles and stones.

Erosion at the Base Camp work area does not occur as rapidly, and the effects are not as evident as at other Task Order 7 work areas. This is due primarily to the lower rainfall and less harsh winds than those that occur at the eastern and central portions of the island.

1.3.2.2 Seagull

The Seagull Work Area consists of 86 GMU located within the central-western zone of Kaho`olawe island north of Lua Kealialalo (Figure 1-2). Modern structures within the area consist of a few rundown observation facilities located in the southern portion of the work locality. These structures consist of a concrete observation bunker, two partially standing wooden structures, and a steel-panel helipad.

Estimated rainfall for the work area is approximately 5 to 10 inches annually (Nakamura and Smith 1995:1). Overall vegetation consists of dense Kiawe Forest/Woodland in the southern portion of the work area, bordering the Kealialalo crater. The eastern and northern portions of the work area have large expanses of sparsely vegetated hardpan (Parsons-UXB Joint Venture 1998a: C-19). The terrain of the work area varies from flat hardpan around the helicopter landing zone to moderate rises and gullies along the northern end of the work area. Elevation ranges from 210 to 256 meters AMSL.

1.3.2.3 OB/OD

The OB/OD Work Area consists of 96 GMU located within west central Kaho`olawe island (Figure 1-2). Estimated rainfall in the work area is approximately 5 to 10 inches annually (Nakamura and Smith 1995:1). Overall vegetation consists of mostly denuded hardpan that is interspersed with scattered hummocks of remnant soil, which are generally covered with various grasses and *kiawe* and *koa haole* trees. The terrain of the work area varies from flat hardpan to moderate rises and erosive gullies. Elevation ranges from 216 to 262 meters AMSL.

1.3.2.4 K-1 Road

The K-1 Road Work Area consists of a corridor (2 to 7 GMU wide) surrounding K-1 Road, extending approximately nine miles from the western edge of the Base Camp work area to the eastern edge of the Lua Makika work area. There are a total of 401 GMU in this long and narrow work area that essentially bisects the island longitudinally in a southwest-northeasterly direction (Figure 1-2).

Rainfall in the work area is estimated to range between approximately 10 and 25 inches per year (Nakamura and Smith 1995:1). Vegetation varies across the length of the work area. In the southwestern portion of the work area, the vegetation is classified as Pili Lowland Dry Grassland and *Kiawe* Forest (Parsons-UXB Joint Venture 1998a:C-17), consisting of dense high grass with dispersed stands of *kiawe* and *koa haole*. Toward the east, as the elevation increases along the southwest rift past Pu`umo`iwi to Pu`u o Moa`ulanui, the terrain changes gradually to where the majority of the ground surface is comprised of mostly denuded hardpan, with scattered hummocks of remnant soil which are generally covered with various grasses and koa *haole* and *kiawe* trees.

1.3.2.5 K-1 Road Bypass

The K-1 Road Work Area consists of 57 GMU in the central portion of Kaho'olawe south of Pu`umo`iwi. It is a proposed road corridor (2 to 7 GMU wide) intended as a realignment of a portion of K-1 Road to bypass the Pu`umo`iwi traditional cultural property. This small work area is situated very close to Pu`umo`iwi to the north and Kaneloa Gulch to the south (Figure 1-2).

Rainfall in the work area is estimated to range between approximately 10 and 25 inches per year (Nakamura and Smith 1995:1). The terrain in the majority of the work area is comprised of mostly denuded hardpan with scattered hummocks and accumulated soils, on which grow various grasses and *koa haole* and *kiawe* trees.

1.3.2.6 Lua Makika

The Lua Makika work area is located within the eastern portion of Kaho'olawe situated around the summit of Pu`u o Moa`ulanui. It consists of 205 GMU and encompasses the Moa`ulanui crater and the area surrounding it (Figure 1-2). The entire work area lies within the traditional cultural property of Moa`ulanui (a combination of Pu`u o Moa`ulanui and Pu`u o Moa`ulaiki traditional cultural properties). The elevation for the Lua Makika work area ranges from 375 meters (1230 feet) to 450 meters (1477 feet) at the highest point of the island.

The most distinct landform defining this work area is the Moa`ulanui crater and its rim. The crater is approximately 700 meters in diameter and 26 meters deep. While the outer rim of the crater is virtually devoid of vegetation, the crater floor is almost entirely covered with non-native grasses, shrubs and trees. The crater interior is somewhat protected from the almost constant high winds of Kaho'olawe, thus allowing *kiawe* trees, *koa haole* trees, lantana, and various grasses to cover the majority of the ground surface. Another reason for the thick vegetation along the crater floor is that rainwater is able to collect rather than runoff downslope as it does on the outside of the crater.

With the exception of Moa`ulanui crater, erosion has been the most significant factor contributing to the makeup of the modern terrain at the top of the island. The majority of the ground surface is comprised of hardpan, devoid of any vegetation. Hummocks of remnant soil are scattered about the landscape and are usually covered with various grasses and *koa haole* and *kiawe* trees. Most of the hummocks in the Lua Makika work area are eroding along the edges; however, many appear to actually be collecting soils on top. Shallow gullies exist in almost every GMU outside the crater, and during heavy rains these gullies carry water and sediment downslope.

Non-native flora within the Lua Makika work area consists of *kiawe*, eucalyptus, tamarisk, and *koa haole* trees, sisal, Australian salt-bush, wild tobacco, lantana, vines, and various grasses. Native flora observed within the work area consists of *wiliwili* trees, *a'alii*, *ilima*, *ma`o*, *ulei*, and various grasses.

Long lines of tamarisk and ironwood trees were planted as windbreaks across most of the Pu`u o Moa`ulanui area. The treelines were planted in the 1980's by the Navy and are oriented at an almost true north to south direction perpendicular to the prevailing winds. These rows are approximately 100 meters apart and, in some cases, have disturbed historic properties.

There are several areas within the Lua Makika work area where mostly indigenous species have been planted as part of revegetation efforts. One of them is situated to the northwest of the crater and consists of rows of native *wiliwili* trees, covering an approximate area of 100 square meters that is bisected by the K-1 Road. Another planting area located just north of the crater and on the downslope side of the K-1 Road has recently been started and consists primarily of *a'alii* plants. The largest of the revegetated areas is located several hundred meters west of the crater, and is part of the CERL Re-vegetation Prescription Project (see letter dated 13 October 1989 from P.W. Hiller [PACDIV] to William Paty [DLNR]). It is a large area made up of several raised planting berms with *wiliwili* trees planted along the sides. The flat soil areas in between the berms were tilled and planted with various grasses that have created an effective ground cover.

1.4 Scope of Work

The Scope of Work for Task Order 07, Area Pre-investigation and Assessment, is outlined in the Technical Proposal of the Statement of Work and includes the separate tasks described below.

1.4.1 Area Pre-investigation

1.4.1.1 Archival Research

Historic preservation archival research involved the collection of all available historic preservation data from past investigations on Kaho`olawe. Historic preservation personnel reviewed, analyzed, and summarized the National Register of Historic Places forms and accompanying maps, UXO Model Clearance Project Final Report, Archaeological Report on Monitoring During the Kaho`olawe UXO Model Clearance Project, Ogden Environmental

Historic Properties Location Map, aerial photographs, and additional site-specific studies. The accumulated information was synthesized into a list of known historic properties within the work areas. This information enabled the historic preservation personnel to make preliminary predictions regarding the types and locations of historic properties in a work area in preparation for on the ground assessment.

1.4.1.2 Cultural Review

Cultural Review involved the documentation of traditional cultural properties within work areas. During Cultural Review, UXO, historic preservation, and survey personnel accompanied KIRC representatives to locate and designate the boundaries of areas identified as traditional cultural properties. Once a traditional cultural property is identified in a work area, the KIRC representative may conduct an appropriate cultural protocol. The KIRC is consulted to determine appropriate treatment during clearance activities. The specific task of historic preservation personnel during cultural review is to record descriptions of traditional cultural properties and assist in marking and locating their position.

1.4.2 Area assessment

Area assessment was designed as a multi-disciplinary approach to assess actual field conditions in relation to UXO, historic properties, environment, and natural resources. Area assessment teams verified and refined the area pre-investigation data, noted the existing conditions in the Grid Map Unit, and documented their findings through data forms, written descriptions, maps, and digital photographs. The area assessment team provided the information for each functional area (UXO, historic preservation, natural resources, environmental, and survey) to formulate their recommendations to the Review Board for proceeding with UXO clearance activities. See Section 2.1.1 and 2.1.2 for a detailed description of the historic preservation component of area assessment. The findings and recommendations of the area assessment functional areas were compiled and reviewed by PUXB's members of the Review Board. Approved findings and recommendations were forwarded to the Government members of the Review Board. Each Government Review Board member then recommended "Approval," "Conditional Approval," or "Disapproval" of the finding and/or recommendations in their respective area. A conditional approval or disapproval given by any of the Review Board member(s) was accompanied by amendments to the findings and recommendations, mitigation measures, and/or monitoring of activities on the Record of Decision. In the event of a conflict within the Review Board, the Government Chairperson would step in and resolve any conflict and issue a final decision. At the time of this report, there were no conflicts within the Review Board regarding Task Order 07 review and consequently no need for the Government Chairperson to step into the review process. The approved Record of Decision was then transmitted for implementation during clearance operations. During area assessment, historic preservation personnel provided all of the necessary documentation for historic property physical evaluations, significance assessments, determination of effects, and choice of mitigation through Tier I clearance activities. HP personnel re-located previously recorded historic properties, compared the existing records to the current field conditions, and recorded any supplemental data. HP personnel also located and recorded any new historic properties.

1.5 Traditional, Historical, and Archaeological Background

The history and archaeology of Kaho`olawe have been well documented recently in many good sources, due, in large part, to the reclamation effort on the island initiated by native Hawaiians. Only a brief summary is presented here; the reader is referred to other sources listed below for more complete historical information.

1.5.1 Traditional Cultural Places

A traditional cultural property (TCP) "can be defined generally as one that is eligible for inclusion in the National Register of Historic Places because of its association with cultural practices or beliefs of a living community that (a) are rooted in the community's history and (b) are important in maintaining the continuing cultural identity of the community" (National Register Bulletin No. 38). Reeve (1993) provides the legendary and historic context for a number of historic properties that fit these qualifications. Places and sites at Kamohio, Kanapou, Hakioawa, Kealaikahiki, Lua Makika, and other areas on Kaho`olawe are traditional cultural properties based on their cultural significance to Native Hawaiians (see Section 4 for detailed information on the TCPs identified for the work areas of Task Order 07). In some cases these historic properties correspond to recorded archaeological sites. According to the KIRC Cultural Coordinator, Hokulani Holt-Padilla (personal communication 04 February 1999), the TCP is the reason why we have archaeological sites are within the area. The people went there because the place itself was special and this is the foundation upon which traditional activities were based.

On 21 October 1998, Theresa Donham (HPNTR) and Hokulani Holt-Padilla (KIRC Cultural Coordinator) held a consultation meeting regarding traditional cultural properties on Kahoolawe. Five TCPs within the Task Order 07 and Task Order 015 work areas were identified at this time and the preliminary information regarding the boundaries of these properties was provided. The TCPs defined in this consultation meeting were Pu `u Moa`ulanui/Pu` u Moa`ulaiki, Pu `umo`iwi, Hakioawa, Kealaikahiki, and Pu` u Kealialuna.

On 02 February 1999, the HPNTR, the KIRC Cultural Coordinator, Hallett Hammatt (HPM), and Derek Chow (KIRC Representative) held a second consultation meeting with regards to the address the identification and treatment of TCPs on Kaho`olawe. It was agreed that the boundaries for Kealikahiki, Moa`ulanui, Hakioawa, and Kealialuna were clear and could be easily translated to a map. The boundaries for Pu`umo`iwi, however, were still unclear and therefore in need of a cultural review of the area whereby the boundary would be identified on the ground and surveyed in. It was also agreed upon that HPM is authorized to contact the KIRC Cultural Coordinator directly for purposes of TCP consultation in cases in which there are potential adverse impacts to the TCP such as construction projects and *in situ* detonation. Special restrictions applying to activities in particular TCPs would be identified.

On 16 February 1999, the HPM, KIRC Cultural Coordinator, KIRC Representative, Clyde Higa (COTR), and a Survey Team went up-range to determine the boundaries of the Pu`umo`iwi TCP. The results of this cultural review determined that the western boundary would include SIHP sites 211 and 384, the eastern boundary would include SIHP sites 204, 250, and 206, and the north and south boundary would include all the landforms associated with this *pu`u*.

1.5.2 Historic Background

Knowledge of Kaho`olawe's pre-contact past is derived from known place names, legends, oral histories and traditions, genealogies, and its archaeology. The name "Kaho`olawe" means "to be caused to be carried away" or "to be brought together" and may refer to the nearby ocean currents which converge at Kaho`olawe (Kaho`olawe Island Conveyance Commission [KICC] 1993:17). Another name for the island taken from a chant by Pukui, a court chanter-composer for Kamehameha I, is "Kanaloa," referring to one of the four major Polynesian gods. This association with Kanaloa gives Hawaiians the sense of Kaho`olawe as a special place and a sanctuary. Other names include: "Kohemalamalama" or "Kohemalamalama o Kanaloa," "Kahiki Moe," "Hineli`i," "Kohema" or "`Ailani Kohema Lamalama," and "Kukulu Ka`iwi o Ka `Aina." Kohemalamalama is thought to refer to the island as a directional aid for the ancient Hawaiian voyagers; Kahiki Moe refers to "where the Sun sets"; Hineli`i refers to the light rain characteristic to the island; Kohema or `Ailani Kohema Lamalama refers "to the left" or "to your left and lit up like heaven;" and Kukulu Ka`iwi o Ka `Aina translates as "the bone of the land standing upright;" these latter names perhaps refer to how early voyagers viewed the island from their canoes (Kaho`olawe Island Conveyance Commission [KICC] 1993:17).

In 1779 the first written descriptions began to appear in ship logs. Historic time divisions have been made to account for various major trends in Kaho`olawe's modern history. A useful grouping of seven periods includes:

- Early Contact Period (1779-1825);
- Missionary Period (1825-1853);
- Early Ranch Period (1853-1910);
- Forest Reserve Period (1910-1918);
- Later Ranch Period (1918-1941);
- Military Period (1941-1980); and finally
- The Joint-Use Period (1980 - Present) (Kaho`olawe Island Conveyance Commission [KICC] 1993:19).

Sources available for the detailed history of the legends and different time periods include:

Environment Impact Study Corp (1983), *Kaho'olawe Cultural Study, Hawaiian Archipelago*, 2 v., Prepared for the Department of the Navy, Honolulu, HI.

Reeve, Roland B. (1993), *Na Wahi Pana*, Kaho`olawe Island Conveyance Commission (KICC), Honolulu, HI.

Kaho`olawe Conveyance Commission (1993), "From Mists of Time to Clouds of Dust" *Kaho`olawe Island: Restoring a Cultural Treasure*, Kaho`olawe Island Conveyance Commission (KICC), Honolulu, HI (pp. 16-29).

Ogden Environmental and Energy Services Co., Inc. (1995), *Cultural Resource Management Plan for Kaho`olawe Archaeological District*, Vol. 1, prepared for the Department of the Navy, Honolulu, HI.

Silva, Carol (1983), *Kaho'olawe Cultural Study, Part 1, Historical Documentation,* Environment Impact Study Corp., Honolulu, HI.

Spoehr, Hardy (1992), *Kaho`olawe Forest Reserve Period: 1910-1918*, Kaho`olawe Conveyance Commission, Honolulu, HI.

Spoehr, Hardy (1992), *Kaho`olawe Honey and Pineapple Ventures: Anecdotes to the Island's History*, Kaho`olawe Conveyance Commission, Honolulu, HI.

1.5.3 Previous Archaeology

This section reviews only major studies comprising archaeological surveys of the island of Kaho`olawe, as well as other recent studies directly relevant to the Task Order 7 work. For a more complete review of previous archaeological studies, the reader is referred to the Historic Preservation Plan (Parsons-UXB Joint Venture 1998a).

J.F.G. Stokes, of the Bishop Museum, was the first person to record and map archaeological sites on Kaho'olawe (Bishop Museum Field notes 1913). Stokes' descriptions of *heiau* are included in the 1916 Charles S. Judd article about the Kaho'olawe *heiau* in *Thrum's Annual* of

1917. About this same time, Judd also asked for and received from J. Kauwekane a listing of all place names known for Kaho`olawe and a map showing their locations. This map is now in the Hawai'i State Archives collection (Reeve 1993a:268).

Stokes identified fifty sites, which were later reidentified and numbered by Gilbert McAllister in his *Archaeology of Kaho'olawe* (1933). The McAllister report documents findings and materials collected during the Stokes and McAllister visits to Kaho`olawe. McAllister believed that his survey of the island was thorough and that all sites were recorded:

> Fortunately, unlike those on the other Hawaiian Islands, the remains are not completely hidden by native and exotic vegetation. The desolation of Kahoolawe is in this respect an advantage. There are undoubtedly some isolated sites that were not seen, but as the most habitable parts of the island were examined, it is probable that the material which was missed will not prove to be significant. (McAllister 1933:3-4)

Inez MacPhee Ashdown (1979), in her youth as a resident of Kaho`olawe at her father's ranch at Kuheia, wrote her recollections of visits to sites and of talks she had with people about Kaho`olawe between 1910-1941. She also drew a map showing approximate locations of sites (shown in Johnson 1993:3.2); the map is not topographic but indicates places where there are houses, *heiau*, midden scatters, etc. It is unclear when she drew this map.

Following the work of McAllister in the early 1930s, there was a long hiatus in archaeological research while Kaho`olawe was used by the Navy. This hiatus ended in 1976 when an intensive four year survey of the entire island was undertaken (Hommon 1980). The survey was sponsored by the Department of the Navy as part of its responsibilities under Executive Order 11593, the National Historic Preservation Act of 1966 (as amended), and the Advisory Council on Historic Preservation's "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800). The initial portion of the survey, from January 1976 through October 1977, was conducted as a joint effort between personnel of the Department of Land and Natural Resources, State of Hawaii and its sub-contractor, Hawaii Marine Research, Inc. (HMR). In May 1978, HMR was contracted directly by the U.S. Navy to finish the survey under Contract No. N62742-78-C-0061.

The entire island was covered by pedestrian sweeps and "...as each site was located, its location was plotted on aerial photographs and maps, it was described in notes and photographed and a scale map was prepared of the whole site and each constituent feature..." (Hommon 1980:4). The survey located 544 sites containing 2337 features (Hommon 1980:9). Hommon describes three zones of settlement based on habitation density: a) the Coastal Zone, an approximately 400 meter wide strip along the coast (Zone I); b) the Inland Settlement Zone, the upland interior generally above 325 meters AMSL (Zone III); and c) the Intermediate Settlement Zone, an area between Zones I and III (Zone II).

The island-wide survey recorded 258 sites in the coastal zone, 97 sites in the intermediate zone, and 189 sites in the inland zone. The largest variety and concentration of sites occurs in the coastal zone. The coastal sites tend to congregate in areas accessible to the ocean, such as at the outlets of gulches and on low cliff shorelines. Sites include: (a) 2063 habitation features (sub-elements of sites), (b) 87 shrines and *heiau*, (c) 32 lithic quarries and workshops, (d) 24 petroglyph clusters, (e) 52 post contact walls and features, (f) 64 mounds, and (g) 15 miscellaneous sites. The majority of the sites recorded in the island-wide survey are associated with prehistoric Hawaiian settlement of the island. These sites are significant because they represent well-preserved, physical remnants of a total island community

Also during the project, "a total of 1,120 basaltic glass samples from 655 of the 2,337 archaeological features recorded during the survey of Kahoʻolawe were dated through the hydration rind analysis technique" (Hommon 1980:item 7, pp.2-4). This dating analysis was done by Hawaii Marine Research, Inc. "In addition, five charcoal samples from four features (263A, 263D, 288, and 349D) were submitted to Teledyne Isotopes for radiocarbon age determinations" (Hommon 1980:item 7, pp.2-4). A total of twelve test probes (usually 25 cm^2) and eight test pits (1.0 m^2) were excavated to collect subsurface data. The twelve test probes were excavated at the following habitation features and midden scatters: 131A, 139C, 197B, 203, 215, 240, 241A, 271, 277, 299A, 302, and 311A. The eight test pits were excavated at the following features: 347A, 349D, and 359D in the Hakioawa Archaeological District (356); 367 and 378E in the Honokoa Archaeological District (379); and 571A and 571E in the Hakioawa `Iki gulch area.

Hommon describes in detail the process by which sites were plotted on a map:

> Both aerial photographs and maps have been used to delineate survey areas and to plot site locations. Enlargements of aerial photographs of the island provided by the Navy have proved the most useful graphic tools for plotting site locations, since landmarks as small as a few meters across are often visible. A photo-mosaic constructed from the aerial photos has been used in conjunction with contour maps to plot the U.T.M. locations of sites. It should be noted that the U.S.G.S. map used for individual Kahoʻolawe National Register forms is of 1:62,500 scale rather than the 1:24,000 scale normally used. The Kahoʻolawe U.S.G.S. map was first issued in 1929 and was reprinted in 1947. It does not include U.T.M. notations. (Hommon 1980:item 7, pp.2-4)

The 1976-1980 survey of Kahoʻolawe was the first systematic survey of an entire major Hawaiian island. Following the work, the entire island was placed on the National Register of Historic Places. In the period between 1980 and 1985 many specialized archaeological studies were completed. These include data recovery of eroded sites (Hommon 1981, Hommon 1982, and Rosendahl *et al.* 1987). There were also studies of the Pu`umo`iwi adz quarry (McCoy 1993) as well as studies of petroglyphs (Lee and Stasack 1993 and Stasack *et al* 1994). In addition, a number of historic preservation management studies were completed (Ahlo and Hommon l982, Yent 1983, Graves and Abad 1993, and Ogden Environmental and Energy Services Company Inc., 1995).

The *Archaeological Report on Monitoring During the Kahoʻolawe UXO Model Clearance Project* (Hammatt *et al.* 1996) documents all historic property recording and protection activities that occurred in support of UXO clearance of a limited corridor on the island. The report contains updated descriptive and location data on the historic properties encountered during the project. Location data for the historic properties were recorded by global positioning systems. A major effort was concentrated at Hakioawa, which resulted in improved recording of historic properties within the Hakioawa Archaeological District. Guidelines for future historic protection in the context of UXO Clearance were developed.

One of the outcomes of the 1995-1996 Model Clearance Project was the development of recommendations for historic properties protection procedures during in-situ UXO detonations (BIPs). The recommendations were based on the results of actual live ordnance tests (Boyden *et al.* 1996, in *Ordnance Demolition and Its Impact on Archaeological Sites: An Experimental Project Conducted on the Island of Kahoʻolawe, Hawaii*). This study showed that placement of barriers (i.e., stacks of banded tires) around the BIP comprised one means of effective protection of surrounding areas from potential damage caused by blast and fragmentation resulting from the UXO detonation under certain circumstances. The results of this study for protective works (PW) should be applied during future clearance operations for protection of historic properties.

1.6 Specific Research Questions and Data Requirements

1.6.1 Objectives

The primary purpose of Historic Preservation on Kaho`olawe during the UXO clearance and environmental restoration activities is the protection of historic properties to ensure their eventual safe management and use for cultural and educational purposes. The objectives of archaeological research on Kahoʻolawe are to place the historic properties into a context that encompasses the settlement history of the entire island. Various explanations for the dynamics of this settlement have been formulated during extensive previous research. These explanations are distilled into research topics and questions grouped under four broad subjects: (1) chronology, (2) settlement patterns, (3) economic patterns, and (4) environmental change. Because of the primary need to keep archaeological research in the context of historic property protection, the work of each Task Order only focuses on those research topics that can realistically be addressed during site recording in the work areas. These topics depend on the nature and location of the sites. Most relevant to the historic properties located in the Task Order 7 work area, with the majority of the sites being in the Lua Makika and upper K-1 Road work areas, are the topics of settlement patterns and economic patterns of island use.

1.6.2 Settlement Pattern

As a result of the information collected during the island-wide survey, Hommon (1980) developed a pre-contact settlement pattern sequence consisting of four phases and three environmental zones. During the initial phase, settlement was concentrated along the coast, followed by expansion of permanent settlement into inland areas with a presumed agricultural base after A.D. 1400. Barrera (1984), who describes a similar settlement sequence, notes a dramatic increase in the number of features in inland areas during the 1400's. Again, the settlement sequence is based on the frequency of volcanic glass date sites in the different zones of the island. Rosendahl (1987), besides compressing the chronological model, claims that the inland sites on Kaho`olawe do not represent permanent habitation, which remained concentrated along the coast throughout pre-history. Neller (1981) similarly disputes the "inland expansion hypothesis" of Hommon and saw a stable coastal population based on marine exploitation and little reliance on agriculture. Hommon (1980) relies on average "duration values", an abstract concept derived from volcanic glass dates, to argue for permanent habitation of the inland zone. He also argues that because the inland zone was appropriate for agriculture it would have supported a long-term inland occupation by analogy to the pattern on other islands. Rosendahl *et al.* (1987) discounts this type of evidence for permanency of habitation and argues that the physical attributes of the inland sites (such as range of artifacts and midden, presence, absence and function of large structures, presence or absence of postholes and burials) should be used in evaluating degree of permanency of settlement.

An important consideration in interpretation of settlement patterns is assignment of site categories, especially those based on function. A continuing major issue for settlement pattern study on Kaho`olawe is the distinction between permanent and temporary habitation. Clustering and nucleation of features, especially habitation features, indicate permanency. Variety and quantity of midden and artifactual material especially associated with structures is also a consideration, along with presence, size, and inferred function of structures. Specific site categories for this project are described in the Historic Property Survey Standard Operating Procedure (Appendix A).

The theoretical issues of human settlement on Kaho`olawe should be addressed by asking these questions of the data collected.

- What areas of the island supported permanent habitation?
- Was there permanent habitation in the inland zone?
- Where are the areas of nucleated settlement on the island?

The settlement patterns of Kaho`olawe Island, which include the parameters of original settlement, expansion across the land, and the development of residence patterns, are discernible from historic property location data and from how different kinds of sites are distributed across the landscape. Therefore, these patterns should be interpretable from the amended NRHP forms and the accurate historic property location data within the data management system. Size, midden and artifact associations, and clustering of structures will be recorded. Excavations of archaeological layers should be followed by analysis of variety and concentration indices of artifact and midden materials. The context of an historic property within the overall island settlement pattern is clearly related to determining the significance of that property; therefore, the appropriate site treatment. Determining the settlement pattern context is, therefore, relevant to the overall goal of historic property protection.

1.6.3 Economic Patterns of Island Use

The three main economic activities on the island during pre-history would have been marine exploitation, dry-land agriculture, and adz making. Hommon (1980) sees emphasis in the early phases of island habitation on marine exploitation, and a shift to an emphasis on agriculture, associated with the establishment of permanent inland settlement in the uplands during his Phase II period (1400 to 1550). Agriculture would also have been practiced in broad gulch bottoms, particularly in the larger gulches and particularly in Ahupu, Honokoa, and Hakioawa. Neller (1982) disputes the major economic importance of agriculture and sees a coastal population reliant on marine exploitation throughout pre-history. Adz quality basalt was clearly an inland economic resource obtained in numerous surface quarries around Pu`umo`iwi. The economic system operating on the island would affect the exploitation and distribution of adz quality basalt as well as other land, marine, and agricultural resources. Hommon (1980) visualized the island being divided into a series of *ahupua`a*, the self-sufficient, land tenure system unit well documented on the other major Hawaiian Islands. Barrera (1984) disputes this interpretation saying that individual *ahupua`a* did not develop on the island, but that the island economic system was opportunistically based. The land divisions that appear on a nineteenth century map are presently considered to be *`ili*, which implies the entire island functioned as a single *ahupua`a* of the island of Maui. There are historic accounts of close economic connection to the island of Maui, which probably included economic exploitation and control of resources by non-residents of the island.

Research issues relating to economic patterns that reflect island use are presented in the following three questions:

- Was Kaho`olawe a self-sufficient economic unit in the pattern of the pre-contact Hawaiian ahupua`a?
- What scale of agriculture was practiced on Kaho`olawe?
- Were adzes manufactured for use of island residents or for export?

Determining the economic patterns within the prehistoric and historic settlement of Kaho`olawe can be accomplished by identification and analysis of historic property function and recorded artifact attributes. Identification of historic properties with a specialized function is important in determining economic patterns. Analyzing the artifact frequency and dimensions (Section 5) as well as the content of midden assemblages from individual sites should indicate the degree of focus on single economic activities, such as fishing or adz manufacturing, as opposed to broad-based exploitation patterns by permanent residents with associated agricultural practices. It should be possible, through a study of site and artifact attributes, to distinguish categories of sites and site function based on variations in site area, material diversity and artifact type diversity. By gaining a clearer picture of site function we will then be able to discern patterns of settlement and land use. The general data necessary to address these research questions is contained within the amended NRHP forms, HPF-01 forms and HPF-13 forms. This could be combined with the accurate historic property location data in the data management system. More specialized data will become available from data recovery of specific historic properties. The determination of the function of the historic property and therefore the establishment of the role of the property within the overall economic pattern, is directly related to the significance of the historic property and would in turn, affect the property protection measures. Specific site categories for this project are described in the Historic Property Survey Standard Operating Procedure (Appendix A).

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Section 2 Methods

2.1 Field Methods

The archaeological fieldwork performed for Task Order 7 consisted of the discovery and recording of all Historic Properties and isolated finds in the five work areas. Normally referred to as an inventory survey in Hawai'i, the fieldwork was conducted as part of the area assessment Phase of the UXO Clearance Project of the Kaho'olawe Island Reserve. The fieldwork was divided into two tasks, discovery and recording, which were performed by separate teams of field personnel. All aspects of the fieldwork tasks, including their organization, were controlled by a series of Standard Operating Procedures (SOP). The SOP governing the performance of the Task Order 7 Historic Property Survey can be found in its entirety in Appendix A, while the general field methods employed are discussed following.

2.1.1 Grid Map Unit Stakeout Monitoring

During Grid Map Unit stakeout, historic preservation personnel accompanied the survey team to ensure that placement of survey markers did not adversely impact historic properties. When necessary, the historic preservation personnel instructed the surveyor to select an alternative offset point that would not adversely impact the historic property.

2.1.2 Historic Property Discovery

The discovery of historic properties was accomplished by way of pedestrian transects of each GMU performed by the area assessment team, composed of five members (an unexploded ordnance specialist, a surveyor, a natural resources specialist, a historic preservation supervisor, and a historic preservation field assistant or historic preservation field technician). The spacing between team members varied between 10 and 15 meters depending on ground cover conditions.

Historic property is defined as any prehistoric or historic district, site, building, structure, or object equal to or greater than 50 years and/or a Traditional Cultural Property included in or eligible for inclusion in the National Register of Historic Places (NRHP). Upon discovery of a historic property, it was assigned a temporary field number by the historic preservation (HP) component of the area assessment team and entered on the HPF-01 form. Temporary field numbers consist of the eight-digit GMU number where the property is located, followed by a dash and a sequential number beginning with "1" in each GMU. The location of each historic property was established by two reference points, A and B. Reference point A was marked with a ½-inch diameter by 12 inch long galvanized steel pipe, driven into the ground in a central location. Reference Point B, sometimes placed near the perimeter, was marked by a 2-inch square by 12-inch long wooden stake. An aluminum tag marked with the point identifier (A or B) and the temporary field number was attached to each reference point marker. The perimeter of the property or feature was defined and clearly marked with blue flagging tape. The surveyor member of the assessment team, using ASHTECH GPS land survey equipment, then mapped the reference points A and B, as well as the property perimeter. For each site or feature, the HP component of the area assessment team filled out the following fields of the HPF-01 form: temporary field number, SIHP number and feature letter if known, environmental setting, and historic property type (see Appendix A).

In the event that no historic properties were found in the GMU, the area assessment team would mark the "No HP Findings in GMU" box, fill out the environmental setting section, and leave the rest of the form blank.

2.1.3 Historic Property Recording

All historic properties discovered by the assessment teams were revisited and recorded by a three-member team composed of an unexploded ordnance specialist, a historic preservation supervisor, and a historic preservation field technician. Detailed recording of each property consisted of identification as a previously recorded or newly discovered property, photography, preparation of a scaled map, completion of the HPF-01 form begun by the area assessment team, a written description of the property and its material contents.

Correlation of historic properties with previously recorded sites and features was accomplished by use of archival materials gathered prior to commencement of the fieldwork which included photogrammetric maps provided by the Navy. The National Register of Historic Places Nomination Forms that were completed for each site and feature provided the necessary descriptive data to make the positive re-identification (correlation) or to determine that a property was newly discovered.

Written descriptions were then recorded on the back of the HPF-01 forms (see Appendix A). If a property was correlated with a previously recorded site or feature, the previously assigned State Inventory of Historic Places (SIHP) number was marked on the aluminum tag placed on the Reference Point A marker by the assessment team. If a property was determined to be newly discovered a new SIHP number was assigned and marked on the Reference Point A tag.

Whole specimens of finished or in-production tools (and fragments that constituted an estimated 25% of the whole) were recorded individually on separate forms (See Appendix A, HPF-13 form). Because collection of portable remains is prohibited, the data collected in the field was more extensive than normally associated with Inventory-level recording. Data collected for the tools and tool fragments in the field included tool and material type, length, width, and thickness of the tool, and the presence/absence of discernable use-wear and its location, if present. Field measurements of recorded artifacts were made with digital calipers and recorded to the millimeter.

Scaled maps of each historic property were drawn on archive-quality graph paper, using a compass and metric tape measure. The maps were prepared to record and illustrate the boundaries of the property, areas with high concentrations of cultural materials, locations of all recorded tools and tool fragments, and prominent features of the landscape, such as roads, hummocks of remnant soils, or erosive channels.

All historic properties were photographed from at least two perspectives, using a Kodak DC220 digital camera. Each site photograph contained a two-meter scale and a photo board to identify the property and the photo. At least two digital photographs were also taken of selected artifacts or artifact fragments that were recorded. Only specimens of high quality or that exhibited unusual characteristics were selected for photography. Approximately 10% of all recorded artifacts in sites or features were photographed and all isolated finds were photographed regardless of the condition of the item. A total of 1493 digital photographs[‡] were taken by the recording team and downloaded into the public drive of the Parsons-UXB Maui Technical Office computer network.

[‡] This total is a combined count of site and artifact photos.

2.1.4 Isolated Find Discovery and Recording

An isolated find (IF) is defined by the SOP as a single artifact or other important item separated from other historic properties. During the fieldwork for Task Order 7, generally only whole or fragmentary specimens of finished or in-production tools were recorded as isolated finds. Upon discovery of an IF the assessment team assigned it a number consisting of the GMU number followed by a dash, the letters "IF," and a sequential letter beginning with "A" in each GMU. The artifact then was marked clearly with blue flagging tape, and the surveyor member of the assessment team, using GPS land survey equipment, mapped its location.

Isolated Finds were recorded following the same procedures as those for historic properties, except measured site maps and detailed descriptions were not provided. The same artifact data was collected and all IFs were photographed.

2.2 Office Procedures

In order to support the field crews and track their progress across the work areas, one Historic Preservation Field Supervisor (HPFS) and one Historic Preservation Field Technician (HPFT) was assigned to the Maui Technical Office to oversee the tracking, quality, and processing of the paperwork generated in the field. As a means to deal with all of the paperwork associated with each historic property, a site folder filing system was created, whereby all site information is available in one folder as opposed to multiple GMU folders, and a streamlining of the contents of the GMU folder as far as HP paperwork is concerned was implemented. In addition to tracking and processing all paperwork that goes into the site folders and GMU folders, the HPFS is responsible for writing the monthly and quarterly progress reports, as well as taking care of overall office inquiries. This section discusses the procedures governing the creation of site folders as well as the contents of the GMU folders for the HP component

2.2.1 Site Folders

Documentation for each historic property and isolated find generated by the recording team is retained in a separate file and organized according to work area and field number. Site folders contain the following documents:

a) The HPF-01 form completed by the assessment and recording team for each historic property and isolated find
b) If the historic property falls into multiple GMU, an HPF-01 form for each GMU in which that property occurs
c) An HPF-02 form filled out by the recording team, summarizing the contents of the historic property and giving site protection recommendations for all levels of clearance
d) All HPF-13 forms documenting isolated finds or individual artifacts within the site boundary
e) Site or feature map
f) Color prints of all photo shots listed in the digital photo record at the bottom of the HPF-01 form and HPF-13 form
g) Any follow up research and documentation

All files containing original paperwork are kept alongside the GMU folders at the Maui Technical Office and are available to all project personnel who wish to reference these documents. As with all paperwork generated during this project, the contents of these files are contract deliverables and will be deposited with the Navy at the close of the project.

2.2.2 GMU Folders

In an effort to streamline the information contained in the GMU folders, only a summary of HP documentation and recommendations is included in the folder. Four situations are possible when dealing with historic properties at the GMU level: (a) a GMU with no historic properties, (b) a GMU located within a traditional cultural place (TCP) containing no archaeological sites, (c) a GMU containing one or more historic properties, and (d) a GMU containing one or more historic properties within a TCP. The contents of the GMU folder according to each scenario are as follows:

a) If the GMU contains no historic properties the following documentation was placed in the GMU folder:

   1) A partially completed HPF-01 form written up by the assessment team showing the name of the supervisor, the date of assessment, and verifying the absence of historic properties within the grid unit

   2) An HPF-03 form stating that there were no historic properties in the grid unit and therefore no further mitigation is required, which is then verified and signed by the Historic Preservation manager

b) If a GMU containing no archaeological sites is located within the boundaries of a TCP, the following documentation was placed in the GMU folder:

   1) A partially completed HPF-01 form written up by the assessment team showing the name of the supervisor, the date of assessment, verification of the absence of historic properties in the grid unit, and the TCP box in the Historic Property Type section checked off

   2) An HPF-03 form with a statement of the location and significance of the Traditional Cultural Property, for example:

      > Even though there are no previously or newly recorded archaeological sites in the grid, this grid is within the boundary of a TRADITIONAL CULTURAL PROPERTY (a type of Historic Property). This area has been designated as the Pu`umo`iwi Traditional Cultural Property, which contains a major ancient adz quarry complex and is subject to the same considerations of protection as other Historic Properties. Any activities that have major impact to the land should take this into consideration. Personnel should be aware of any restrictions to activities that may apply to this traditional cultural property and should perform activities with awareness of preserving the natural features of the land.

c) If the GMU contains one or more historic properties, the folder will document this with the following:

   1) An HPF-01 form for the historic property or isolated find

   2) An HPF-02 form, containing significance assessment and recommended treatment, for each site in that falls within the GMU

   3) An HPF-03 form summarizing each site or isolated find located in that GMU with specific directions for mitigation particular to that GMU

   4) A topographic map of the GMU with the revised boundaries, as designated by the recording team, for each historic property within the grid unit

d) If the GMU contains one or more historic properties and is located within a TCP, that GMU folder contains all of the information in item c, with the TCP box checked on the HPF-01 form. The archaeological sites listed on the HPF-02 and HPF-03 forms are assessed as significant under criterion A to reflect the presence of the TCP.

This documentation is permanently associated with the GMU folder and will be delivered to the Navy at the close of the project.

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Section 3 Findings

A total of 304 archaeological features at 96 sites were recorded in the five work areas of Task Order 07. Of this total 49 sites and 232 features were previously recorded and 47 sites with a total of 63 component features are newly discovered. The remaining nine features were newly discovered at six of the previously defined and recorded site complexes (Table 3-1). Site and feature descriptions are provided in Appendix B. Traditional Cultural Properties are treated separately in the following section of this report.

Table 3-1. Summary of Feature Status

Status	Base Camp	K1 Road	Lua Makika	OB/OD	Seagull	Total
New	6	20	44	1	1	72
Previously Recorded	11	100	121			232
Total	17	120	165	1	1	304

The number of previously recorded sites and features anticipated to be relocated in each work area was estimated by overlaying the work area boundaries on the Ogden map. Two hundred sixty-seven previously recorded features at 52 sites had been placed on the Ogden map within the boundaries of the Task Order 07 work areas. Two hundred forty-six previously recorded features at 49 of the previously recorded sites were relocated during the Task Order 07 fieldwork. Table 3-2 lists the previously recorded sites and features not relocated in the Task Order 07 work areas, including the most likely reasons why they were not relocated.

Table 3-2. Previously Recorded Sites and Features not Relocated

Work Area	Site/Feature	Comments
Base Camp	131-C	Destroyed
	271	Possibly outside the work area
Lua Makika	104-N	Obscured by CERL revegetation
	393-G	Probably destroyed by tree-line windbreak
	386-B, C	Probably destroyed by *wiliwili* nursery
	402-B	Not recognized (does not fit site definition criteria)
	434	Outside the work area
	535	Not relocated; likely outside work area
	394-B	Probably destroyed by tree-line windbreak
	394-L	Probably obscured by revegetation
	400-E	Not relocated due to thick vegetation
	392-C	Not located where indicated on the NRHP site map
K-1 Road	196-AL	Could not be recognized
	195-T	Could not be recognized
	195-AB	A small quantity of cultural materials in thick grass did not meet site definition criteria
	195-BX	Possibly destroyed by tree-line windbreak
	195-BY	Destroyed by tree-line windbreak
	195-DK	Destroyed by tree-line windbreak

3.1 Feature Types

Formal site and feature type designations are based on certain physical characteristics and structural elements of a site. Twelve formal site/feature types were identified in the five Task Order 07 work areas, and the characteristics of each are defined below. The frequencies of each of these formal types in the work areas are summarized in Table 3-3.

Aircraft Wreckage: An area of wreckage remaining after an aircraft crash. The wreckage is primarily found on the surface, but can also be partially buried. Aircraft wreckage sites are found in the Lua Makika and OB/OD work areas (one in each area). The wreckage in the Lua Makika work area consists of only a few parts and fragments of debris scattered on the surface and a buried radial engine (Plate E-I). It has been identified as the remains of a Douglas Skyraider. The wreckage in the OB/OD area consists of a substantial quantity of parts and fuselage debris scattered on the surface and partially buried. The type of aircraft found in the OB/OD area has not yet been identified.

Scatter: An area of artifacts and other cultural materials distributed on the surface. These sites generally, but not always lack structural remains. Generally, scatters are found on the eroded hardpan surface as "erosionally lagged" deposits, meaning that the cultural items remain after the soil has been removed by erosion. Scatters may have hummocks of remnant soil within their boundaries, and these may contain the remains of fireplaces and/or intact cultural deposits. For this project, scatters are defined by the presence of at least six artifacts in an area of 2 sq. m, and the boundaries are determined as a line outside of which artifact density is less than one artifact per 2 sq. m. This definition could not be followed always when re-identifying sites that were recorded during the original SMI survey. As presented in Table 3-3, the vast majority of scatters was found in the Lua Makika and K-1 Road work areas (Plates E-II and E-III). The variation found within this feature type can be found in the Lua Makika and K-1 Road work area discussions (Sections 3.4.4 and 3.4.5).

Bunker: A military structure typically constructed of thick concrete and sometimes partially covered with earth. As presented in Table 3-3, all features of this type are found in the Base Camp work area and are of identical construction: 3.5 (L) x 2.5(W) x 2.7(H) m concrete buildings (Plate E-IV).

C Shape: A semi-circular-shaped walled structure that partially encloses an area. Walls are constructed of basalt cobbles or boulders stacked more than one course high. As presented in Table 3-3, all two of the C-shaped structures are found in the Base Camp work area. They are both constructed of stacked basalt cobbles and range from 3.4 to 4.3 m in length, from 2.5 to 1.0 m in width, and from 0.8 to 0.4 m in height (Plate E-V).

Cairn: A small structure constructed with stacked or piled stones to create a generally conical or pillar-like structure. Cairn height is usually greater than either length or width. As presented in Table 3-3, the one cairn is found in the K-1 Road work area.

Complex: A site with multiple features, usually of multiple types. As presented in Table 3-3, two site complexes are found in the Lua Makika work area and one in the Base Camp work area. The complexes in the Lua Makika work area are sites with structural remains and significant artifact scatters (Plate E-VI). The complex in the Base Camp work area consists of four small structures.

Enclosure: A walled structure that completely encloses an area, except for entrances. Walls are constructed of basalt cobbles or boulders stacked more than one course high. As presented in Table 3-3, all three enclosures are found in the Base Camp work area. They are all constructed of stacked basalt cobbles and range from 10 to 28 m in length, from 9 to 20 m in width, and from 0.0 to 0.4 m in height (Plate E-VII).

Fence: A series of posts with attached wire that creates a barrier. As presented in Table 3-3, two of the fences are located in the K-1 Road work area, and one in the Lua Makika work area (Plate E-VIII). The fence posts are exclusively made of milled lumber, and the wire (when identifiable) is "hogwire." These long fences most likely extend beyond the boundaries of the work areas and into adjacent work areas.

Modified Outcrop: A natural bedrock outcrop that has been altered by the placement or removal of stones. As presented in Table 3-3, the only feature of this type was found in the Base Camp work area.

Platform: A freestanding structure that is raised above the surrounding ground surface on all sides. Platforms may be earth or stone filled, but all are surrounded by stone retaining walls. As presented in Table 3-3, the only feature of this type was found in the Base Camp work area (Plate E-IX).

Terrace: A terrace is a raised structure, similar to a platform, except at least one of its sides is flush with the adjacent ground surface. As presented in Table 3-3, the only feature of this type was found in the Base Camp work area.

Traditional Cultural Property (TCP): A traditional cultural property "can be defined generally as one that is eligible for inclusion in the National Register of Historic Places because of its association with cultural practices or beliefs of a living community that (a) are rooted in the community's history, and (b) are important in maintaining the continuing cultural identity of the community" (National Register Bulletin No. 38). Within the Task Order 07 work areas, three TCP have been identified by the Kaho`olawe Island Reserve Commission: Kealaikahiki, Site 773; Pu`umo`iwi, Site 772; and Moa`ulanui, Site 771.

Table 3-3. Frequency of Site and Feature Type.

Site Type	Base Camp	K1 Road	Lua Makika	OB/OD	Seagull	Total
Scatter	5	117	161		1	284
Aircraft Wreckage			1	1		2
Bunker	3					3
C Shape	2					2
Cairn		1				1
Complex	1		2			3
Enclosure	3					3
Fence		2	1			3
Modified Outcrop	1					1
Platform	1					1
Terrace	1					1
Total	17	120	165	1	1	304

3.2 Feature Functions

Functional interpretations of archaeological sites and features are based on the types of architectural and portable remains found at the site or feature. The 304 features encountered in the five Task Order 07 work areas have been assigned provisional functional designations, based on the information gathered during survey recording. The ten functional types that have been assigned to the T.O. 7 features are listed below describing the criteria used to determine the functional designation. Table 3-4 summarizes the frequencies of the functional site types for each of the T.O. 7 work areas.

Activity Area: A place where one or more activities were carried out. Scatters not associated with habitation-related architectural remains are generally interpreted to be the result of some special-purpose activity and are referred to as activity areas. Sites and features assigned the activity area function were found in all work areas except OB/OD (see Table 6-4), though the vast majority were found in the Lua Makika and K-1 Road work areas. The most common and most abundant portable remains found at these sites and features are volcanic glass and basalt flakes, suggesting that the manufacture and/or maintenance of stone tools was the main activity conducted at the activity areas. Evidence of food preparation or consumption is directly indicated by marine shell remains found at the activity area features. The quantity of marine shell remains found is generally limited to only a few fragments or whole specimens, suggesting that the duration of occupation of these features was very short, or that shellfish were only a small part of the inhabitants' diet. The variation found within this functional type can be found in the Lua Makika and K-1 Road work area discussions (Sections 3.4.4 and 3.4.5).

Aircraft Crash: A site defined by the presence of aircraft wreckage. Aircraft crash sites are found in the Lua Makika and OB/OD work areas (one in each area). The crash sites have been discussed in Section 3.1.

Animal Husbandry: Typically fences, walls, or corrals that were constructed to assist in the control of domesticated herd animals. Three sites have been assigned the animal husbandry function, and all three are wooden post and hogwire fences. Presumably, these fences (one in the Lua Makika work area and two in the OB/OD work area) were constructed to control the movements of cattle, sheep, and/or goats that were raised during the time when Kaho`olawe was used primarily for ranching.

Ceremonial: Sites are assigned a ceremonial function if there is evidence that some type of religious or ritual performance was conducted at the site. Evidence of religious activities can be architectural, including large well-constructed platforms and terraces that functioned as *heiau*. Religious structures also can be smaller shrines, such as *ko`a* or *`aumakua*. Other evidence of religious activities can be the portable remains that were often included as part of the offerings to shrines, such as, coral in quantities not generally associated with other activities such as craft production. Only one feature, Site 270 in the Base Camp work area, was interpreted to function primarily as a ceremonial site. It is a platform of waterworn cobbles and coral built in front of a large boulder with a natural depression. Four other features (two in the Base Camp work area and two in the Lua Makika work area) are habitations or activity areas that have sufficient quantities of branch coral to suggest that some sort of ceremonial activity was performed at those features.

Habitation: A site or feature that was utilized for either short- or long-term living. Structural or architectural evidence of habitation usually consists of platforms, enclosures, or terraces that are large enough to accommodate a walled and roofed structure. In the absence of structural remains, habitation can be inferred from portable remains that provide evidence of the preparation and consumption of food and that indicate an extensive range of activities were conducted at the site. Seventeen features (four in the Base Camp work area, two in the K-1 Road work area, and 11 in the Lua Makika work area) have been assigned the habitation function. All seventeen of these features have been assigned multiple functions (e.g., activity area, quarry, and ceremonial) in addition to habitation. Some of these features have been assigned the habitation function based on the presence of abundant portable remains that indicate an extensive variety of activities were conducted there. The assemblage recorded at Site 732 (including a relatively high quantity of awls and engraving tools, in addition to abraders, hammerstones, cores, adz preforms, one scraper, one *`ulu maika*, and one cowry shell lure) indicates an extensive variety of activities were conducted at the site, including stone tool manufacture and/or maintenance, woodworking or other craft production, and possibly leisure activities, such as *maika*. Other sites (101 and 149) have abundant quantities and varieties of material remains, as well as structural remains from which the habitation function can be inferred.

Indeterminate: This category is used when structural or portable remains do not indicate the function of a site or feature clearly. Only five sites or features were assigned the indeterminate function (three in the Base Camp work area, one in the K-1 Road work area, and one in the Lua Makika work area). Feature types for which the function could not be readily inferred include two enclosures, one modified outcrop, and two scatters.

Marker: Sites or features constructed to mark the location of a boundary or trail. One cairn that was found in the K-1 Road work area was assigned the marker function.

Shelter: A site or feature utilized for a very short time. Site 710, in the Base Camp work area, is the only site assigned the shelter function. Site 710 is a complex of four small enclosures constructed on a bluff overlooking Hanakanai`a Bay. They are not associated with any portable remains on the surface. These structures may have served as informal shelters associated with some activities conducted near the shore.

Storage: A structure constructed to store something. Three concrete bunkers found in the Base Camp work area are assigned the storage function (Site 712 Features A, B, and C). These bunkers were manufactured during World War II, and all are inscribed in the concrete with the date "1942."

Quarry: A source of lithic material that has been mined for tool manufacture. Three features of Site 108 in the K-1 Road work area have been assigned exclusively the quarry function, and one multi-function site (732) in the Lua Makika work area has been assigned the quarry function as one of its functions. The features of Site 108 are part of the P`umo`iwi adz quarry complex and are scatters of lithic debris resulting from the initial reduction of nodules of the tool-quality basalt that is found there. Site 732 was assigned the quarry function because there are some boulders of fine-grained basalt that have had several large flakes removed. These boulders seem to occur naturally in the site area, and one of the activities conducted at this site appears to be mining the tool-quality basalt at or near this site.

Table 3-4. Frequency of Site and Feature Function.

Site Function	Base Camp	K1 Road	Lua Makika	OB/OD	Seagull	Total
Activity Area	4	111	150		1	266
Activity Area, Ceremonial	1		1			2
Aircraft Crash			1	1		2
Animal Husbandry		2	1			3
Ceremonial	1					1
Habitation, Activity Area	3	2	9			14
Habitation, Activity Area, Ceremonial	1		1			2
Habitation, Quarry, Activity Area			1			1
Indeterminate	3	1	1			5
Marker		1				1
Shelter	1					1
Storage	3					3
Quarry		3				3
Total	17	120	165	1	1	304

3.3 Feature Age Determination

The probable age of each site or feature is based on the types of architectural and portable remains found at the site or feature. The 304 features encountered in the five Task Order 07 work areas have been assigned provisional age determinations, based on the information gathered during survey recording (Table 3-5).

Table 3-5. Frequency of Feature Probable Age.

Probable Age	Base Camp	K1 Road	Lua Makika	OB/OD	Seagull	Total
Prehistoric	13	117	162		1	293
Historic	3	3	3	1		10
Indeterminate	1					1
Total	17	120	165	1	1	304

3.4 Work Areas

Historic Properties were found in all five of the TO 07 work areas, though the majority are located in the Lua Makika work area (see Table 3-6). Essentially, the work areas are in different parts of Kaho`olawe and therefore are samples of different settlement zones of the island (cf. Hommon 1980:47-52). The exception is the K-1 Road work area that resembles a curvilinear transect through the central portion of the island that extends from Moa`ulanui to Honokanai`a (Base Camp) (see Figure 3-2). Because the work areas are so different, the findings from each will be discussed separately.

3.4.1 Base Camp

Eleven sites with seventeen component features were recorded in the Base Camp work area (Figure 3-1), all of which are in the Coastal Settlement Zone (cf. Hommon 1980:47-52). In the Base Camp work area 13 of the estimated 15 previously recorded sites and features were relocated (see Table 3-2). Thirteen of the 17 features are tentatively identified as prehistoric, three are historic, and one is of indeterminate age. Historic features consist of three concrete bunkers constructed during World War II that likely served as storage facilities.

Of the 13 prehistoric features, eight are structures consisting of C-shape shelters, enclosures, a terrace, and one platform. The remaining five prehistoric features are scatters or complexes of subsurface deposits and surface scatters.

Function could be inferred for 11 of the 13 features considered to be of prehistoric origin. Most of the structures are interpreted to be associated with temporary habitation or ceremonial functions, based on the criteria discussed in a previous section. Site 270 is the only feature interpreted to have an exclusively ceremonial function. It is a platform with abundant coral remains and elongate cobbles that presumably were placed upright as elements of the shrine. The surface artifact scatters and subsurface deposits not associated with architectural remains are interpreted to be activity areas.

3.4.2 Seagull

Only one historic property was located and recorded, and it is a low-density scatter (Figure 3-2). A number of single wall shelters and excavations associated with military training exercises were noted, but they were not treated as historic properties. This area of Seagull obviously was not highly utilized by prehistoric Hawaiians.

3.4.3 OB/OD

Only one historic property and two isolated finds were found in this Intermediate Settlement Zone work area (Figure 3-3). One of the isolated finds is a basalt core and the other is a piece of aircraft wreckage. The historic property is a scatter of wreckage from an aircraft crash. This site has not yet been assigned a SIHP number pending identification of the aircraft or the acquisition of Kaho`olawe Island crash records; either of which will assist in the age determination of the crash. Knowing the age of the crash will determine its status as a historic property.

3.4.4 K-1 Road

Thirty-one sites with 120 component features were recorded in the K-1 Road work area (Figure 3-4; Figure 3-5; Figure 3-6; Figure 3-7). In the K-1 Road work area, 91 of the estimated 100 previously recorded sites and features were relocated (see Table 3-2). Artifact scatters by far comprise the majority of the 120 features, with a total of 117. The remaining three consist of two fence lines and one cairn. In addition, thirty-two isolated finds were recorded (see Tables C-4 and C-5). Only nine of the sites are found in the Intermediate Settlement Zone (approximately 12 – 325 m amsl elevation), with the other 111 located in the Inland Settlement Zone (approximately 325 to 375 m amsl elevation).

Two of the historic properties in the Intermediate Settlement Zone are fence lines (Sites 754 and 755), believed to have been built during the ranching period on Kaho`olawe Island. Another three are features of Site 108 (Features C, D, and H) that is the tool-quality basalt quarry of Pu`umo`iwi. The remaining features consist of three artifact scatters and one military cairn.

The 111 features in the Inland Settlement Zone are exclusively artifact scatter activity areas. The artifact scatters are found on the eroded hardpan surface as erosionally lagged deposits. Many of the artifact scatters in the K-1 Road work area have hummocks of remnant soil within their boundaries, some of which contain the remains of fireplaces and/or intact cultural deposits. For example, Feature A of Site 111 has three soil hummocks within its boundaries, one of which contains the remains of a firepit.

The artifact scatters range in size from 24 to 22,272 sq. m, with an average of 1,558 sq. m, and a median size of 812 sq. m. Most of the artifact scatters (n=87; 78%), have low-density concentrations of cultural materials meaning, that they have an average of less than one artifact per square meter. Only four (4%) of the scatters are high-density (more than three artifacts per square meter), and 20 (18%) are medium-density (one to three artifacts per square meter).

Portable remains found at the artifact scatters typically include fractured basalt, basalt and volcanic glass debitage and cores, marine midden, coral fragments, and various cores, tools, and tool fragments that were mapped and recorded. Eighty-five of the 111 artifact scatter features (77%) have at least one recorded core or tool/tool fragment. The highest number of artifacts recorded at any feature in the K-1 Road work area is 46 (Site 614, Feature H). The average number of artifacts recorded at each feature that has at least one is five, and the median number is three.

Function could be inferred for 116 of the 117 prehistoric sites and features recorded in the K-1 Road work area, all of which are artifact scatters. One hundred eleven of the artifact scatters are interpreted to be activity areas, meaning that the material remains indicate that one or more activities were performed at the site, but no additional information is available to suggest that the site was utilized for habitation. Three features (Site 108 Features C, D, and H) are part of the Pu`umo`iwi basalt quarry complex. The other 2 artifact scatters have multiple functions, and are inferred to be habitation and activity areas.

3.4.5 Lua Makika

The greatest number of historic properties (165 out of 303) was found in the Lua Makika work area in the Inland Settlement Zone (Figure 3-7). In the Lua Makika work area, 142 of the estimated 151 previously recorded sites and features were relocated (see Table 3-2). Of the 165 recorded features, 161 are artifact scatters, two are complexes consisting of an artifact scatter with a structural remains, and the others are a fence and an aircraft crash. In addition, thirty-six isolated finds were recorded (see Table C-2).

The 161 artifact scatters, primarily interpreted to be activity areas, are found on the eroded hardpan surface as erosionally lagged deposits. Many of the artifact scatters in the Lua Makika work area, particularly around the crater rim have hummocks of remnant soil within their boundaries. Frequently, the scatters of cultural materials are found around the perimeters of these eroding hummocks, suggesting that they may contain intact cultural deposits. The remains of fireplaces and intact cultural deposits were identified in the exposed faces of some of the hummocks. For example, Feature L of Site 715 has four soil hummocks within its boundaries, three of which contain the remains of five firepits.

The artifact scatters range in size from 24 to 34,500 sq. m, with an average of 3,221 sq. m, and a median size of 1520 sq. m. The majority of the artifact scatters (n=98; 59%) have low-density concentrations of cultural materials, meaning that they have an average of less than one artifact per square meter. Only 24 (15%) of the scatters are high-density (more than three artifacts per square meter), and 43 (26%) are medium-density (1-3 artifacts per square meter).

Portable remains found at the artifact scatters typically include fractured basalt, basalt and volcanic glass debitage and cores, marine midden, coral fragments, and various cores, tools, and tool fragments that were mapped and recorded. Of the 165 artifact scatter features, 125 (76%) have at least one recorded core or tool/tool fragment. The highest number of artifacts recorded at any feature in the Lua Makika work area is 58 (Site 161). The average number of artifacts recorded at each feature that has at least one is about six, and the median number is four.

Function could be inferred for the161 artifact scatters, all of which are considered to be of prehistoric origin. One hundred fifty of the artifact scatters are interpreted to be activity areas, meaning that the material remains indicate that one or more activities were performed at the site, but no additional information is available to suggest that the site was utilized for habitation. The other 11 activity areas have multiple functions, nine of which are inferred to be habitation and activity areas. One site (732) is interpreted to be a quarry in addition to a habitation and activity area. Site 101 is interpreted to be a habitation with additional ceremonial and activity area functions, and Site 473 is interpreted to be an activity area with a ceremonial function.

Table 3-6. Summary of Sites and Features

★SIHP Number	Feature*	Field Number	Setting	Feature Type	Feature Function	Material Quantity	Material Density †	Probable Age ‡	Subsurface Deposits	Work Area
101	-	75272757-1	Inland	Complex	Habitation, Activity Area, Ceremonial	> 100	High	PH	Observed	LM
102	-	75312756-1	Inland	Scatter	Habitation, Activity Area	> 100	Medium	PH	Observed	LM
103	A	75242752-3	Inland	Scatter	Activity Area	> 100	High	PH	Observed	K1
	B	75252751-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Observed	K1
	C	75252752-1	Inland	Scatter	Activity Area	> 100	High	PH	Potential	K1
	D	75252752-2	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	K1
	E	75252752-3	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	F	75252752-4	Inland	Scatter	Activity Area	< 10	Low	PH	No Potential	K1
104	A	75292750-2	Inland	Scatter	Habitation, Activity Area	> 100	High	PH	Observed	LM
	B	75282750-2	Inland	Scatter	Habitation, Activity Area	> 100	High	PH	Observed	LM
	C	75292750-3	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
	D	75292750-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
	E	75292749-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
	F	75282749-3	Inland	Scatter	Activity Area	> 100	High	PH	Potential	LM
	G	75282750-3	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
	H	75282750-1	Inland	Scatter	Activity Area	> 100	High	PH	Potential	LM
	I	75282751-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	J	75282751-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	K	75292751-1	Inland	Scatter	Activity Area	11-100	Medium	PH	Potential	LM
	L	75292751-2	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
	M	75302751-1	Inland	Scatter	Activity Area	> 100	High	PH	Potential	LM
108	C	75012734-2	Intermediate	Scatter	Quarry	> 100	High	PH	Observed	K1
	D	75012734-1	Intermediate	Scatter	Quarry	> 100	High	PH	Observed	K1
	H	75002732-1	Intermediate	Scatter	Quarry	> 100	High	PH	Observed	K1
111	A	75132737-1	Inland	Scatter	Habitation, Activity Area	> 100	High	PH	Observed	K1
	C	75142737-2	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	L	75182740-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	N	75152739-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	O	75152739-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	P	75152739-3	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	U*	75132736-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	K1
131	A	74172697-1	Coastal	Scatter	Activity Area	11-100	Low	PH	Potential	BC
	B	74182697-1	Coastal	Enclosure	Activity Area, Ceremonial	< 10	Low	PH	Observed	BC
	D, F	74172699-1	Coastal	Scatter	Activity Area	< 10	Low	PH	Observed	BC
	E	74182697-2	Coastal	Scatter	Activity Area	11-100	Low	PH	Potential	BC
	G*	74182698-1	Coastal	Scatter	Activity Area	11-100	Low	PH	Observed	BC
133	A	75252759-1	Inland	Scatter	Activity Area	> 100	Low	PH	No Potential	LM
	B*	75262759-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	LM
144	-	75392752-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	LM
149	A	75352747-1	Inland	Scatter	Habitation, Activity Area	> 100	High	PH	Observed	LM
	B	75352746-2	Inland	Scatter	Habitation, Activity Area	> 100	High	PH	Observed	LM

★SIHP Number	Feature*	Field Number	Setting	Feature Type	Feature Function	Material Quantity	Material Density †	Probable Age ‡	Subsurface Deposits	Work Area
	C	75342746-1	Inland	Scatter	Habitation, Activity Area	> 100	Medium	PH	Observed	LM
150	A	75312751-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
	B	75332750-1	Inland	Scatter	Activity Area	> 100	High	PH	Observed	LM
	C	75332750-2	Inland	Scatter	Activity Area	> 100	High	PH	Observed	LM
	D	75342749-1	Inland	Complex	Habitation, Activity Area	> 100	High	PH	Observed	LM
	E	75382751-1	Inland	Scatter	Activity Area	> 100	Medium	PH	No Potential	LM
	F	75382753-1	Inland	Scatter	Activity Area	> 100	High	PH	No Potential	LM
	G	75372754-1	Inland	Scatter	Activity Area	> 100	High	PH	Potential	LM
	H	75362756-3	Inland	Scatter	Activity Area	> 100	High	PH	Potential	LM
	I	75352756-1	Inland	Scatter	Activity Area	> 100	Low	PH	Observed	LM
	J	75332756-2	Inland	Scatter	Activity Area	> 100	Low	PH	No Potential	LM
	K	75312755-2	Inland	Scatter	Activity Area	> 100	Low	PH	Observed	LM
	L	75312755-1	Inland	Scatter	Activity Area	> 100	Low	PH	Observed	LM
	M	75302754-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
	N	75312754-1	Inland	Scatter	Activity Area	> 100	Medium	PH	No Potential	LM
	O	75302753-2	Inland	Scatter	Activity Area	> 100	Low	PH	Observed	LM
	P	75312754-2	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
	Q	75332753-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	R	75312754-5	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	S	75332754-1	Inland	Scatter	Activity Area	< 10	Low	PH	Potential	LM
	T	75322755-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	U	75372750-1	Inland	Scatter	Activity Area	> 100	High	PH	Observed	LM
161	-	75322746-1	Inland	Scatter	Habitation, Activity Area	> 100	Low	PH	Observed	LM
195	O	75222751-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	P	75222751-3	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	Q	75222750-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	R	75222750-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	S	75222751-4	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	K1
	AA	75212749-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	AC	75212749-3	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	BK	75222749-5	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	K1
	BM	75192746-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	BN	75192746-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	BO	75202746-3	Inland	Scatter	Activity Area	11-100	Medium	PH	Potential	K1
	BP	75202746-2	Inland	Scatter	Activity Area	11-100	Medium	PH	No Potential	K1
	BQ	75192747-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	BR	75192747-2	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	K1
	BS	75202747-3	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	K1
	BT	75202747-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	BZ	75222750-3	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	CA	75232751-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	CB	75232751-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	DI	75192745-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	DJ	75182744-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	DL	75192745-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	DN*	75212749-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	DO*	75212750-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1

★SIHP Number	Feature*	Field Number	Setting	Feature Type	Feature Function	Material Quantity	Material Density †	Probable Age ‡	Subsurface Deposits	Work Area
196	A	75182744-2	Inland	Scatter	Activity Area	< 10	Low	PH	Potential	K1
	B	75182743-1	Inland	Scatter	Activity Area	< 10	Low	PH	Potential	K1
	C	75182743-2	Inland	Scatter	Activity Area	< 10	Low	PH	Potential	K1
	D, E, F	75182743-3	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	G	75172743-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Observed	K1
	S	75182742-1	Inland	Scatter	Activity Area	< 10	Low	PH	No Potential	K1
	T	75172743-2	Inland	Scatter	Activity Area	< 10	Low	PH	No Potential	K1
	U	75172742-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	V	75162743-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	K1
	W	75162741-2	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	K1
	X	75162741-1	Inland	Scatter	Activity Area	> 100	High	PH	Observed	K1
	Y	75162742-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	K1
	Z	75152740-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	K1
	AA, AB	75142740-3	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	AD	75152740-2	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	K1
	AF	75142740-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	AG	75142740-1	Inland	Scatter	Activity Area	11-100	Medium	PH	Potential	K1
	AH	75142739-1	Inland	Scatter	Activity Area	11-100	Medium	PH	Potential	K1
	AI	75132739-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	K1
	AK	75122738-1	Inland	Scatter	Activity Area	< 10	Low	PH	Potential	K1
204	-	75062735-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	K1
205	E	75042734-1	Inland	Scatter	Activity Area	< 10	Low	PH	Potential	K1
	F	75032734-1	Inland	Scatter	Activity Area	11-100	Medium	PH	Observed	K1
	G	75032733-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	H	75032734-2	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	K1
214	A	75112737-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Observed	K1
	B	75112736-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	K1
	C	75102737-2	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	K1
	D*	75102737-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	K1
248	A	75122735-1	Inland	Scatter	Activity Area	> 100	Low	PH	No Potential	K1
	B	75122735-2	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
265	-	74192699-1	Coastal	Scatter	Indeterminate	< 10	Low	PH	Potential	BC
266	-	74182700-1	Coastal	Enclosure	Indeterminate	< 10	Low	PH	Potential	BC
267	B	74152702-2	Coastal	Enclosure	Indeterminate	< 10	Low	PH	Potential	BC
268	A	74152702-1	Coastal	C shape	Habitation, Activity Area	< 10	Low	PH	Potential	BC
	B	74152702-3	Coastal	Terrace	Habitation, Activity Area	< 10	Low	PH	Potential	BC
	C	74152702-4	Coastal	C shape	Habitation, Activity Area	< 10	Low	PH	Potential	BC
270	-	74142703-1	Inland	Platform	Ceremonial	< 10	Low	PH	Potential	BC
281	-	74392706-1	Intermediate	Cairn	Marker	< 10	Low	H	Potential	K1
381	-	75332749-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
382	-	75322750-2	Inland	Scatter	Activity Area	> 100	Low	PH	Observed	LM
385	A	75242753-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	B	75232752-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	K1
	C	75242752-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	D	75242752-4	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	E	75242753-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	F	75242754-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1

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	O	75242754-2	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	P	75232753-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
386	-	75272755-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
387	-	75262756-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	LM
388	A	75252753-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	B	75262753-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
	C	75262753-3	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
	D	75262753-2	Inland	Scatter	Activity Area	> 100	Low	PH	No Potential	LM
	E	75272753-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
	F	75272752-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	G	75272752-2	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
	H	75282753-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
	I	75282753-2	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
	J	75282752-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
	K	75282753-3	Inland	Scatter	Activity Area	> 100	High	PH	Potential	LM
	L	75292753-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
	M	75292753-2	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
	N	75302753-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
	O	75282753-4	Inland	Scatter	Activity Area	> 100	High	PH	Potential	LM
	P	75282754-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	Q	75272754-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	R	75292754-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	S	75302755-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
	T	75292755-1	Inland	Scatter	Habitation, Activity Area	> 100	Medium	PH	Observed	LM
389	A	75242749-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	B	75242749-2	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	C	75252748-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
390	A	75222749-2	Inland	Scatter	Activity Area	> 100	Medium	PH	Observed	K1
	B	75222748-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	C	75222747-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Observed	K1
391	A	75202746-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	B	75212747-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	C	75212748-1	Inland	Scatter	Activity Area	> 100	Low	PH	Observed	K1
	D	75202747-2	Inland	Scatter	Activity Area	> 100	Medium	PH	Observed	K1
392	B	75222746-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	D	75222746-2	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	E	75322746-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
393	A	75232747-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	B	75232747-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	D	75252747-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	E	75252748-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
394	A	75262749-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	C	75262750-1	Inland	Scatter	Activity Area	11-100	Medium	PH	Potential	LM
	D	75262751-3	Inland	Scatter	Activity Area	11-100	Medium	PH	Potential	LM
	E	75262751-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	LM
	F	75262751-4	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	LM
	G	75262751-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	H	75262752-1	Inland	Scatter	Activity Area	11-100	Medium	PH	Potential	LM
	J	75262751-5	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM

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	K	75272751-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	LM
	M	75272751-2	Inland	Scatter	Activity Area	11-100	Medium	PH	No Potential	LM
395	A	75252747-2	Inland	Scatter	Activity Area	<10	Low	PH	No Potential	LM
	B	75262747-1	Inland	Scatter	Activity Area	11-100	Medium	PH	Potential	LM
	C	75252747-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	D	75262746-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	LM
	E	75252746-1	Inland	Scatter	Activity Area	> 100	Medium	PH	No Potential	LM
	F	75252746-2	Inland	Scatter	Activity Area	> 100	High	PH	Potential	LM
397	A	75272748-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
	B	75282748-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
	C	75282749-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
	D	75272749-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
398	A,B	75272759-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	C	75272759-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
399	A	75282757-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	B	75292758-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	C,D	75312758-1	Inland	Scatter	Activity Area	> 100	Low	PH	No Potential	LM
	E	75302757-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Observed	LM
	F	75312759-1	Inland	Scatter	Activity Area	> 100	Low	PH	No Potential	LM
	G	75322757-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
400	A	75332758-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Observed	LM
	B	75342758-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
	C	75332757-1	Inland	Scatter	Activity Area	> 100	Medium	PH	No Potential	LM
	D	75332756-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
401	A	75342757-1	Inland	Scatter	Activity Area	11-100	Medium	PH	Potential	LM
	B	75342757-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	C	75352757-1	Inland	Scatter	Activity Area	> 100	High	PH	Potential	LM
	D	75362757-1	Inland	Scatter	Activity Area	11-100	Low	PH	Observed	LM
	E	75362756-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	F	75362756-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	G	75382756-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	LM
	H	75372755-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	I	75382755-3	Inland	Scatter	Activity Area	> 100	High	PH	No Potential	LM
	J	75382755-1	Inland	Scatter	Activity Area	11-100	High	PH	Potential	LM
	K	75382755-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	L	75362758-1	Inland	Scatter	Activity Area, Midden	11-100	Low	PH	Potential	LM
	M	75352758-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	N	75352759-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
402	A	75382757-1	Inland	Scatter	Activity Area	< 10	Low	PH	Observed	LM
403	A	75262757-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	B	75262758-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
413	-	75302759-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
416	A	75342759-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
473	-	75392758-1	Inland	Scatter	Activity Area, Ceremonial	> 100	High	PH	Observed	LM
534	-	75392759-1	Inland	Scatter	Activity Area	> 100	High	PH	Potential	LM
614	A, B	75172741-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	C	75182742-4	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	D	75182741-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1

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	E	75182742-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	F	75192743-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	G	75192743-2	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	H	75202745-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	K1
	I	75202744-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	K1
	J	75192742-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	AA*	75182742-3	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	AB*	75182741-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
	AC*	75172740-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
700	*	74662733-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	S
702	*	75252758-1	Inland	Fence	Ranch Wall	< 10	Low	H	No Potential	LM
703	*	75282759-1	Inland	Scatter	Indeterminate	11-100	Medium	H	No Potential	LM
704	*	75362758-3	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	LM
705	*	75352757-2	Inland	Scatter	Activity Area	11-100	Medium	PH	Potential	LM
707	*	75392757-1	Inland	Scatter	Activity Area	11-100	Medium	PH	Observed	LM
709	*	75392752-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
710	*	74122704-1	Coastal	Complex	Shelter	< 10	Low	PH	Potential	BC
712	A*	74142707-1	Coastal	Bunker	Storage	< 10	Low	H	No Potential	BC
	B*	74132707-1	Coastal	Bunker	Storage	< 10	Low	H	No Potential	BC
	C*	74132706-1	Coastal	Bunker	Storage	< 10	Low	H	No Potential	BC
714	*	74152707-1	Coastal	Modified Outcrop	Indeterminate	< 10	Low	I	No Potential	BC
715	A*	75312747-3	Inland	Scatter	Activity Area	> 100	Low	PH	No Potential	LM
	B*	75312747-2	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
	C*	75312747-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
	D*	75322747-2	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	E*	75312748-1	Inland	Scatter	Activity Area	> 100	Low	PH	Observed	LM
	F*	75322747-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	G*	75322748-1	Inland	Scatter	Activity Area	> 100	Low	PH	No Potential	LM
	H*	75332747-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	I*	75332748-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Observed	LM
	J*	75342748-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
	K*	75312749-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
	L*	75312750-1	Inland	Scatter	Activity Area, Habitation	> 100	High	PH	Observed	LM
716	*	75392747-2	Inland	Scatter	Activity Area	> 100	Low	PH	No Potential	LM
717	*	75392747-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	LM
718	*	75382749-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	LM
719	*	75372749-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
720	*	75372749-2	Inland	Scatter	Activity Area	11-100	Medium	PH	No Potential	LM
721	*	75382750-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
722	*	75362748-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Observed	LM
723	*	75362747-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
724	*	75362746-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	LM
725	*	75262758-2	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	LM
726	*	75322751-1	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
727	*	75332751-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
728	*	75322751-2	Inland	Scatter	Activity Area	> 100	Low	PH	Potential	LM
729	*	75302748-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
730	A*	75292747-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM

★SIHP Number	Feature*	Field Number	Setting	Feature Type	Feature Function	Material Quantity	Material Density †	Probable Age ‡	Subsurface Deposits	Work Area
	B*	75292746-3	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
	C*	75292746-2	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
	D*	75292746-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	LM
731	*	75302747-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
732	*	75302746-1	Inland	Scatter	Habitation, Activity Area, Quarry	> 100	Low	PH	Potential	LM
733	*	75392754-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	LM
734	*	75392756-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	LM
735	*	75322752-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
736	*	75342751-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	LM
737	*	75242752-2	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	K1
739	*	75362748-2	Inland	Aircraft Wreckage	Aircraft Crash	> 100	Low	H	Observed	LM
740	*	75242753-3	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
741	*	75252754-2	Inland	Scatter	Activity Area, Habitation	> 100	Medium	PH	Potential	K1
744	*	75242750-1	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
745	*	75232749-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	K1
746	*	75222749-4	Inland	Scatter	Activity Area	11-100	Low	PH	Potential	K1
747	*	75172741-2	Inland	Scatter	Activity Area	< 10	Low	PH	Potential	K1
752	*	74992731-1	Inland	Scatter	Activity Area	> 100	Medium	PH	Potential	K1
753	*	74512721-1	Inland	Scatter	Indeterminate	< 10	Low	PH	No Potential	K1
754	*	75002731-1	Inland	Fence	Animal Husbandry	< 10	Low	H	Observed	K1
755	*	74992725-1	Inland	Fence	Animal Husbandry	11-100	Low	H	Potential	K1
756	*	75042729-1	Inland	Scatter	Activity Area	< 10	Low	PH	Potential	K1
757	*	75022731-1	Inland	Scatter	Activity Area	11-100	Low	PH	No Potential	K1
815	*	74792720-1	Inland	Aircraft Wreckage	Aircraft Crash	> 100	Low	H	Observed	OB/OD

★ State Inventory of Historic Places (SIHP) numbers are five-digit numbers prefixed by 50-20-97.

* Newly discovered site/feature

† Material Density:

Low = Less than c. 1 item/m^2
Medium = c. 1-3 items/m^2
High = >c. 3/ m^2

‡ Probable Age:

PH = Prehistoric
H = Historic

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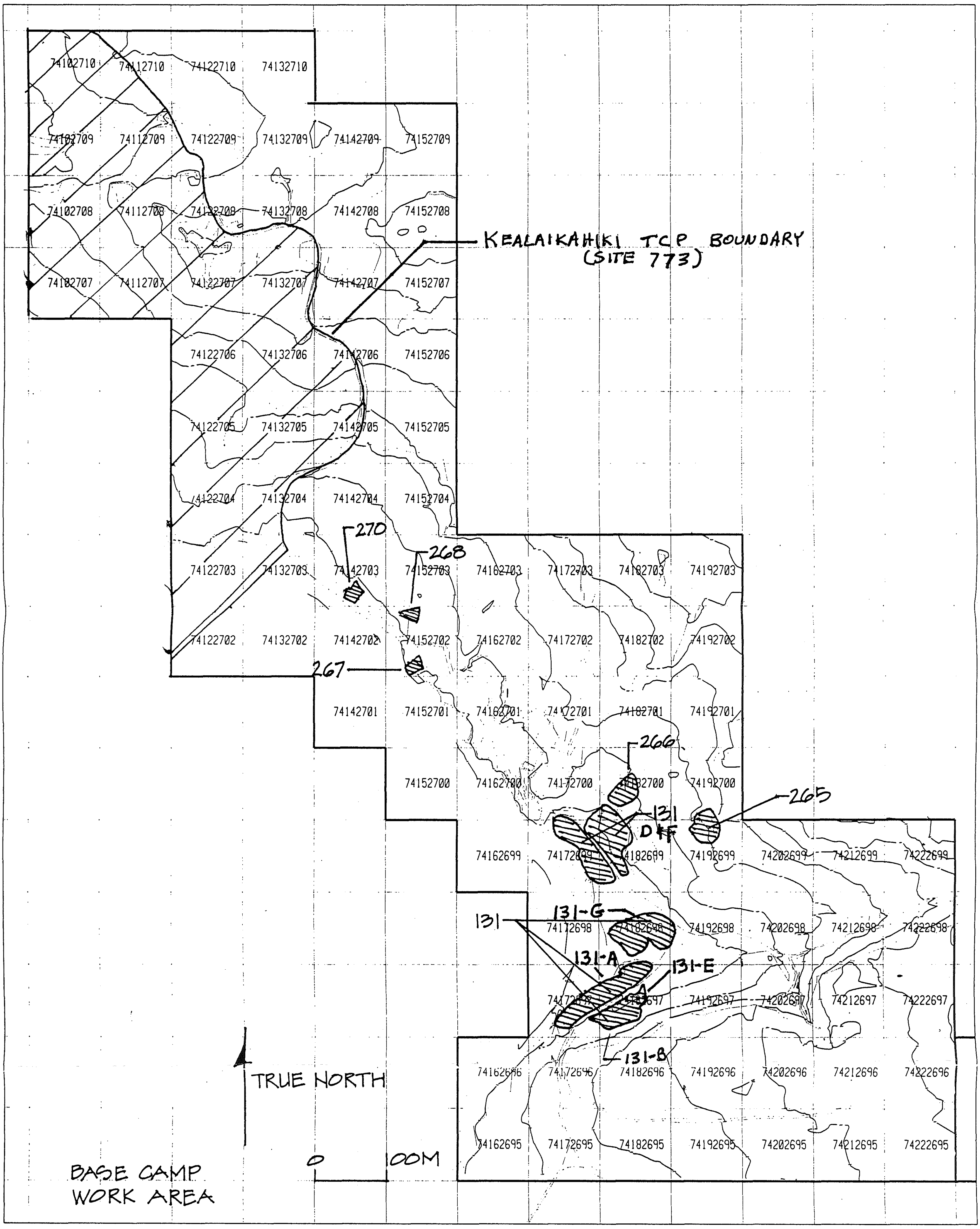

Figure 3-1. Base Camp Work Area Site Location Map

Figure 3-2. Seagull Work Area Site Location Map

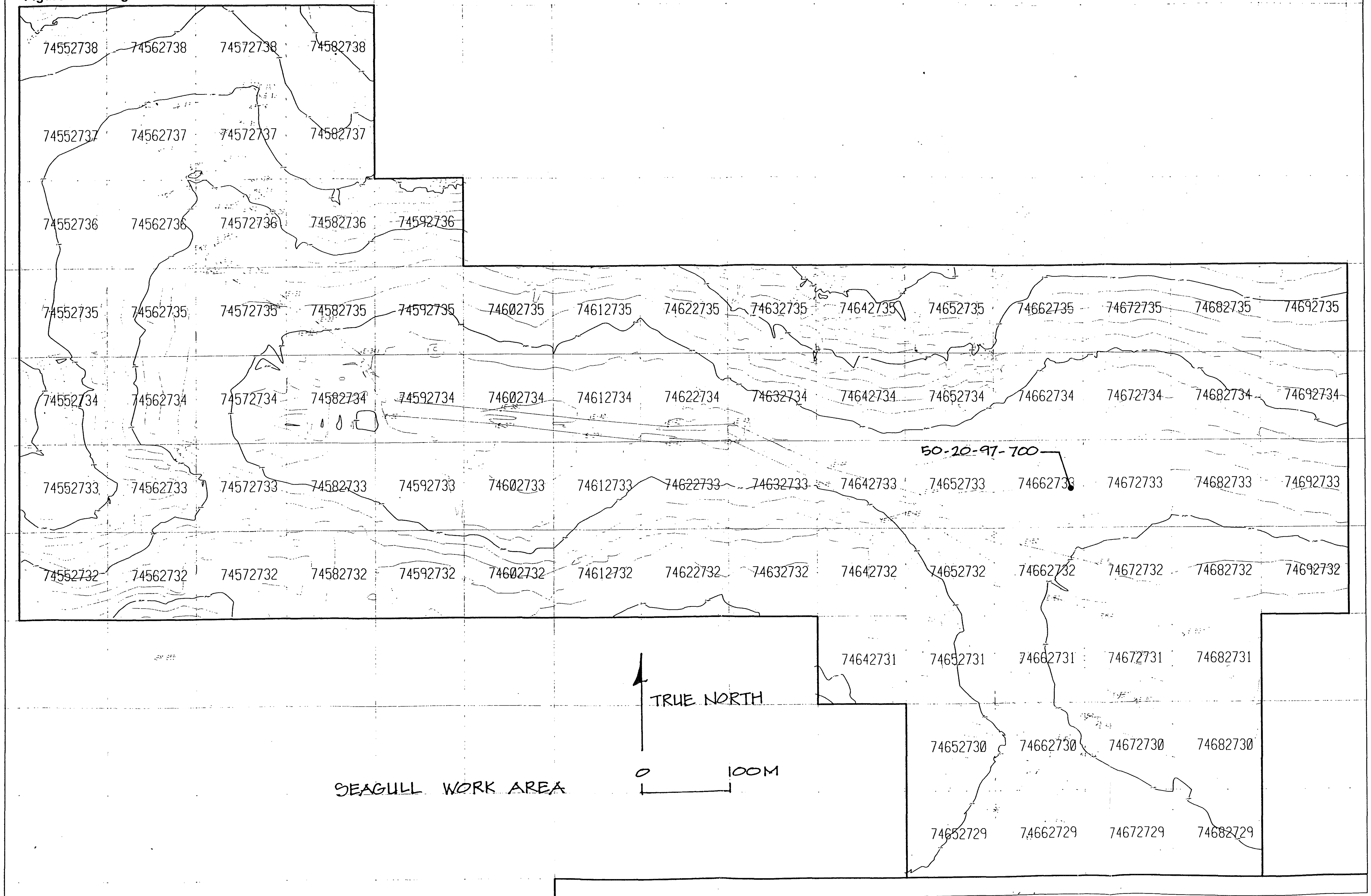

Figure 3-3. OB/OD Work Area Site Location Map

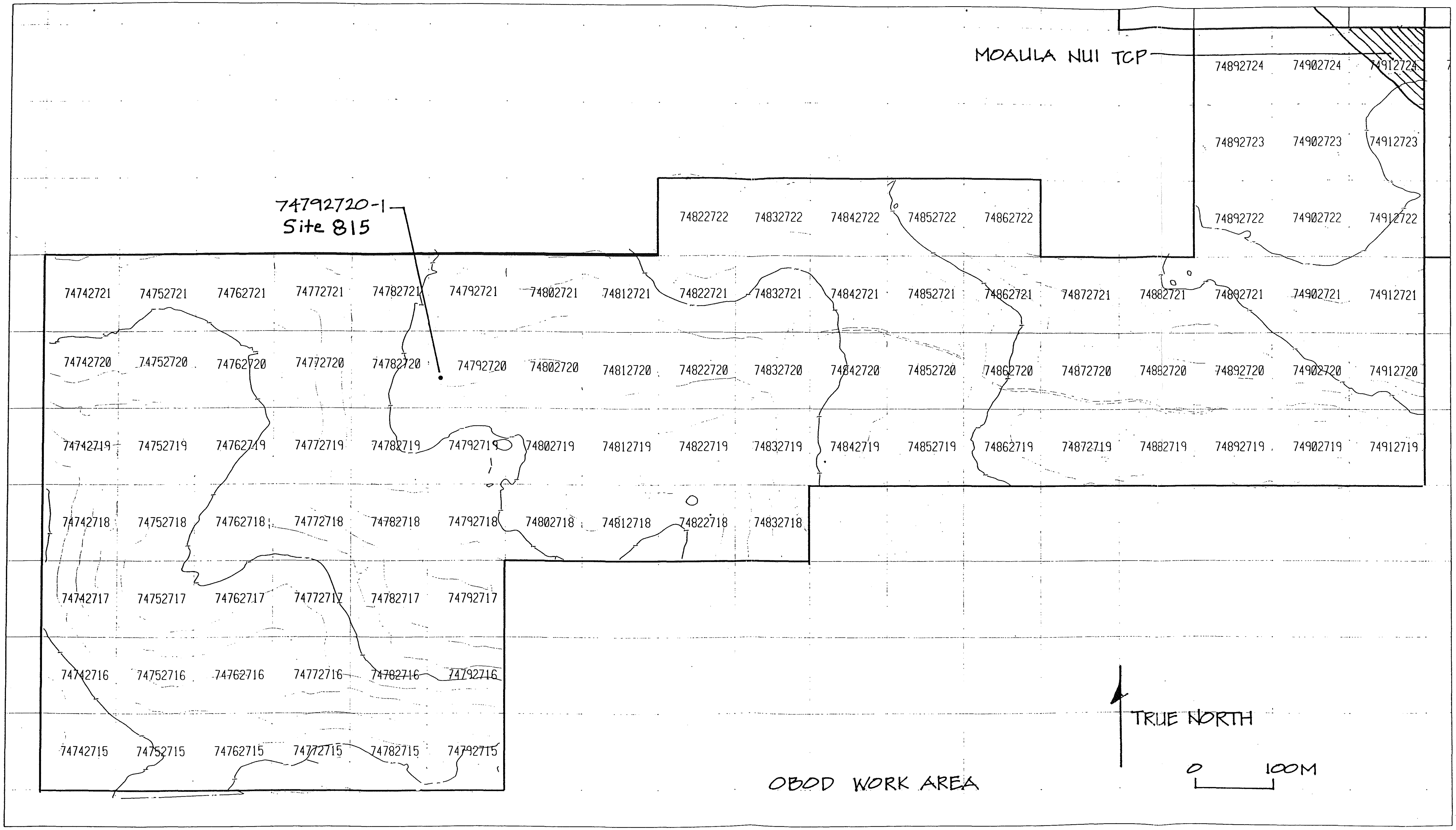

Figure 3-4. Lower K-1 Road Work Area Site Location Map

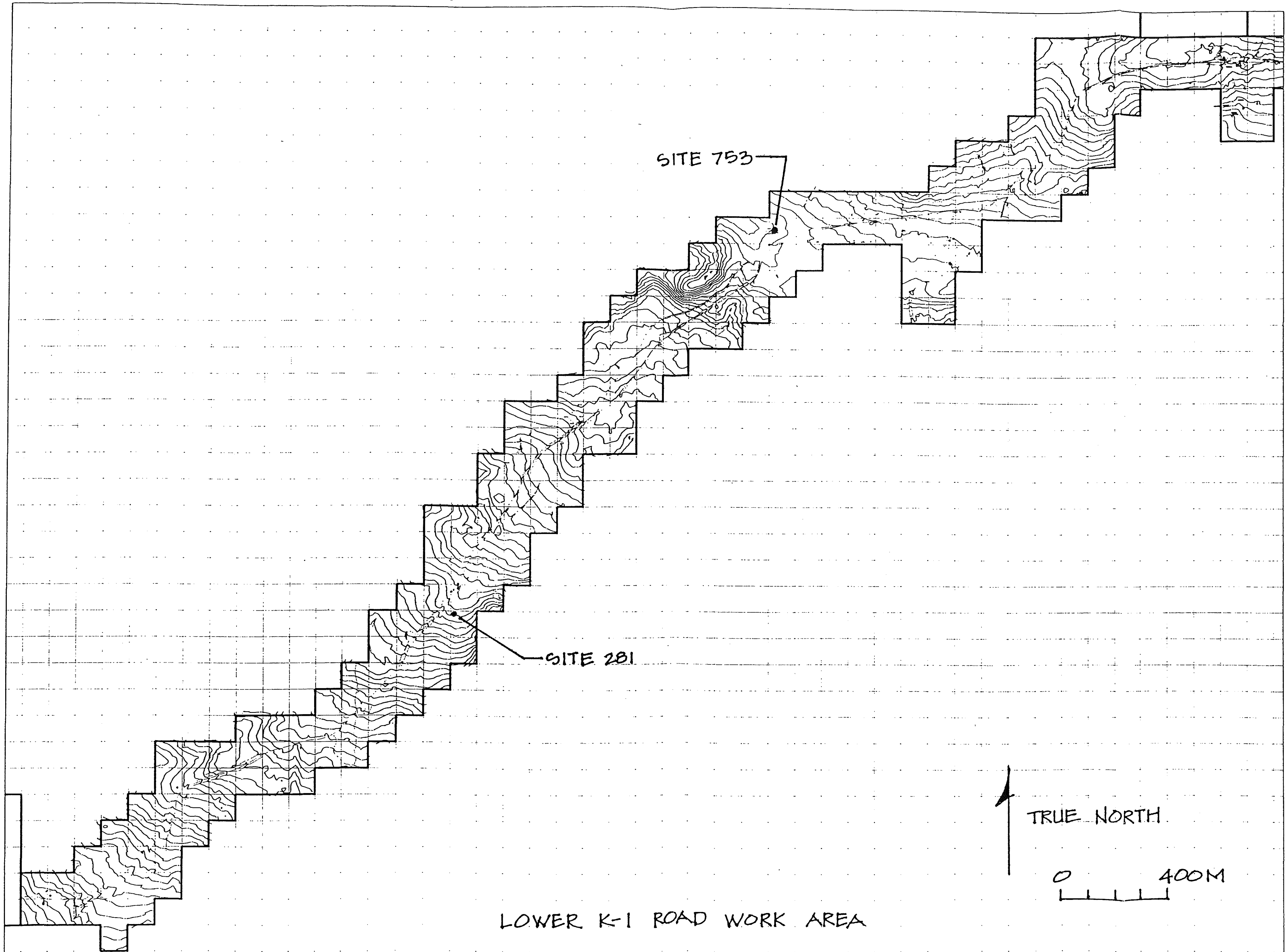

Figure 3-5. Middle K-1 Road Work Area Site Location Maps;

(a) from Easting 7498 to Easting 7507

(b) from Easting 7508 to Easting 7517

(c) from Easting 7514 to Easting 7522.

All three maps can be found at the end of the report.

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Figure 3-6. K-1 Bypass Road Work Area

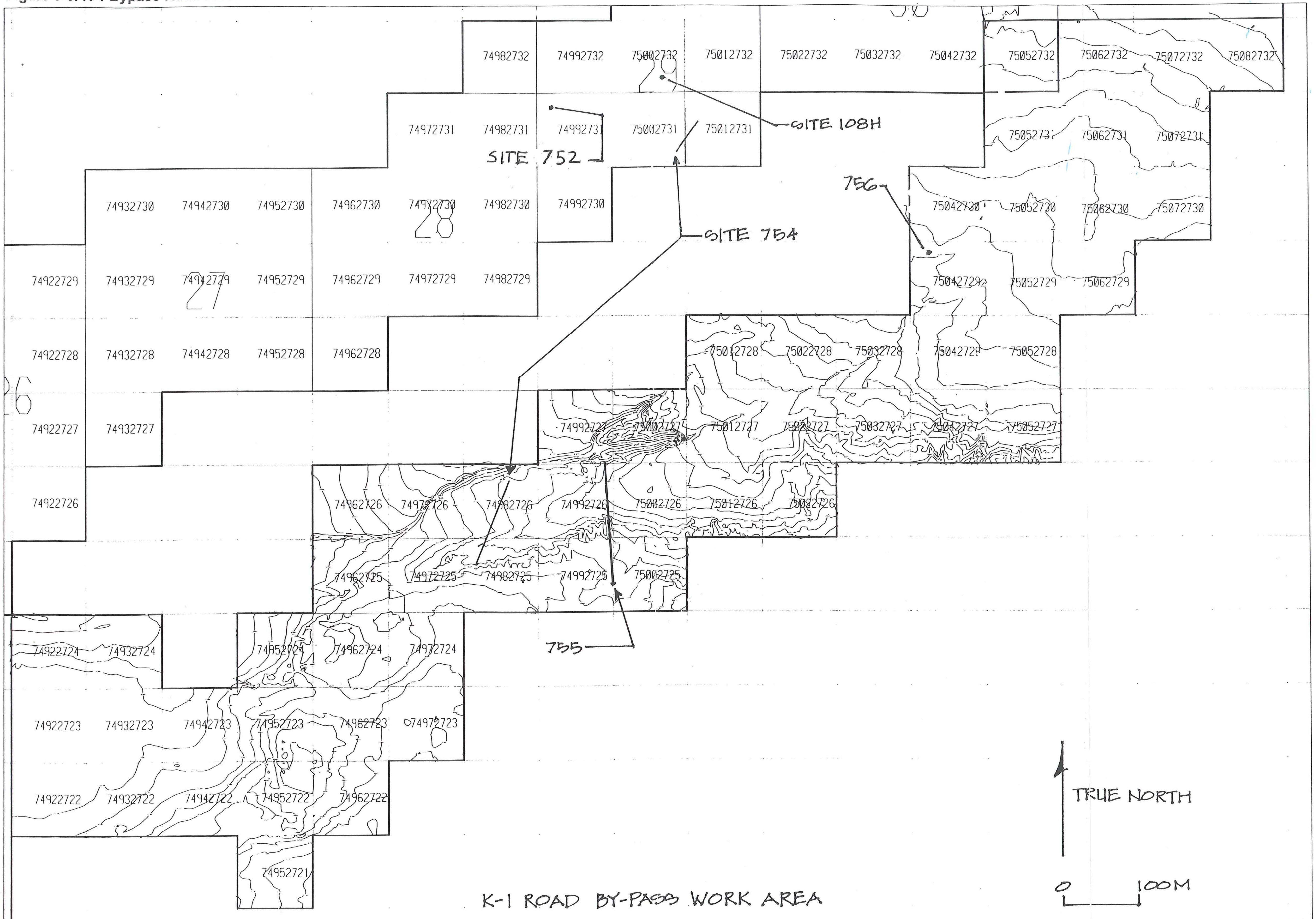


Figure 3-7. Upper K-1 Road and Lua Makika Work Areas Site Location Map.

This map can be found at the end of the Report

3.5 Task Order 07 Work Area Summary

As briefly mentioned before, the work areas sample the three major settlement zones of the island: Coastal, Intermediate, and Inland (cf. Hommon 1980:47-52). The exception is the K-1 Road work area that extends through the central portion of the island from the western portion of the Inland Settlement Zone at Moa`ulanui to the Coastal Zone at Honokanai`a (Base Camp) (Figure 1-2). Table 3.7 illustrates the differences in the density of historic properties found in the five work areas. The most remarkable aspect of this table is its illustration of the dramatic difference in site and feature density in the Lua Makika area (Hommon's Inland Settlement Zone) as measured by the ratio of features to hectares and in the total area covered by historic properties. On the other hand, it is easy to see that the Seagull and OB/OD work areas (Intermediate Settlement Zone) are virtually devoid of sites. This is also true of the portion of the K-1 Road work area that crosses the Intermediate zone, though there are a few more sites (Figure 3-2; Figure 3-3; Figure 3-4).

Table 3-7. Summary of Feature density in each Work Area.

Work Area	Area (Ha.)	Number of Features	Number of Features/Ha.	Total Area of H.P. (Ha.)	Percent of Work Area Covered by H.P.
Seagull	86	1	0.01	0.09	0.10%
Base Camp	90	17	0.19	2.76	3.07%
OB/OD	96	1	0.01	0.27	0.28%
Lua Makika	205	165	0.80	54.15	26.42%
K-1 Road*	458	120	0.26	18.12	3.96%
Total	935	304	0.32	75.39	8.06%

*Includes the 57 GMU in the K-1 Road Bypass Work Area

Based on the sample of the settlement zones represented by the various work areas, it is apparent that the Intermediate Settlement Zone was the part of the island that was least utilized or occupied. The small number of sites recorded in this zone are associated primarily with quarrying the tool-quality basalt from Pu`umo`iwi. Even though the sample is very small, the evidence indicates that the Intermediate Settlement Zone appears to have been utilized more for special purpose activities than for residence.

The density and types of historic properties in the Inland Settlement Zone indicate that this area was highly utilized, and further suggests that it was used for at least seasonal habitation. The abundance of lithic debris resulting from the production of basalt adzes and other stone tools may suggest that this activity was the primary impetus for the intensity of utilization of the Inland Settlement Zone. On the other hand, this intensity of use may provide evidence that the Moa`ulanui area was occupied for seasonal agriculture, and that lithic tool production and maintenance were embedded activities.

The sample from the Coastal Settlement Zone cannot be considered representative, since the Base Camp work area has been substantially altered as a result of the construction of the facilities and the intensity of military related activities conducted there over the past half century. McAllister's (1933:12) group of Sites 34 through 41 recorded at Honokanai`a Bay included several house foundations and a fishing shrine, some of which may be in the Site 131 complex, suggest that this area may have been utilized for permanent residence. However, the extant features include only temporary habitation sites and a *ko`a* shrine suggesting that this part of the coastal zone was at least utilized for fishing and short-term occupation.

3.6 The Relative Stability of Site Cond itions

The nature and rate of erosion on Kaho`olawe Island, and its effects on archaeological sites have been an ongoing issue since the completion of the Navy's island-wide survey. The question of the relative stability of the archaeological site conditions can be accurately answered with comparable data sets.

Among the types of data that would be required for such assessments of the lithic scatters (the predominant site type in the (Task Order 07 work areas) would be detailed maps and descriptions of the sites' material characteristics. Ideally, the maps would show precise locations of individual artifacts in relation to a permanent reference point, and would include remnant soil hummocks, both large and small. The site descriptions would include estimates of artifact quantities and density, as well as accurate identifications of and thorough counts of specific artifacts. Such detailed maps or site descriptions are not available in the published reports or NRHP Nomination forms of the original survey (Hommon 1978, 1980). Site areas cannot be accurately compared because the site-boundary defining criteria utilized during the original survey are unknown. The NRHP Nomination form descriptions usually state that the boudaries were determined arbitrarily. The reasons given vary from form to form. An example for one of the forms is, "The boundaries of the site were determined arbitrarily, because the density of activity areas in this part of the island makes it impossible to discern discrete archaeological site boundaries." (National Register of Historic Places Inventory – Nomination Form, Site 389, p. 1).

Another type of reliable comparative data would be detailed photographs of the sites from different angles. Generally, the photographs supplied in the NRHP Nomination forms do not provide the kind of detail needed to assess the degree to which the condition of the sites has (or has not) degraded since their initial discovery. However, the site photographs from the original survey did, on occasion, assist in the re-identification of particular sites and site features.

Although systematic comparison of the qualitatively and quantitatively unequal data sets is possible, such comparisons would not produce accurate interpretive conclusions regarding the relative stability of the site conditions. With few exceptions, the differences observed between the site descriptions produced during the original survey and those produced for this project reflect the difference in the level of effort expended or the amount of detail required (collected) during each survey, rather than actual changes in the conditions of the sites.

There are photographs available in Navy files that could be used as a basis of comparison for changing site and feature conditions. This comparison would involve additional fieldwork and analysis, which would include revisiting the photographed sites and features and locating exact points where the photographs were taken and recording the observed changes. Additionally, new photographs could be taken to visually document these changes.

The information provided on the NRHP Nomination forms from a few sites is sufficiently detailed to permit some observations regarding the stability of the sites in the Inland Zone of Kaho`olawe.

When Feature B of Site 104 was originally recorded (Hommon 1980), the remains of firepits were observed in the eroding edge of a centrally located hummock, and two were excavated by Science Management, Inc. (SMI). When PHRI mapped the feature in 1982-83, only one firepit and two prior excavation units were illustrated (Rosendahl *et al* 1987). When this feature was recorded during the present project, only one firepit and one prior excavation unit were visible, though visibility of the hummock edge was limited by the thick overgrowth of grass. The apparent disappearance of three firepits since 1976 and one excavation unit since 1983 may be due to the erosion of the unstable hummock edge. Another possible explanation could be the decreased visibility of the hummock edge resulting from the eradication of the goat population that allowed the vegetation on the hummock to flourish. Although both potential causes are probable, it is likely that a combination of the two is at work. Neller (1981) revisited Site 104 in an effort to assess the extent of the erosion of archaeological sites on Kaho`olawe. A comparison of a photograph of a firepit in the face of an eroding hummock (probably Feature A) that was taken by Hommon in 1976 with one taken by Neller in 1981 show that a considerable quantity of fire-cracked rock had fallen to the base of the hummock during the intervening five years.

Feature C of Site 401 was initially recorded as an activity area located adjacent to a number of soil hummocks containing a total of ten eroding firepits. Two of the eroding firepits in the excavation units were visible when visited by PHRI in 1982-83 (Rosendahl *et al* 1987) and during the present project in 1998. By the amount of the visible window screen that was used by SMI in back-filling the excavation units, it is apparent that the edge of this hummock has suffered some loss due to erosion.

Another example of the relative stability of the sites in the Lua Makika Work Area is Site 161. As originally described, this site included a stone-lined firepit exposed at a depth of 1.3 m in one face of the eroding hummock and a concentration of scattered volcanic glass. When this site was recorded during the present project, the remains of the firepit were still visible, although the condition may have deteriorated. The concentration of volcanic glass flakes and cores was also readily identifiable and in the same location as indicated by the NRHP nomination form map. An additional indication of the relative stability of Site 161 is the presence of three very small (ca. 5.5 cm x 2.5 cm) waterworn pebble hammerstones located within the main cluster of volcanic glass flakes and cores. That these very small hammerstones – the size likely used to flake small volcanic glass nodules and cores – still remain within the volcanic glass debitage concentration may indicate that even the surface material of some sites are rather stable.

Although we are not able to accurately measure the effects of erosion on the archaeological sites of the Lua Makika work area, the general observations that were possible allow for tentative conclusions. While the hummocks are eroding, at this time it does not appear to be at a rate that puts their cultural contents (e.g., firepits, architectural remains, and cultural horizons) at immediate risk for total loss. It should be emphasized, however, that due to the constant erosion, total loss of these cultural deposits is inevitable. Furthermore, the effects of a severe storm that could occur at almost any time are presently unknown and could be catastrophic. Understanding the effects of erosion on an artifact scatter on non-vegetated hardpan is more difficult. The general nature of the site descriptions of the island-wide site inventory do not permit many comparisons, but the few that are possible do suggest that some surface scatters are relatively stable. Sites that are on steep slopes or in locations susceptible to swift-moving water during heavy rains are not stable.

A systematic measurement of the effects of erosion on sites and features over time would require survey control and quantitative measurements. The best starting point would be a measurement of the effects of erosion on hummock features.

Section 4 Traditional Cultural Properties

A traditional cultural property (TCP) is a special category of historic property that is eligible for inclusion in the National Register of Historic Places by virtue of its traditional importance in cultural practices. The concept of a TCP encompasses all elements of the land and landscape within an area and not just the archaeological resources.

Places and sites at Pu`umo`iwi, Hakioawa, Kealaikahiki, Pu`u o Moa`ulanui, and Pu`u Kealialuna have been designated as traditional cultural properties based on their cultural significance to Native Hawaiians. Ms. Hokulani Holt-Padilla (KIRC Cultural Coordinator) identified these five TCPs in October 1998 (see Section 1.5.1 for details on TCP consultations). Each TCP was assigned a State Site number, and the three TCPs within Task Order 7 work areas are briefly described following and are shown in Figure 4-1. Reeve (1993) provides the legendary information for Kealaikahiki and Pu`u o Moa`ulaiki TCPs, and the historic context for Pu`u o Moa`ulanui TCPs; however, there is no mention of Pu`umo`iwi TCP.

4.1 Moa`ulanui (Site 771)

The high points of Kaho`olawe, most often the *pu`u* or vents, and craters of an island created by volcanism are considered to be special places in the culture of Native Hawaiians. The creation aspect of the *pu`u* is what makes these places special, as the *pu`u* is the place from which the island of Kaho`olawe was created (Hokulani Holt-Padilla personal communication 22 June 1999). Additionally, these high points are the places where the people went to observe the night sky for navigational purposes, for planting purposes, for fishing purposes, and for religious purposes. Pu`u o Moa`ulanui is the island's highest peak, a remnant of the shield-dome volcano that originally formed Kaho`olawe (Reeve 1993: 93). Easily recognizable from almost anywhere on the northern half of the island, Pu`u o Moa`ulaiki, one of the most distinctive physical features on Kaho`olawe, is a small cinder cone set against the slope of Pu`u o Moa`ulanui, (Reeve 1993: 211). Tradition suggests that the vantage points of these prominent peaks were not lost on the Hawaiians of old, as these points were used as natural observatories. Reeve 1993 (p. 211, 212) includes the following chant, "*Oli Kuhohonu o Kaho`olawe Mai na Kupuna mai*" (Deep chant of Kaho`olawe from our ancestor) recounted by the late Harry Kunihi Mitchell of Keanae, as it is significant to this TCP:

> Dust is spreading over Mount Moa`ula.
>
> Gathering place of the kahuna classes to study astronomy.
>
> Stone of deep magic of Keaweiki.

Though difficult to establish a boundary around a place that roots itself in the spiritual and cultural traditions of Kaho`olawe, the Cultural Coordinator for the KIRC, Hokulani-Holt Padilla, was able to determine the extent of the TCP for the purpose of this project. The decision to include the Moa`ulaiki TCP with the Moa`ulanui TCP is based on the 370-meter contour line encompassing Pu`u o Moa`ulanui and Pu`u o Moa`ulaiki. This area contains a high-density concentration of archaeological sites and features that are included in the inland settlement zone defined by Hommon (1980:41).

4.2 Pu`umo`iwi (Site 772)

Like Pu`u o Moa`ulanui and Pu`u o Moa`ulaiki, Pu`umo`iwi is also a prominent point on the island with the same cultural and religious connotations and significance. Additionally, this *pu`u* is the source for one of the premier adz quarries in the Hawaiian Archipelago.

The Pu`umo`iwi TCP encompasses the cinder cone formation that defines the *pu'u*, including the tool-quality basalt source areas, lithic reduction workshops, shrines, and campsites that together define the Pu`umo`iwi adz quarry area. The boundary of this TCP was defined on the ground and survey located through consultation with Ms. Holt-Padilla in February 1999.

4.3 Kealaikahiki (Site 773)

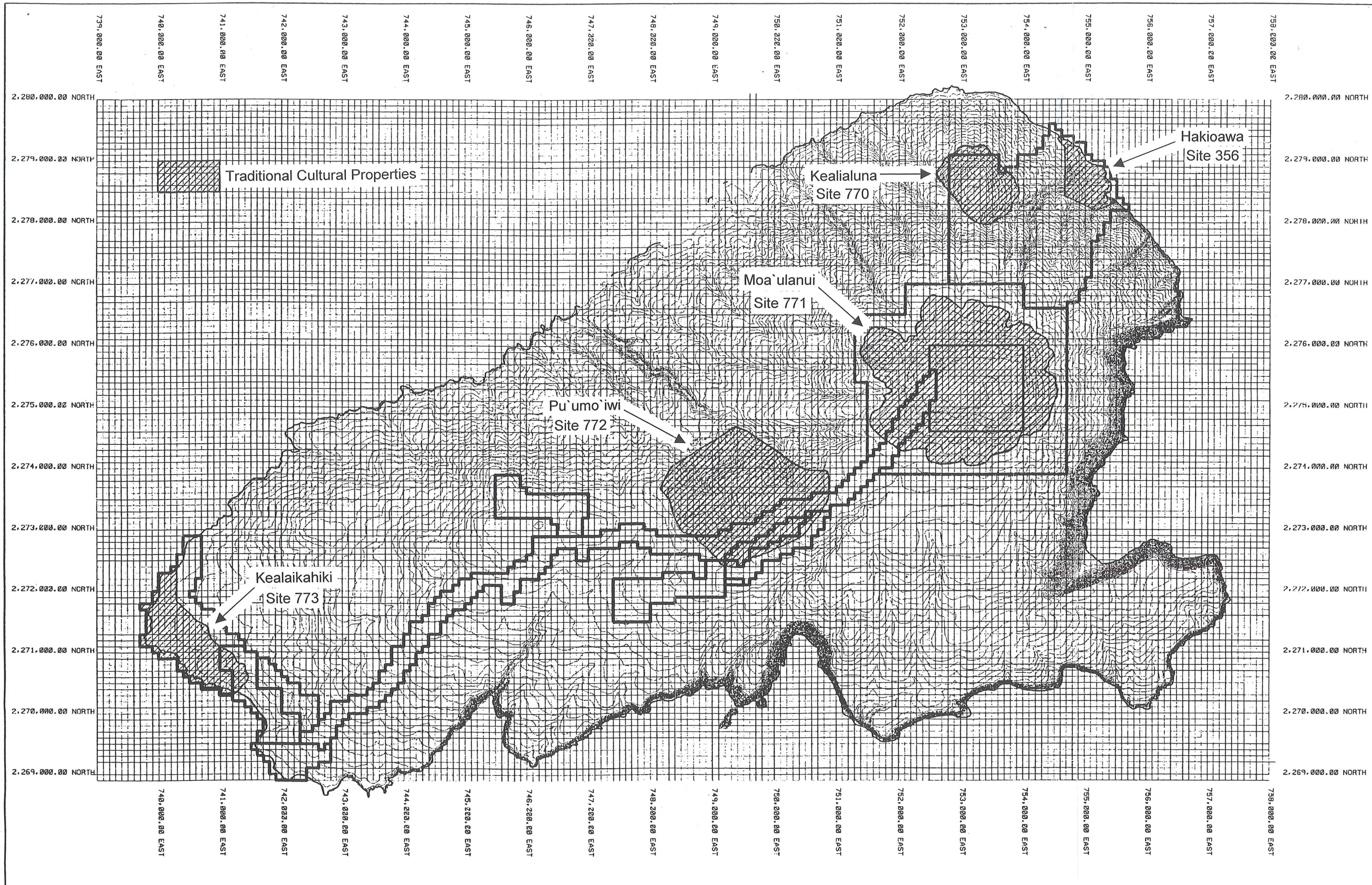
The chants and legends of old Hawai`i tell us of the double-hulled sailing canoes that would make the journey back and forth between Kahiki (currently equated with Tahiti but once thought to refer to the numerous islands of the South Pacific) and Hawai`i (Reeve 1993: 164). Kealaikahiki, "the road to Tahiti," is the name of the channel that runs between Kaho`olawe and the island of Lana`i. By steering their voyaging canoes through Kaho`olawe and Lana`i, the ancient navigators would catch the momentum of the current and use it to propel them south (Reeve 1993: 164). The westernmost tip of Kaho`olawe Island also bears the name of Kealaikahiki. At times, this point is also referred to as Ka lae I Kahiki, "The point to Kahiki", and it is from this place that many ancient voyagers would launch their canoes southward (Reeve 1993: 165). This place is also said to be the last residence of La`amaikahiki before finally leaving for Tahiti.

> As the place [Kahikinui] was too windy, La`amaikahiki left it and sailed for the west coast of the island of Kaho`olawe, where he lived until he finally left for Tahiti. It is said that because La`amaikahiki lived on Kaho`olawe, and set sail from that island, that was the reason why the ocean to the west of Kaho`olawe is called " the road to Tahiti." (Reeve 1993: 173)

Upon the return of La`a to Kahiki, it appears that the voyaging period came to a close, as tradition contains no account of other voyages to or from the South Pacific.

The Kealaikahiki TCP (Site 773) includes the coastal zone along the western shoreline of Kaho'olawe, including Kealaikahiki Point. The inland boundary of this TCP follows the existing Rocky Road from Honokanai'a beyond Keanakeiki.

Figure 4-1. Traditional Cultural Properties Defined by KIRC during Task Order 7



Section 5 Artifact Analysis in the Context of the Project Design and Research Questions

Of the total sites and features previously recorded during the National Register of Historic Places survey, almost all of the properties in the inland zones are categorized as surface scatters (lithic and/or midden) or have surface scatters and/or diagnostic artifacts associated with them. In addition to these types of historic properties, the archaeological component of area assessment has also recognized the presence of isolated finds across the landscape. An isolated find is defined for the project as: "A single artifact or other important item separated from other historic properties" (SOP A11.b).

Considering the highly dispersed and fragile nature of artifact scatters and isolated finds, it was noted that these properties and artifacts could be adversely impacted by unavoidable day-to-day UXO clearance activities, such as, vehicular and pedestrian traffic. Additionally, surface and subsurface UXO clearance activities (e.g., vegetation clearance, surface sweep, excavation for ordnance, and BIPS) pose a significant threat to historic properties and/or isolated finds (Tuggle and Tomonari-Tuggle 1997). Brush may be dragged across a historic property, resulting in damage or widespread dispersal of cultural items. Sweep crews may inadvertently pick up artifacts, resulting in damage or loss of the item. Geophysical detection crews may damage artifacts, midden remains, or fire-pit features when pulling the EM61 across a site or feature. Damage and displacement of cultural materials may occur during excavation for ordinance or in situ detonations. With these concerns in mind, the Historic Preservation (HP) staff implemented a basic data-collection procedure where items or artifacts clearly related to Native Hawaiian craft and tool manufacture or historic events and activities are plotted on a field map. The Recording Team (Historic Property Survey Team B) then enters artifact-attribute information onto an HPF-13 form (see Appendix A). The following discussion outlines the advantages to collecting individual artifact information.

First, the HP staff has noted that historic properties in eroded areas are minimally described and mapped on the NRHP forms. These original descriptions and maps lack detail about distinguishing site characteristics that are important for determining property type and function, as well as, their relative archaeological and cultural value. Recording the attributes and plotting the locations of these artifacts and artifact concentrations found within deflated surface scatters expands on the information of the rather limited and boiler-plate nature of the site and feature descriptions and maps generated during the original NRHP survey.

Second, areas of artifact concentrations and/or places where artifacts are observed eroding out of a hummock are positively located by tape and compass on a field map and by GPS equipment in the project database. Such documentation helps make sure the HP monitors and UXO clearance teams are better prepared when conducting cleanup operations within that property. Knowing exactly what the material characteristics of a historic property are by a momentary look at site map, as well as, knowing the accurate locations of artifacts and artifact concentrations enables the monitors to concentrate most of their effort in making sure these areas of concern are either avoided or treated with the utmost caution. Further, if surface artifacts need to be temporarily removed for subsurface clearance, as avoidance of adverse effects on historic property cannot be accomplished, section IV.D.3 of the Site Protection Agreement (Appendix B of the MOU) explicitly states that "(a)rchaeological materials removed under these conditions should be replaced in their approximate pre-Cleanup location to maintain the educational value of their pre-Cleanup location and distribution." Mapping these items provides the means for the HP staff to remain true to this agreement.

Third, the artifact information collected in the field will serve as an aid for making dependable and consistent inferences about historic property type and/or function. Because most of the upland sites and features of Kaho`olawe lack distinctive architecture, information from the material content of surface scatters is essential for formulating typological or functional determinations for sites or features. To establish the function of the historic property, the location of artifacts, type of artifacts, type of raw material used for artifact manufacture, artifact density, and overall historic property dimensions are the main variables considered during analysis. The goal here is to refine the blanket functional determination of "activity area" assigned to most surface scatters in the original NRHP survey by identifying the type of activity that likely occurred at a particular historic property (e.g., lithic workshop, quarry, or habitation). This information and refinement of historic property function is then utilized to make reasonable mitigation decisions for surface clearance, subsurface clearance, and earth-moving activities on a site-by-site basis.

Lastly, the Historic Preservation Plan (hereafter referred to as the HP Plan) requires the sub-contractor to address the following research questions pertaining to tool technology, manufacture, tool distribution and their probable relationship to Hawaiian settlement and economic patterns (Parsons-UXB Joint Venture 1998a):

1. Was there permanent habitation in the inland zone?
2. Where are the areas of nucleated settlement on the island?
3. What scale of agriculture was practiced on Kaho`olawe?
4. Were adzes manufactured for the use of island residents or for export?

The following hypotheses have been generated to address these questions:

Was there permanent habitation in the inland zone?

- If yes, then the artifact assemblage should reflect a diverse range of activities (i.e., fishing, food preparation, craft manufacture, and lithic tool reduction), rather than a single specialized activity.
- If yes, then the artifact assemblage of the inland zone should be reflective of the artifact assemblage at known permanent habitation areas on the island.
- If no, then the artifact assemblage should reflect a single activity (e.g., lithic workshop comprised mainly of lithic manufacturing implements, fishing area comprised predominantly of fishing implements, etc.).
- If no, and assuming that the inland areas were used mainly for quarrying and temporary workshop type activities, then we could postulate that basalt cores and preforms were reduced to a manageable size, then transported to habitation areas for further refinement, polish, and usage. If this holds true, then we could expect that the number of adz preforms/rejects would be greater than the number of finished adzes.

What scale of agriculture was practiced on Kaho`olawe?

- If there was intense agriculture practiced island wide, and assuming that finished adzes were being used to clear vegetation, then the number of finished adzes should be greater than that of adz preforms/rejects at eroded agricultural sites. Additionally, the size of adzes would be significantly larger to account for the task at hand. Moreover, the spatial distribution of such assemblages would be spread evenly across the landscape.

Were adzes manufactured for use of island residents or for export?

- If manufactured for island residents, then the number of adz preforms/rejects should be less than or equal to the number of finished adzes, working under the assumption the population would actively utilize the implements immediately after manufacture.
- If manufactured for island residents, then the dimensions of preforms/rejects and finished adzes would be highly variable and evenly distributed across the landscape.
- If manufactured primarily for export, then we could expect the people would follow an optimizing behavior pattern (Kelley 1995: 73), where the goal is to maximize their economic returns for the amount of energy expended in the quarry. If this holds true, then the following trend should be observed:
    - The number of adz preforms/rejects would be greater than the number of finished adzes found in the upland areas under the assumption that the adz maker would want to spend most of the time in the quarry manufacturing prepared preforms or blanks rather, than taking the time to finish only a few adzes.
    - Length, width, and thickness of preforms/reject would lean toward smaller more uniform sizes, thus increasing the number of transportable items and minimizing the cost of their transport to the coast and across the channel for trade.
    - The lithic debitage of a scatter would be remarkably dense and widespread due to the mass production of adz preforms/reject.
    - The mineralogical make up of adz-quality basalt found on Kaho`olawe should also be found on other islands in the form of finished adzes, adz preforms/rejects, or adz flakes.

By examining the frequency of specific types of artifacts (e.g., adzes, adz preforms, lithic tools, fishing implements, and agricultural implements) and the intra- and inter-site diversity of artifact assemblages based on resource material, artifact type, and artifact dimensions, we should be able to make sound inferences about these research concerns.

The sample analyzed here is comprised of 1350 items-901 from Lua Makika and 449 from Upper K-1 Road. The additional 36 items from the K-1 Road Bypass are not included in this analysis.

5.1 Field Methods

As outlined in the HP Plan (Parsons-UXB Joint Venture 1998a) it is the responsibility of Team B to: (1.) Record (i.e. map and describe) new historic properties in detail, (2.) Compare previous records of the historic properties to existing condition in the field, and (3.) Record supplemental data on previously recorded properties (emphasis added). The following outline refers to the procedure Team B follows when recording supplemental data where isolated finds and artifacts are concerned:

1. Unless it is an Isolated Find that has been located with the survey equipment, take a distance and bearing from reference points A or B to artifacts located and flagged during the initial site walk over.
2. Identify each item's type and material and check off appropriate box on the HPF-13 form.

3. Type is divided into 12 categories:
    a. Abrader: Implement showing signs of being used to abrade for purposes of tool or craft manufacture
    b. Adz: A stone cutting/chopping implement that has an asymmetrical bevel when viewed from the side, in contrast to an axe, which displays a symmetrical bevel
    c. Adz P/R: An adz preform or reject. An unfinished adz that has been abandoned at some point in the manufacturing sequence
    d. Awl: basalt flake or core that has been retouched to form a tapered point
    e. Biface: A flake or core that has been flaked on both sides to form an edge
    f. Core: A piece of volcanic glass or basalt that exhibits evidence of reduction
    g. Fishhook: A hooked wood implement, bone implement, shell implement, or combination thereof used for fishing
    h. Hammerstone: A rounded stone used for lithic reduction
    i. Lure: Non-hooked implement used to attract marine resources (i.e. cowry shell lures)
    j. Ulu maika: A ground stone, coral, or sandstone gaming piece
    k. Other: Other culturally modified items; brief descriptions are entered next to check box
4. Material is divided into eight categories:
    a. Basalt
    b. Shell
    c. Bone
    d. Volcanic Glass
    e. Scoria
    f. Coral
    g. Wood
    h. Other
5. Locate and identify artifact attributes that are discernible without the aid of a loop or other magnifying device and check off appropriate box on the HPF-13 form.
6. Type of artifact attribute or modification to artifact:
    a. Retouch/Usewear
    b. Polish
    c. Not Applicable
7. Location of modification:
    a. Butt
    b. Edge

   c. Proximal
   d. Distal
   e. Dorsal surface
   f. Ventral surface
8. Type of fishhook
   a. One-piece
   b. Two-piece
9. Measure each artifact along their long axis, short axis, and cross-section using digital calipers and enter information onto the HPF-13 form.
10. Take a digital photo if the artifact is unique, displays unusual attributes, or is an isolated find then enter time and frame on to photo log and HPF-13 form.

5.2 Analysis Methods

For the purpose of analysis, artifact types within the Task Order 07 (TO 07) work areas were divided into five categories: (1.) Implements used in stone tool and craft manufacture, (2.) Products of stone tool or craft manufacture, (3.) Craft manufacture by-products, (4.) Implements used in food preparation, and (5.) Other. These categories should help to differentiate the kinds of activities occurring at the individual level of historic properties and overall level of settlement zones. Within the "Other" category under "Artifact Type" and "Artifact Material" of the HPF-13 form, there are several recurring types and materials that are not individually listed in their respected section. In light of this, the category of "Other" under "Artifact Type" has been further refined in the artifact database to discern positively identified scrapers and utilized flakes from other miscellaneous artifacts. Additionally, the category of "Other" under "Artifact Material" has been further refined to differentiate historic materials (metal, ceramic, and glass) from traditionally used materials (basalt, coral, shell, scoria, and sandstone). What follows is a description of the previously mentioned artifact categories and the artifact types that fall within these categories.

5.2.1 Implements Used in Tool or Craft Manufactur e

Implements used in tool or craft manufacture (tools for making tools), also described as fabricators (McCoy 1986: 14), refer to the basic pre-contact Hawaiian toolkit. Made out of the various raw materials available, this toolkit would be used to manufacture and refine adzes, sinkers, fishhooks, recreational items, and woodcrafts. Three types of artifacts recorded during the Task Order 07 phase of this project fall into this category: abraders, awls, and hammerstones.

5.2.1.1 Abraders

Abrading tools (Plate I,Plate II, and Plate III) are used for the smoothing or refining of lithic and non-lithic (e.g. wood crafts, fishhooks, adzes, *`ulu maika*, etc.), as well as, the final sanding stages of stone tools and recreational pieces (e.g., adzes, chisels, *`ulu maika*). Oftentimes, abraders are further categorized into subtypes, such as, files, saws, and rubbing stones (Kirch 1985:189); however, for the current project, all artifacts used for abrading purposes were recorded under the single artifact type referred to as "abrader" on the HPF-13 form. Within the work areas of Task Order 07, abraders are made of coral, scoria, and dense basalt.

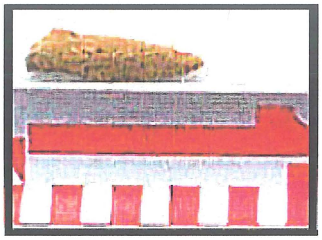


Plate I: Side view of a coral abrader (file) recorded at Site 50-20-97-104G in the Lua Makika Work Area.

Plate II:Top view of a scoria abrader recorded at 50-20-133A in the Lua Makika Work Area.

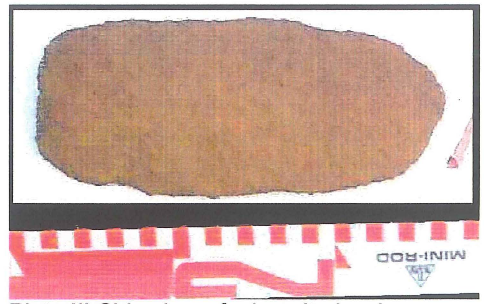


Plate III:Side view of a basalt abrader recorded at 50-20-393P in the Lua Makika Work Area.

5.2.1.2 Awls

Stone and bone awls are most commonly used for making perforations in wood or shell implements. However, based on overall size, location of usewear, and type of usewear found on artifacts recorded as awl implements (Plate IV, Plate V, and Plate VI) for this task order, it is probable that these tools were used primarily for shaping and smoothing holes in wood crafts or cowry lures, rather than boring the initial hole. An additional function of these awls, as evidenced by the presence of wear on the tip of the tapered end, may have been to work and smooth the grooves of sinkers. All awls recorded for this Task Order were made of basalt.

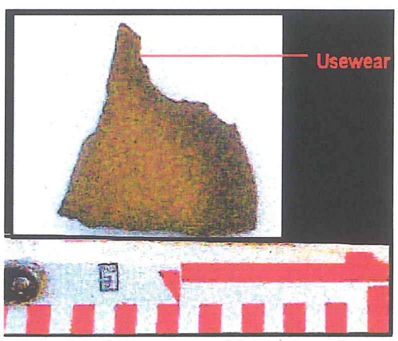


Plate IV: Side view of basalt awl (AW-1) recorded at 50-20-730 in the Lua Makika Work Area (Note the grooved shape and location of usewear.)

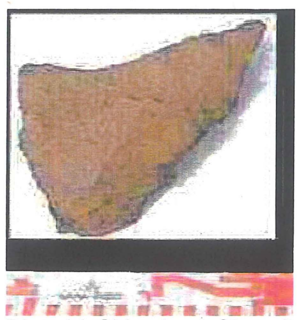


Plate V: Side view of basalt awl (AW-2) recorded at 50-20-97-104A in the Lua Makika Work Area (Note the relatively large tip width.)

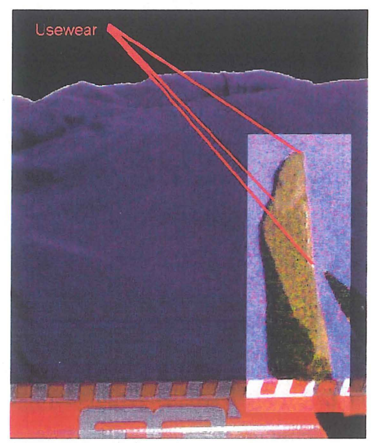


Plate VI: Side view of basalt awl recorded in the Lua Maika Work Area (Note location and length of usewear evidence.)

5.2.1.3 Hammerstones

For the most part, hammerstones recorded within the TO 07 work areas consist of dense waterworn basalt that exhibits pecking or battering on at least one end of the stone (see Plate VII,Plate VIII, and Plate IX) from use as a hammer during stone tool manufacture. These tools vary in size and shape depending on the task or stage of lithic reduction they are being used for (e.g. large hammerstones for primary lithic reduction, smaller hammerstones for the final stages of reduction).

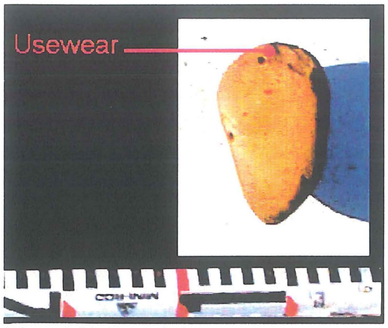


Plate VII: Basalt hammerstone (75222747-IFB), ventral view, recorded in the K-1 Road Corridor (Note usewear on one end.)

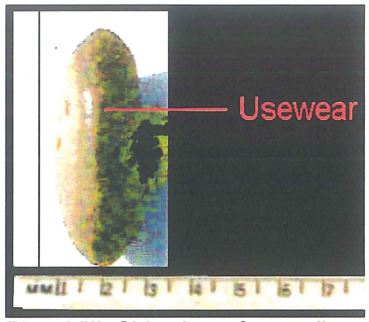


Plate VIII: Side view of a small basalt hammerstone recorded at 50-20-97-161 n Lua Makika Work Area (Note size of the cobble and location of usewear.)


Plate IX: Side view of a hammerstone (75422733-IFA) recorded in K-1 Road Corridor (Note extent of usewear.)

5.2.2 Products of Tool or Craft Manufacture

Products of tool or craft manufacture refer to artifacts that are in their preform or final stages of manufacture. Items recorded for the TO 07 phase of work that fall into this category consist of adzes and adz preforms, bifaces, sinkers, shell lures, and *`ulu maika*.

5.2.2.1 Adzes

Stone, shell, and *walahe`e* wood (*Canthium odoratum*) adzes were used as implements for felling trees, vegetation clearance, and working or shaping the wood for canoes, houses, fence posts, or any other item that may be needed (Kamakau 1976: 23,122). All adzes recorded are of dense, fine-grained basalt (Plate X, Plate XI, and Plate XII). Stone adzes are distinguishable from axes in that they have an asymmetrical bevel when viewed from the side, whereas axes display a symmetrical bevel. Manufactured by flaking and, in most cases, grinding and polishing dense, fine-grained basalt, these types of adzes range in size from small blade-like implements a few centimeters in length to large chopping implements up to 55 cm in length (Kirch 1985: 184). Usually, basalt adzes found in Hawai`i are rectangular or quadrangular in cross-section, often displaying the reduction of a butt (tang) to facilitate attachment to a wooden handle. Sometimes however, Hawaiian adzes are either triangular in cross-section (similar to those found in Marquesan artifact assemblages) or lack the reduction of a butt end. These are adz variations frequently found on Kaho`olawe.

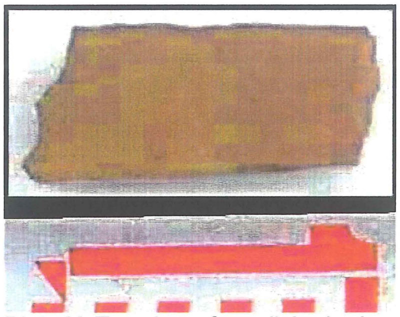


Plate X: Top view of a polished adz fragment (75302750-IFA) recorded in the Lua Makika Work Area.

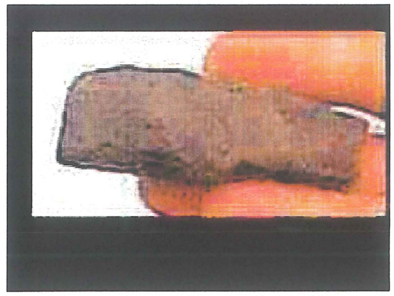


Plate XI:Top view of a basalt adz (A-1) recorded at 50-20-97-401I in the Lua Makika Work Area.

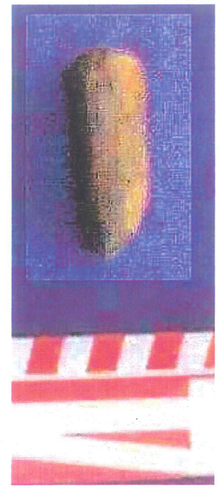


Plate XII:Side view of basalt adz (A-1) recorded at 50-20-97-534 in Lua Makika Work Areas. Note small size.

5.2.2.2 Adz Preforms/Rejects

The working definition of an adz preform/reject for this project is:

> An unfinished adz that has been abandoned at some point in the manufacturing sequence (HP SOP A11.b-19).

Simply stated, an adz preform/reject is an unfinished tool where the final form is evident (Cleghorn 1982: 7). Problems and confusion involved in classifying these artifacts by their different stages of manufacture have been discussed extensively by McCoy (1986, 1991), McCoy et.al. (1993), and Weisler (1990). In an effort to avoid large inconsistencies between the data recording teams in distinguishing rejects from preforms or blanks based on their morphological characteristics alone, there was no distinction made between the different stages of adz reduction and refinement on the HPF-13 form. Consequently, artifacts found in various stages of adz manufacture were recorded as adz preforms/rejects (Plate XIII, Plate XIV, and Plate XV).

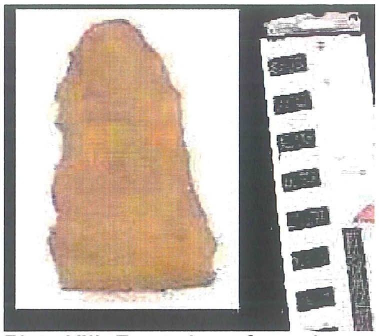


Plate XIII: Front view of an adz preform/reject recorded at 50-20-97-391D in K-1 Road Corridor.

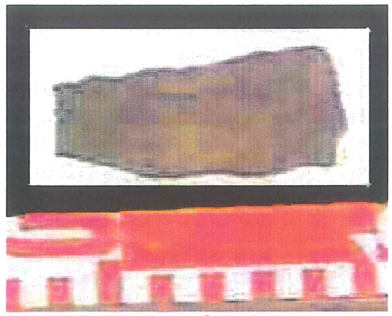


Plate XIV: Adz preform/reject recorded at 50-20-97-400B in the K-1 Road Work Area. Note the relatively small size.

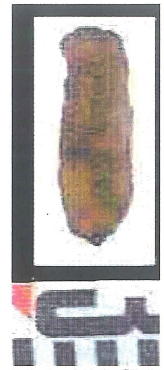


Plate XV: Side view of preform/reject recorded at 50-20-97-400B in K-1 Road Corridor.

5.2.2.3 Bifaces

Literally, the term biface describes a tool that has been worked or flaked on both sides/faces. Modern stone tool workers use the term "to biface" generally as a verb meaning to work a bifacial tool, by either hard-hammer or soft hammer percussion, in order to thin the object. The term biface is most commonly employed in European Paleolithic archaeology and North American Paleoindian archaeology when referring to large bifacially flaked knives, blades, projectile points, or the early manufacturing stages thereof (Whittaker 1994:178). There has been little, if any mention of bifaces in Hawaiian archaeology, though there are specimens on Kaho`olawe that have clearly been bifacially worked and thinned. These artifacts have been recorded as bifaces (Plate XVI and Plate XVII) on the HPF-13 form. The purpose of such items in Hawaiian archaeology has yet to be positively determined; however, it appears that on Kaho`olawe they were being manufactured for eventual use as scrapers (Section 5.2.4.1). This inference is evidenced by the presence of usewear along the edges of these tools.

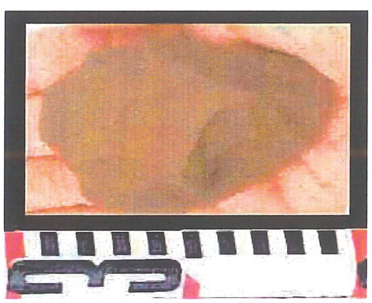


Plate XVI: Top view of a baslat biface (BF-1) recorded at 50-20-97-401F in the Lua Makika Work Area.

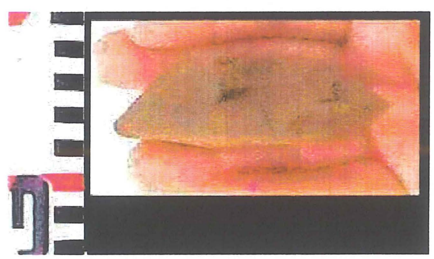


Plate XVII: side view of a basalt biface (BF-1) recorded at 50-20-97-400B in the Lua Makika Work Area.

5.2.2.4 Sinkers

Sinkers were used as weights for fishing lines, squid lures, fishnets, and possibly bird nets. Generally, Hawaiian sinkers fall into four categories: grooved (coffee bean), perforated, bread-loaf (Plate XVIII, Plate XIX, and Plate XX), and plummet (Buck 1964: 342, Emory et.al. 1968: 28). Curiously, all of the recorded sinkers in the TO 07 work areas are of the bread-loaf variety. A specialized form of sinker particular to the Hawaiian Islands, bread-loaf sinkers are referred to as such because the upper part resembles the top of a loaf and the lower part is shorter and narrower, much like a loaf of bread (Buck 1964:344). The uppermost part is convex, both length- and width-wise, with a continuous groove along both sides and around the ends separating the upper and lower parts of the sinker. According to Buck (1964: 345), the bottom, grooved surface of several of these types of sinker would be fitted against the lower ends of the rod spreaders of dip nets used for fishing. It appears however, that the primary association of the bread-loaf sinker is with octopus or squid hooks. Because of its size and shape, the bread-loaf sinker has the advantage over the grooved sinker in that it can accommodate two cowrie shell lures (Emory et.al. 1968: 28).

Plate XVIII: Side view of bread-loaf sinker (75392754-IFB) made out of an unknown material.

Plate XIX: Cross-section view of basalt bread-loaf sinker (75262750-IFB) recorded in the Lua Makika Work Area.

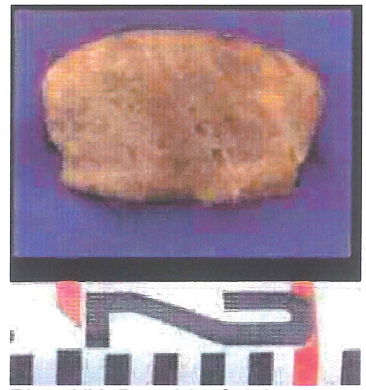


Plate XX: Bread-loaf sinker (75392754-IFB) made of an unknown material recorded in the Lua Makika Work area.

5.2.2.5 Cowrie Shell Lures

Cowrie shell lures (Plate XXI) are used in conjunction with a wooden stem, a stone sinker, a cowrie shell, a hook, and a tail of *ti* leaves for squid or octopus fishing (Buck 1964: 359). These lures are identifiable by holes punctured at each end of the cowrie shell (Plate XXII) to facilitate the attachment of the lure to the wooden stem with lashing cords.

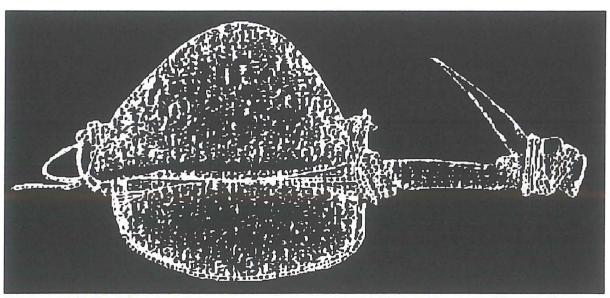


Plate XXI: Typical octopus lure (Hammatt and Sheidler 1996).

Plate XXII: Top view of a cowrie-shell lure (75392747-IFA) recorded in the Lua Makika work area.

5.2.2.6 `Ulu Maika

`Ulu maika, discoidal gaming stones, are used in the *maika* game where they are bowled between two upright wooden pegs (Kirch 1985:197-198). These items are distinguishable from discoidal hammerstones and disc shaped abraders by a sharp definable edge around the circumference of the artifact. Most commonly made of dense, fine-grained basalt that has been ground smooth, it is not unusual to come across gaming stones made of different materials. *`Ulu maika* recorded for this task order are made of coral, dense fine-grained basalt, and sandstone (Plate XXIII,Plate XXIV, and Plate XXV).

Plate XXIII:Side view of a basalt *`ulu maika* (75352758-IFA) recorded in the Lua Makika Work Area.

Plate XXIV: Front view of a basalt *`ulu maika* (75352758-IFA) recorded in the Lua Makika Work Area.

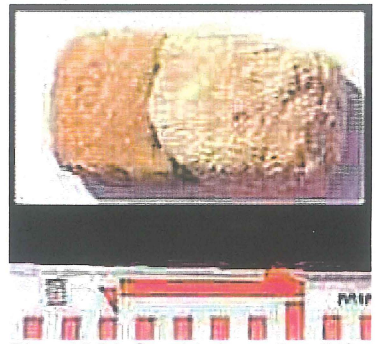


Plate XXV: Coral *`ulu maika* (U3 and U4 conjoined) recorded at 50-20-149A in the Lua Makika Work Area.

5.2.3 Craft Manufacture By-Products

This category is used to refer to the lithic waste generated during stone tool manufacture. Locations of manufacturing by-product concentrations will aid us in determining lithic workshop localities, temporary habitation localities, and permanent habitation localities when using the artifact assemblage as a variable. Included in this category are exhausted basalt cores, exhausted volcanic glass cores, and debitage (i.e. basalt or volcanic glass flakes).

5.2.3.1 Cores

A core (Plate XXVI and Plate XXVII) is the material being struck to produce useable flakes or blades for various tasks and/or tools. Both basalt and volcanic glass cores were recorded in the Task Order 07 work areas.

Plate XXVI: Top view of a basalt core (75262747-IFA) recorded in the Lua Makika Work Area.

Plate XXVII: Side view of basalt core (75262747-IFA).

5.2.3.2 Flakes

A flake is any piece of stone removed from a larger mass by the application of force – intentionally, accidentally, or by natural means. Flakes made via cultural processes (Plate XXVIII) display the following distinguishable characteristics: a striking platform with a bulb of percussion at the proximal end and flake ripples extending toward the distal end. Flakes were not individually recorded or point-plotted for the current project; however, presence or absence of basalt and volcanic glass flakes and artifact density at HP sites and features was noted on the HPF-01 form and used in this analysis.

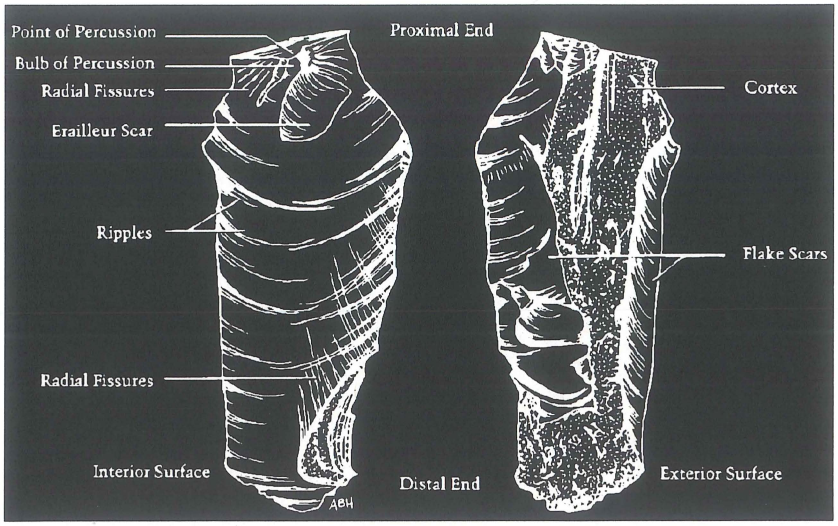


Plate XXVIII: Diagram showing the attributes of a flake made via cultural processes (Whittaker 1994:16).

5.2.4 Artifacts Associated with Food Preparation

This category refers to tools and/or artifacts associated with the preparation of food. Items recorded for TO 07 that fall into this category include scrapers and fractured basalt.

5.2.4.1 Scrapers

Although scrapers have been associated with other uses (e.g., wood shaping and breaking down plant materials), for the purposes of this study, scrapers are identified with general food preparation activities (e.g., removing the taro corm and sweet potato skins). (Plate XXIX and Plate XXX) These items are commonly made of bone, stone, and shell. The scrapers identified within the Task Order 07 work areas were made of retouched basalt flakes and basalt bifaces. Evidence of wear along the edges of these items indicates use as a scraper.

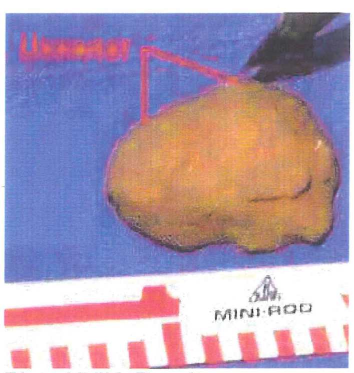


Plate XXIX: Basalt scraper recorded at 50-20-97-707 in the Lua Makika Work Area. Note location of usewear along the edge of the item.

Plate XXX: Basalt scraper recorded at 50-20-97-707 in the Lua Makika Work Area. Note location and extent of usewear.

5.2.4.2 Fractured Basalt

Basalt stones and cobbles were heated for cooking purposes and used in an *imu* (earthen oven) or fire-pit. Either rapid cooling or expansion of water molecules causes cracking or fracturing of these stones when heated at high temperatures, thus the term fractured basalt (i.e., fire-cracked rock). In the absence of fire-pits or *imu* at a historic property, the presence of fractured basalt on site may be an indication of food heating or processing. Fractured basalt stones were not individually point plotted on field maps for the current project; however, presence or absence of these items at HP sites and features was noted on the HPF-01 form and locations and sizes of dense concentrations were mapped.

5.2.5 Other

Items that fall under this classification were recorded as "other" on the HPF-13 form and could not be clearly put into the previously discussed categories. Personal ornaments (*lei palaoa* and/or shell pendants), objects that are culturally modified for unidentifiable reasons, or objects that occur in singular numbers are included in this category. Such items include various pendants or possible pendants, modified waterworn stones, a single chisel, a possible *`ulu maika* preform, and possible slingstones. These artifacts are not used in this analysis but are included in counts of the overall artifact content of historic properties and work areas.

5.3 Artifacts Characterized By Work Areas For Task Order 0007

Team B of the Historic Properties Survey component of TO 07 conducted recording activities in the Lua Makika, K-1 Road Corridor, OBOD, Seagull, and Base Camp work areas. What follows is a breakdown and discussion of the isolated find and artifact content of sites and features by work area.

5.3.1 Lua Makika Work Area

A total of 901 individual artifacts were recorded in the Lua Makika work area. Eight hundred and sixty-five of these artifacts are associated with sites and/or features (Table C-1, Appendix C) and 36 were recorded as isolated finds (Table C-2, Appendix C). Of all artifacts recorded at Lua Makika, 43.7% (n=394 items) are of tool and craft manufacturing products (Figure 5-1), 39.5% (n=356) are implements used for stone tool and craft manufacture, 8.4% (n=76) are manufacturing by-products, 5.3% (n=48) fall into the "other" category, and 3.0% is represented by items associated with food preparation. Figure 5-2 represents the type of material used for artifacts in the Lua Makika work area. Of the artifacts recorded for Lua Makika, 84.8% (n=765) are made of basalt; coral represents 11.8% (n=106), 1.7% (n=15) is represented by shell; 1.0% by scoria, 0.6% by volcanic glass, and 0.2% of the artifact assemblage is represented by an unidentified material.

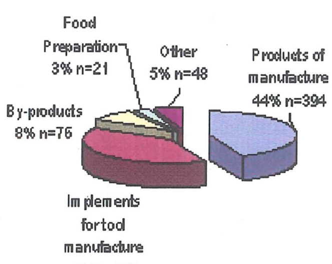


Figure 5-1: Breakdown of artifacts recorded in Lua Makika by categories.

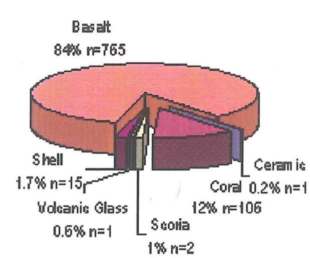


Figure 5-2: Breakdown of materials used for artifacts at Lua Makika.

5.3.1.1 Implements used in craft manufacture.

Of the artifact assemblage at Lua Makika, 39.4% is classified as implements used in craft manufacture. Basalt hammerstones (n=106) make up the bulk of the manufacturing implements, constituting 17.7% of the entire artifact assemblage in the work area. Maximum length (Figure 5-3) recorded for hammerstones is 20 cm and minimum length equals 2.6 cm for a mean length of 7.9 cm. Maximum width recorded is 12 cm and minimum width is 1.8 cm for a mean width of 5.69 cm. Maximum thickness of all hammerstones at Lua Makika is.7 cm and minimum thickness equals 1.30 cm constituting a mean of 3.81 cm. It is interesting to see that most of the hammerstones recorded for this area form two clusters around the small and mid-size range. The mid-size range hammerstones may indicate that the stages of lithic reduction carried out at the majority of sites and features within the area is focused around the latter stages of tool reduction, i.e. final touches on prepared tool preforms, as opposed to initial core reduction. The smaller hammerstones may have been used to work volcanic glass flakes and cores. This smaller size would allow for better control over the reduction process of this fragile material.

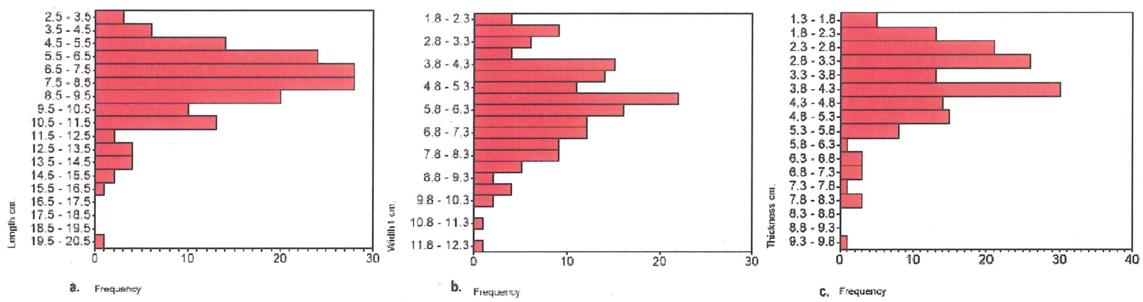


Figure 5-3: Measurements for Hammerstones (n=106) Recorded in the Lua Makika Work Area.

a. Length: min=2.0 cm, max = 20.0 cm, mean = 7.9350 cm, std. deviation = 2.7056 cm, mode = 6.0 cm
b. Width: min=1.80 cm, max = 12.0 cm, mean = 5.6930 cm, std. deviation = 1.9622 cm, mode = 5.50 cm
c. Thickness: min=1.30 cm, max = 9.70 cm, mean = 3.8051 cm, std. deviation = 1.4651 cm, mode = 4.0 cm

Ninety-six of all abraders at Lua Makika are made of coral, nine are basalt abraders, and nine are made of scoria for a total of 114 abraders (12.7% of the entire assemblage). Maximum length (Figure 5-4) recorded for abraders equal 17 cm with the minimum length equaling 1.5 cm for a mean of 5.5 cm. The maximum width recorded is 8.80 cm and the minimum width is .30 cm, for a mean of 3.25 cm. A second width ($width_2$) measurement was recorded for abraders where the artifact tapered off to a point (see Plates IV-VI). $Width_2$ measurements were taken for only five of the 114 abraders at Lua Makika. The maximum $width_2$ measurement taken is 1.1 cm and the minimum is .30 cm for a mean of 3.26 cm. Maximum thickness is recorded at 3.50 cm and minimum thickness is recorded 0.5 cm, for a mean thickness of 1.60 cm

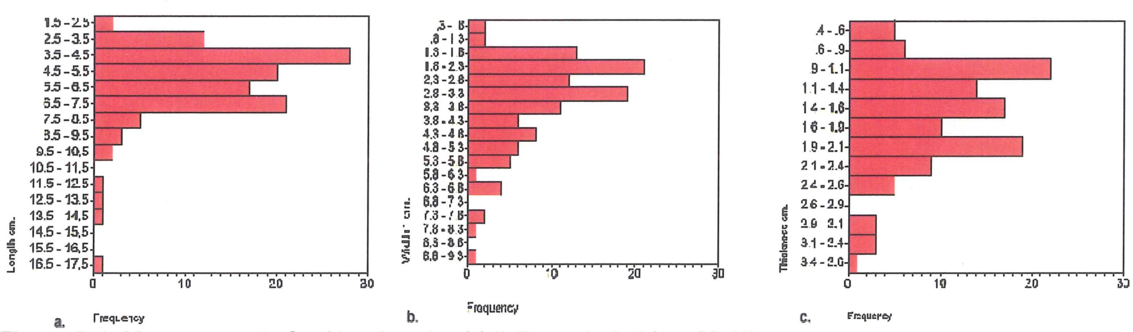


Figure 5-4: Measurements for Abraders (n=114) Recorded at Lua Makika

a. Length: min=1.50 cm, max = 17.0 cm, mean = 5.5184 cm, std. deviation = 2.3564 cm, mode = 6.50 cm
b. Width: min=.30 cm, max = 8.80 cm, mean = 3.2570 cm, std. deviation = 1.6505 cm, mode = 2.0 cm
c. Thickness: min=.50 cm, max = 3.50 cm, mean = 1.6026 cm, std. deviation = .6473 cm, mode = 1.0 cm

Finally, 82 awls (9.1% of the artifact assemblage) were recorded at Lua Makika (Figure 5-5). From base to tip, the maximum length recorded for awls is 14.60 cm, and minimum length is 4.10 cm, for a mean of 7.10 cm. Here, as with the abrader measurements for width, two measurements were taken: $width_1$ represents the width of the base of the awl, and $width_2$ represents the width of the tip of the awl. The maximum measurement for $width_1$ is 10 cm, minimum is .8 cm, for a mean base width of 4.05 cm. $Width_2$ measurements were taken for 48 of the 82 awls with the maximum being 4.1 cm and the minimum being .30 cm for a mean tip width of .77 cm. This rather thick tip width suggests that it was being used for a task other than boring holes through shell or wood. The maximum thickness for this tool was measured at 8 cm and minimum thickness was measured at .5 cm for a mean thickness of 2.15 cm It is interesting to note the mode for tip width is just under a centimeter. This is much too wide for drilling purposes, further supporting an ulterior function such as smoothing the edges of holes after the hole was initially drilled or for grinding the grooves in stone sinkers.

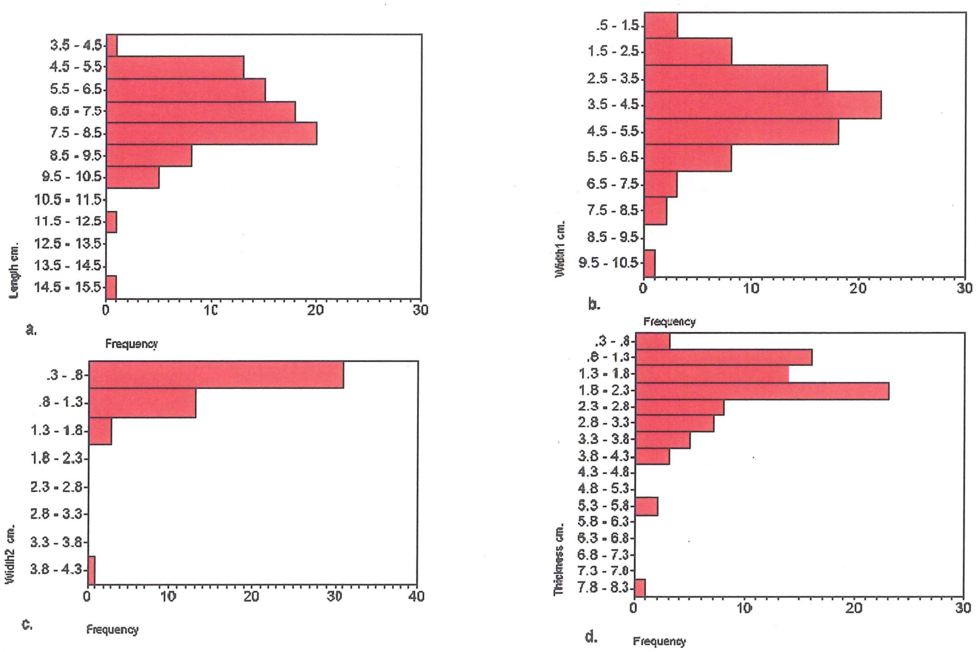


Figure 5-5: Measurements for awls (n=83) recorded in the Lua Makika Work Area.

a. Length: min=3.0 cm, max= 14.60 cm, mean= 7.1337 cm, std. deviation= 1.7995 cm, mode= 8.0 cm
b. $Width_1$: min=0.8 cm, max= 10.0 cm, mean= 4.0446 cm, std. deviation= 1.6056 cm, mode= 4.50 cm
c. $Width_2$: min=2.0 cm, max= 20.0 cm, mean= 7.9350 cm, std. deviation= 2.7056 cm, mode= .60 cm
d. Thickness: min=.50 cm, max= 8.0 cm, mean= 2.1337 cm, std. deviation= 1.821 cm, mode= 2.0 cm

5.3.1.2 Products of Stone Tool and Craft Manufacture.

Thirty-six percent of the artifact assemblage at Lua Makika consists of products of tool and craft manufacture. Basalt adz preforms/rejects (n=250) make up the bulk of this category at 27.7% of the entire artifact assemblage (Figure 5-6). The maximum length taken for adz preforms is 19 cm and minimum length taken is 2 cm for a mean length of 6.35 cm. The maximum width measurement on adz preforms is 10.60 cm and the minimum width is one centimeter for a mean of 4.53 cm. Finally, the maximum thickness of adz preforms within the work area is 8.50 cm with a minimum of 0.60 cm for a mean of 1.80 cm. It is notable that all adz preforms/rejects recorded for the entire work area, like that of the hammerstone dimensions, cluster around the small to mid-size range (less than 10 cm in length, width, and thickness). There appears to be a preference for the smaller size range in this area; whether or not this trend continues in other work areas may help to determine if this is a statistically significant trend or simply a unique characteristic of the Lua Makika work area.

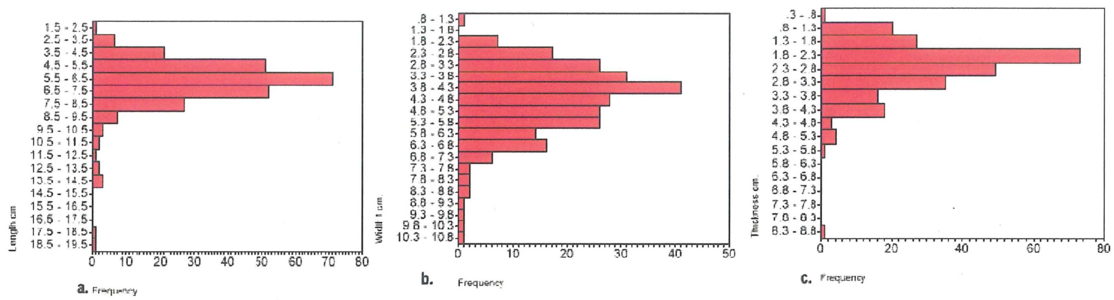


Figure 5-6: Measurements of Adz Preforms/Rejects (n=250) Recorded for Lua Makika Work Area

a. Length: min=2.0 cm, max = 19.0 cm, mean = 6.3470 cm, std. deviation = 2.1192 cm, mode = 5.50 cm
b. Width: min=1.0 cm, max = 10.60 cm, mean = 4.5301 cm, std. deviation = 3.50 cm, mode = 3.0 cm
c. Thickness: min=.60 cm, max = 8.50 cm, mean = 2.4583 cm, std. deviation = .9807 cm, mode = 2.0 cm

Finished adzes (n=33) represent 3.7% of the artifact assemblage in the work area (Figure 5-7). Maximum length, as measured along the long axis, is 6.6 cm, minimum length equals 1.9 cm for a mean length of 4.75 cm. Maximum width, as measures along the short axis, is 5.6 cm and minimum width equals 1.5 cm for a mean width of 3.15 cm. A second width measurement, equaling 5.0 cm, was taken for one adz. Maximum thickness measured along the cross-section, ranges from 4.9 cm at its maximum to 0.5 cm at its minimum, for a mean thickness of 1.81 cm. Again, the size trend follows that of the adz preform/rejects in that there appears to be a preference for the smaller to mid-sized adz implement.

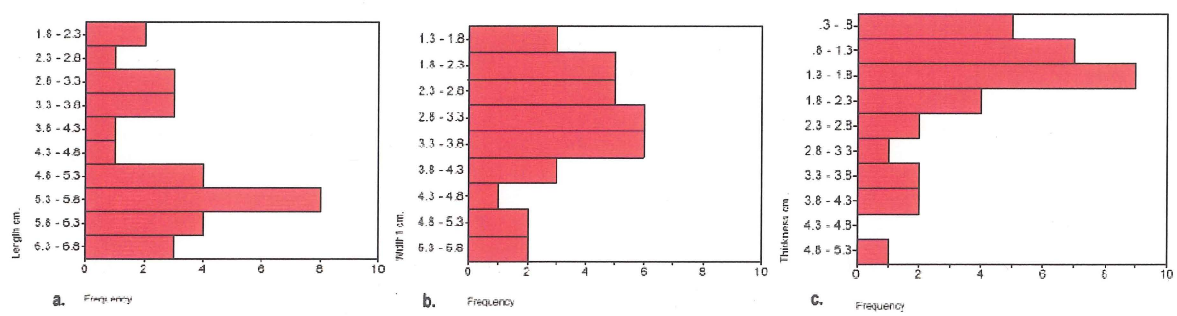


Figure 5-7: Measurements for Adzes (n=33) Recorded for Lua Makika Work Area

a. Length: min=1.90 cm, max= 6.60 cm, mean= 4.7533 cm, std. deviation= 1.3808 cm, mode= 5.0 cm;
b. Width: min=1.50 cm, max= 5.0 cm, mean= 3.1485 cm, std. deviation= 1.0766 cm, mode= 2.0 cm;
c. Thickness: min=.50 cm, max= 4.90 cm, mean= 1.8108 cm, std. deviation= 1.1045 cm, mode a= 1.0 cm, mode b=1.50

Of all artifacts recorded for the work area, 6.9% (=62) consists of basalt bifaces (Figure 5-8). Measured along the long axis, maximum length is measured at 12.50 cm, minimum length is 2.80 cm for a mean length of 7.55 cm. The width of the artifact, measured along the short axis, ranged from 10.00 cm to 0.80 cm constituting a mean width of 6.09 cm. Lastly, maximum thickness for all bifaces at Lua Makika equal 15.30 cm, minimum thickness equals 0.30 cm, for a mean thickness of 3.55 cm.

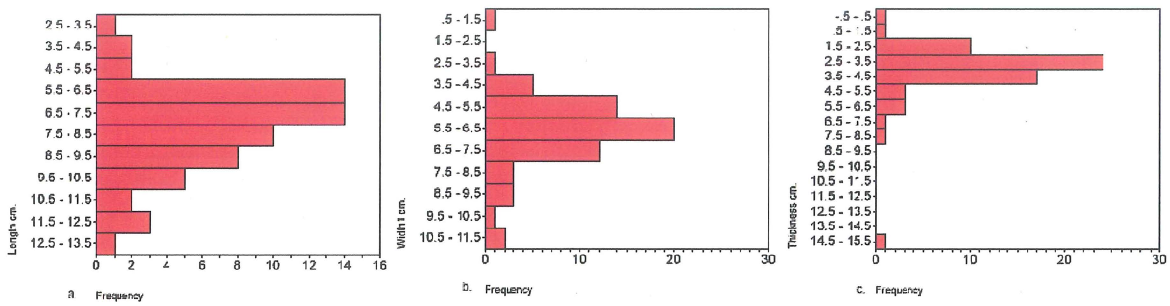


Figure 5-8:Measurements for bifaces (n=62) recorded in the Lua Makika Work Area

a. Length: min= 2.80 cm, max= 12.50 cm, mean= 7.550 cm, std. deviation= 1.9421 cm, mode= 6.0 cm
b. Width: min= 1.40 cm, max= 10.50 cm, mean= 6.0855 cm, std. deviation= 1.9987 cm, mode= 2.50 cm
c. Thickness: min= .30 cm, max= 15.30 cm, mean= 3.5548 cm, std. deviation= 1.9987 cm, mode= 2.50 cm

Sinkers (n=12), all of which are of the bread-loaf variety, make up 1.3% of the artifact assemblage. Nine are made of basalt, two are made of coral, and one is made out of a banded, cryptocrystalline silicate tentatively identified as chalcedony. If this tentatively identified material is chalcedony, the closest known sources for the material is on the eastern edge of West Molokai along Waiahewahewa Gulch and Iao Valley on West Maui (Macdonald et.al. 1983: 486). This in itself is interesting, as it introduces another variable to consider when discussing the pre-contact trade of raw materials and artifacts between districts (Iao Valley lies within the Wailuku District and Kaho`olawe lies within the Honua`ula District) and islands. Length for sinkers (Figure 5-9) ranges from 9.50 cm to 4.60 cm for a mean length of 5.79 cm. The maximum width for sinkers equals 7.00 cm, the minimum equals 2.50 cm, for a mean width of 3.86 cm. Maximum thickness for sinkers at Lua Makika is 4.70 cm and minimum thickness is 2.00 cm constituting a mean thickness of 2.92 cm.

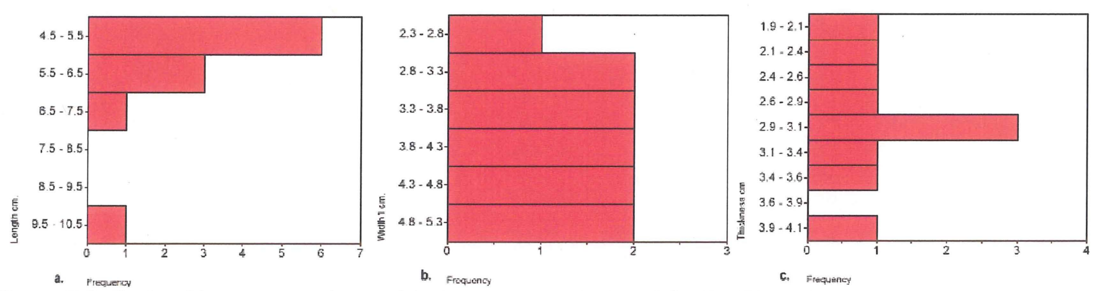


Figure 5-9: Sinker Measurements (n= 11) Recorded in the Lua Makika Work Area

a. Length: min= 4.60 cm, max= 9.50 cm, mean= 5.7909 cm, std. deviation= 1.3479 cm, mode= 5.0 cm;
b. Width: min= 2.50 cm, max= 5.20 cm, mean= 3.8636 cm, std. deviation= 0.8732 cm, mode= even distribution;
c. Thickness: min= 2.0 cm, max= 4.0 cm, mean= 2.920 cm, std. deviation= 0.5770 cm, mode= even distribution.

Cowry shell lures (n=7) make up only 0.80% of the entire artifact assemblage at Lua Makika (Figure 5-10). The maximum length, width, and thickness for lures equal 9.30 cm, 6.90 cm, and 4.60 cm respectively. Minimum length, width, and thickness equal 5.30 cm, 3.70 cm, and 2.10 cm respectively. The mean length, width, and thickness for lures equal 7.10 cm, 5.29 cm, and 3.21 cm, respectively.

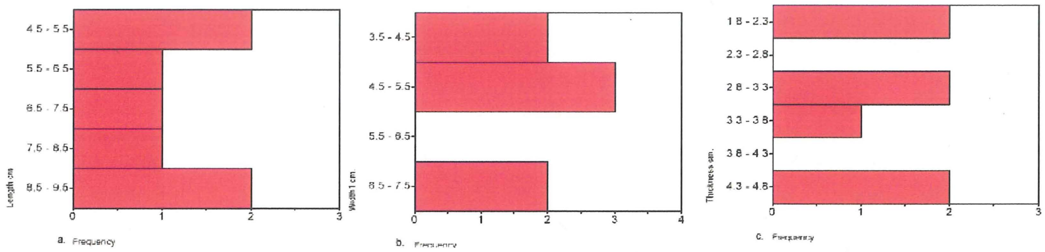


Figure 5-10: : Cowry Shell Lure Measurements (n= 7) Recorded in the Lua Makika Work Area

- **a.** Length: min= 5.30 cm, max= 9.30 cm, mean= 7.10 cm, std. deviation= 1.6941 cm, mode= 9.30 cm;
- **b.** Width: min= 3.70 cm, max= 6.90 cm, mean= 5.2857 cm, std. deviation= 1.2375 cm, mode= 5.40;
- **c.** Thickness: min= 2.10 cm, max= 4.60 cm, mean= 3.2143 cm, std. deviation= 0.9616 cm, mode= even distribution.

`Ulu maika* (n=30) make up 3.3% of the Lua Makika artifact assemblage (Figure 5-11). Length, represented by the diameter of the item, ranges from 7.60 cm to 3.80 cm for a mean length of 5.93 cm. A width measurement was taken on broken *`ulu maika for 21 out of 30 items recorded. Width ranges from 7.00 cm to 2.00 cm for a mean width of 3.86 cm. Thickness was measured for 24 of the 30*`ulu maika* recorded in the work area. Thickness ranges from 4.70 cm, to 2.00 cm, for a mean of 3.61 cm.

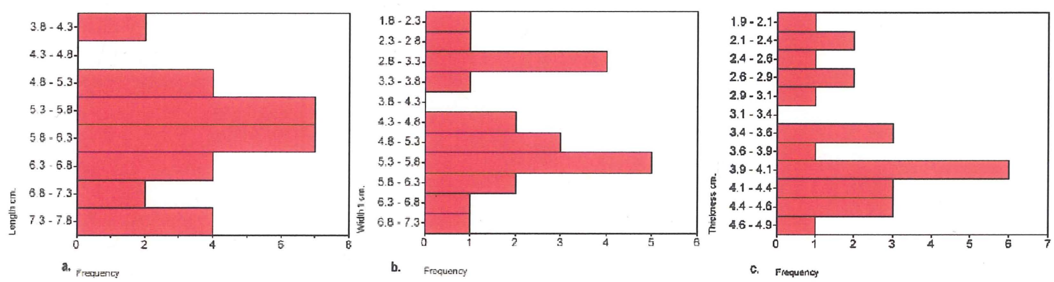


Figure 5-11: :*`Ulu maika* Measurements (n= 30) Recorded in the Lua Makika Work Area

- **a.** Length: min= 3.80 cm, max= 7.60 cm, mean= 5.930 cm, std. deviation= .9610 cm, mode= 5.50 cm
- **b.** Width: min= 2.0 cm, max= 7.0 cm, mean= 4.6129 cm, std. deviation1.3977 cm, mode= even distribution
- **c.** Thickness: min= 2.0 cm, max= 4.70 cm, mean= 3.6195 cm, std. deviation= 0.8040 cm, mode= 3.50

5.3.1.3 Tool and Craft Manufacture By-products.

Cores (n=76) constitute 8.4% of the entire artifact assemblage at Lua Makika (Figure 5-12). Maximum length on cores was measured at 38.00 cm and minimum length was recorded at 3.40 cm for a mean length of 8.32. Width ranged from a maximum of 32.00 cm to a minimum of 2.30 for a mean width of 6.70 cm. Finally, maximum thickness for cores equaled 14.00 cm and minimum thickness equaled 1.00 cm for a mean of 4.93 cm.

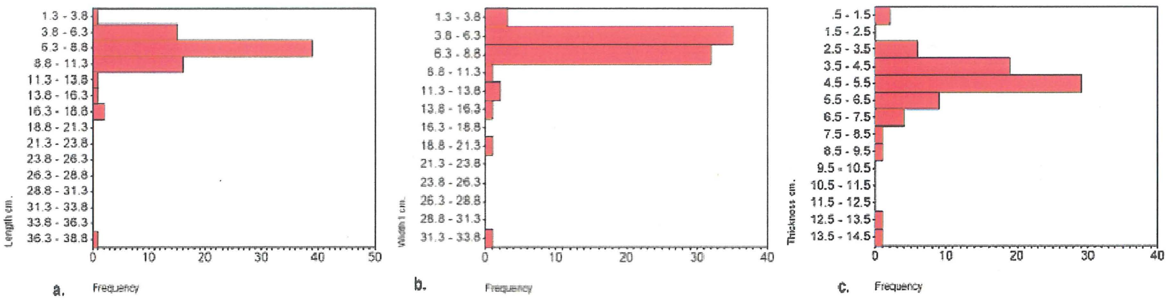


Figure 5-12: : Core Measurements (n= 76) Recorded in the Lua Makika Work Area

a. Length: min= 3.40 cm, max= 38.0 cm, mean= 8.3224 cm, std. deviation= 4.2205 cm, mode= 7.0 cm
b. Width: min= 2.30 cm, max= 32.0 cm, mean= 6.9961 cm, std. deviation= 3.7696 cm, mode= 7.50
c. Thickness: min= 1.0 cm, max= 14.0 cm, mean= 4.9260 cm, std. deviation= 1.9520 cm, mode= 4.50

Basalt and volcanic glass debitage was observed at 98.2% of the sites recorded within the Lua Makika work area. Overall, the majority (54.9%) of the historic properties containing basalt and volcanic glass debitage are low-density artifact scatters. Twenty-nine percent of sites that contain debitage are of medium-density. Finally, only 16% of the sites with flakes present are high-density artifact scatters.

5.3.1.4 Artifacts Associated with Food Preparation.

Scrapers (n=24) (Figure 5-13) and utilized flakes (n=3) constitute only three percent of the entire artifact assemblage at Lua Makika. Measured along the long axis, the maximum length of the former equals 8.00 cm, and minimum length equals 3.50 cm for a mean of 5.86 cm. Measured along the short axis, the maximum width for scrapers equals 7.00 cm and minimum width equals 2.00 cm for a mean width of 4.74 cm. Maximum thickness of all scrapers was measured at 3.00 cm, minimum thickness measured for scrapers equals 0.50 cm for a mean thickness of 1.86 cm Only three utilized flakes were recorded for Lua Makika. Maximum length, width, and thickness for these items were measured at 9.40 cm, 8.70 cm, and 1.40 cm respectively. Minimum length, width, and thickness for utilized flakes measures 5.10, 3.10, and 1.00 centimeters respectively. Because of the low number of recorded utilized flakes, the mean for length, width, and thickness was not calculated. Low frequency of utilized/retouched flakes is due to the sampling and recording differences between the recording teams, whereby some of these items were recorded by one team and not by the other.

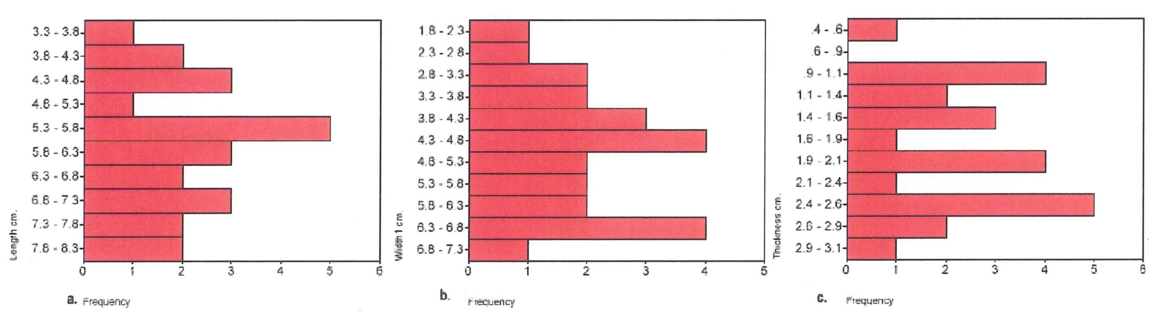


Figure 5-13: Scraper measurements (n= 24) recorded in the Lua Makika Work Area

a. Length: min = 3.50 cm, max = 8.0 cm, mean = 5.8583 cm, std. deviation = 1.2978 cm, mode = even distribution
b. Width: min = 2.0 cm, max = 7.0 cm, mean = 4.7417 cm, std. deviation = 1.4021 cm, mode = 6.50 cm
c. Thickness: min = 0.50 cm, max = 3.0 cm, mean = 1.8625 cm, std. deviation = 0.6914 cm, mode = 2.50 cm

Fractured basalt occurs in 90.3% of the historic properties recorded in the Lua Makika work area. Of these historic properties, 98% were associated with marine shell and/or bone midden. Over half (52.7%) of the sites where fractured basalt and midden was observed are low-density sites, 39.9% of these sites were of medium-density, and finally, only 16.4% of these sites were high-density sites.

5.3.1.5 Other

Five and three tenths (n=48) of the entire artifact assemblage at Lua Makika is made up of artifacts that do no fit into the above categories. Thirty-six of these items are made of basalt, seven of these items are made of shell, four are of coral, and only one is of a ceramic material.

5.3.2 K-1 Road Corridor

All of the artifacts recorded for this work area, a total of 449 items, were located in what is referred to as the Upper K-1 Road Work Area running from the open storage area (OSA) to the Lua Makika Work Area. Four hundred and twenty eight of these items are associated with sites and/or features along K-1 Road (Appendix C, Table C-3) and 21 were recorded as Isolated Finds (Appendix C, Table C-4). The bulk of the artifact assemblage (Figure 5-14) is made up of stone tool and craft manufacturing products (36.3%) and items used for tool and craft manufacture (31.4%). Manufacturing by-products make up the third largest group at 24.9% of the artifact assemblage, followed by items categorized as "other" at 4.2%, and finally artifacts associated with food preparation are represented by a mere 3.1%. Figure 5-15 shows what percentage of which type material was used to make the artifacts. Overwhelmingly, 88.6% (n=398) of assemblage is made of basalt, followed by coral and volcanic glass at 6.9% (n=31) and 2.2% (n=10) respectively. Items made of shell (n=5) represent only 1.1% of the artifact assemblage within the K-1 Road Corridor and, finally, ceramic, glass, and sandstone items (shown as other in the figure) compriseonly1% of the assemblage combined.

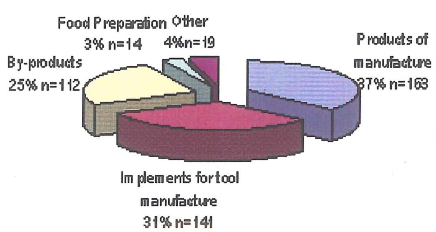


Figure 5-14: Breakdown of artifacts recorded by analysis categories.

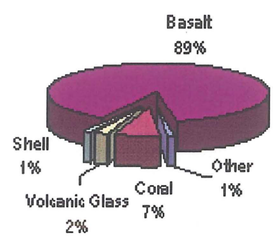


Figure 5-15: Breakdown of materials used for artifacts in K-1 Road Corridor.

5.3.2.1 Implements Used in Stone tool and Craft Man ufacture

Thirty-one and four tenths percent of the artifact assemblage in the K-1 Road corridor is made up of implements used in stone tool and craft manufacture. Hammerstones (Figure 5-16) comprise only 8.5% (n=38) of the entire artifact assemblage. Maximum length for hammerstones is measured at 15.70 cm with a minimum length of 3.60 cm constituting a mean length of 7.72 cm. The maximum width for hammerstones measures 10.70 cm, and minimum width measures 2.20 cm, comprising a mean width of 5.86 cm. Finally, maximum thickness of hammerstones within the Corridor equals 8.80 cm, and minimum thickness equals 1.50 cm constituting a mean thickness of 4.30 cm. Hammerstone frequency in the K-1 Road corridor has decreased significantly from that of Lua Makika; however, dimensions of the items still revolve around the small to mid-sized range, with the mode for length and width revolving around 5-8 centimeters.

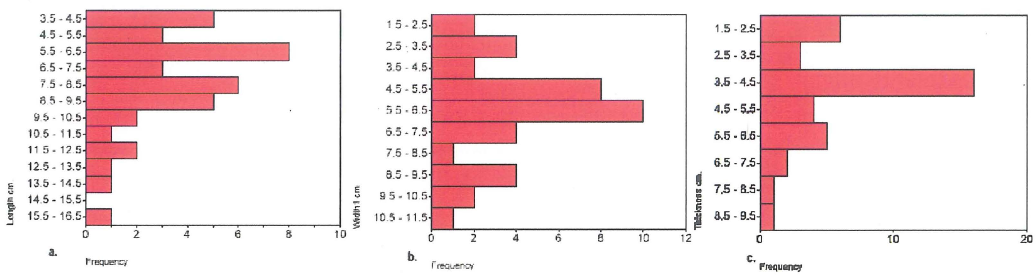


Figure 5-16: Measurements of Hammerstones (n=38) Recorded in the K-1 Road Corridor

a. Length: min= 3.60 cm, max= 15.70 cm, mean= 7.7197 cm, std. deviation= 2.8407 cm, mode= 8.50 cm
b. Width: min= 2.20 cm, max= 10.70 cm, mean= 5.8605 cm, std. deviation= 2.2475 cm, mode a= 2.50 cm, mode b= 5.50 cm, mode c= 5.90 cm
c. Thickness: min= 1.50 cm, max= 8.80 cm, mean= 4.3026 cm , std. deviation= 1.7117 cm, mode a= 3.90 cm, mode b= 4.40 cm

Basalt awls (n=61) make up the bulk of artifacts recorded in this category (Figure 5-17). From base to tip, the length of awls ranges from 13.00 cm to 3.70 cm, for a mean length of 6.91 cm. The base width ($width_1$) of the awls ranges from 8.90 cm to 1.90 cm, for a mean base width of 4.79 cm. A tip width ($width_2$) measurement was taken for 57 of 61 awls. This measurement ranges from 6.20 cm to 0.40 cm for a mean tip width of 1.1 cm. Overall thickness ranges from 5.40 cm at its maximum to 0.90 cm at its minimum, for an overall mean of 2.22 cm. A second thickness measurement ($thickness_2$) was taken on the tapered end of 31 of 61 awls recorded in the K-1 Road corridor. This thickness ranges from 2.00 cm, at its maximum to .30 cm, at its minimum, for a mean of 0.96 cm.

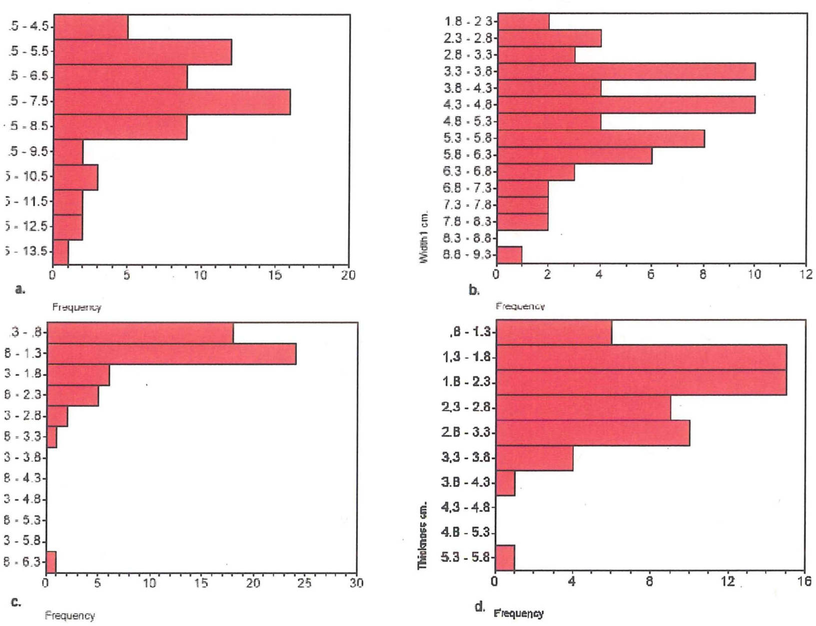


Figure 5-17: Measurements of awls (n=61) recorded in the K-1 Road Corridor.

a. Length: min = 3.70 cm, max = 13.0 cm, mean = 6.9148 cm, std. deviation = 2.0223 cm, mode a= 5.10 cm, mode b= 6.50 cm;
b. $Width_1$: min = 1.90 cm, max= 8.90 cm, mean = 4.7943 cm, std. deviation = 1.5883 cm, mode = 5.30 cm;
c. $Width_2$: min = 0.40 cm, max = 6.20 cm, mean = 1.1560 cm, std. deviation = 0.8693 cm, mode a= 0.50 cm, mode b= 0.90 cm, mode c= 1.20;
d. Thickness: min = 0.90 cm, max = 5.40 cm, mean = 2.2197 cm, std. deviation = 1.5850 cm, mode a= 1.60 cm, mode b= 1.80 cm

Abraders (n=40) make up 8.9% of the assemblage for K-1 Road (Figure 5-18). Thirty-one of these items are made of coral, seven are made of basalt, and two are made of scoria. Maximum length, width, and thickness for abraders is measured at 13.20, 9.40, and 13.00 centimeters respectively. Minimum length, width, and thickness is measured at 2.60, 1.50, and 0.70 centimeters respectively. Mean length, width, and thickness for abraders in the work area is 5.43, 3.67, and 2.22 centimeters respectively.

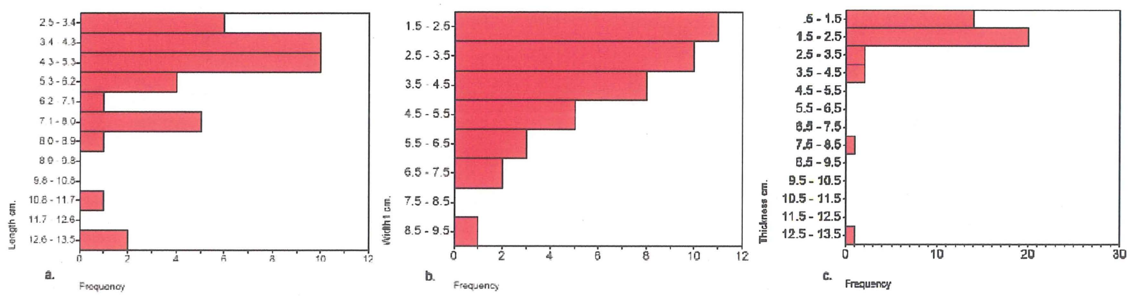


Figure 5-18: Measurements for Abraders (n=40) Recorded in the K-1 Road Corridor

a. Length: min= 2.60 cm, max= 13.20 cm, mean= 5.4263 cm, std. deviation= 2.4666 cm, mode = 4.30 cm
b. Width: min= 1.50 cm, max= 9.40 cm, mean= 3.6650 cm, std. deviation= 1.6993 cm, mode a= 2.0 cm, mode b= 2.20 cm
c. Thickness: min= .70 cm, max= 13.0 cm, mean= 2.2225 cm, std. deviation= 2.1417 cm, mode = 1.40 cm

5.3.2.2 Products of Stone Tool and Craft Manufacture

Thirty-six and three tenths percent of the artifact assemblage are products of stone tool and craft manufacture. Only two finished basalt adzes, comprising less than 1% of the entire assemblage, were recorded in the K-1 Road corridor. The larger of the two is 5.50 cm long by 5.00 cm wide by 2.50 cm thick. The dimensions of the smaller one equals 2.60 cm long by 2.90 cm wide by 1.70 cm thick.

At 27.4%, adz preforms/rejects (n=123 items) constitute the largest group of artifacts recorded for the K-1 Road Corridor (Figure 5-19). The length of these items range from 23.00 cm to 3.90 cm constituting a mean length of 8.07cm. Width ranges from 11.00 cm to 2.20 cm constituting a mean width of 5.13 cm. A second width measurement of 9.50 cm and 1.20 cm was taken for only two of the 123 items. Finally, thickness for adz preforms/rejects ranges from 6.80 cm to 0.80 cm, for a mean thickness of 2.90 cm. The preference trend for small to mid-size adz preforms/rejects seen in the Lua Makika Work Area continues into the K-1 Road corridor. There are a few outlier length measurements, but this is to be expected as the sites and features get nearer to quarry areas. This apparent preference for smaller adz preforms/rejects may be a significant trend when considering lithic procurement strategies and its connection to the overall economic patterns of resource exploitation (see Section 5.5)

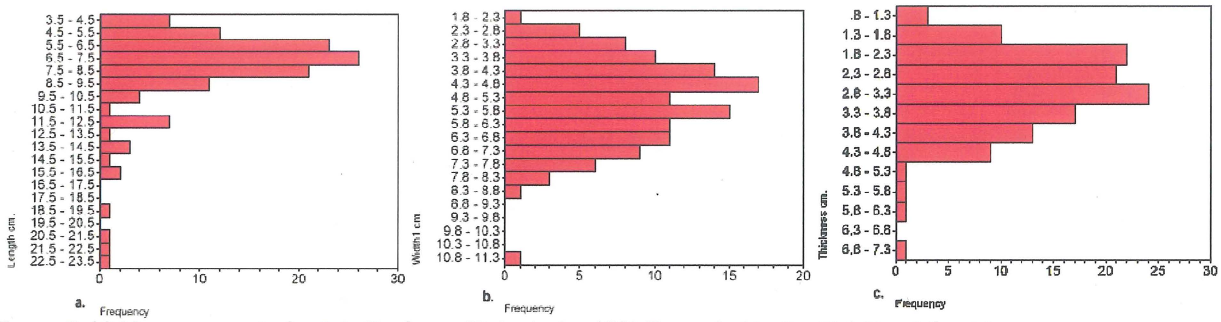


Figure 5-19:Measurements for Adz Preforms/Rejects (n=123) Recorded in the K-1 Road Corridor

a. Length: min= 3.90 cm., max= 23.0 cm, mean= 8.0709 cm, std. deviation= 3.5138 cm, mode = 7.60cm
b. Width: min= 2.20 cm, max= 11.0 cm, mean= 5.1364 cm, std. deviation= 1.5431 cm, mode = 4.40 cm
c. Thickness: min= 0.80 cm, max= 6.80 cm, mean= 2.9447 cm, std. deviation= 1.0494 cm, mode = 1.90 cm

Bifaces (n=23) comprise 5.1% of the artifact assemblage (Figure 5-20). Measured along the long axis of the artifact, the maximum length of all bifaces recorded within the K-1 Road Corridor equals 12.10 cm, and the minimum length equals 5.30 cm, for a mean length of 7.98 cm. Measured along the short axis, the maximum width is 9.70 cm, and minimum width is 3.80 cm for a mean width of 6.60 cm. Lastly, the thickness of bifaces recorded for this work area ranges from 5.40 cm to 1.50 cm, for a mean thickness of 3.17 cm.

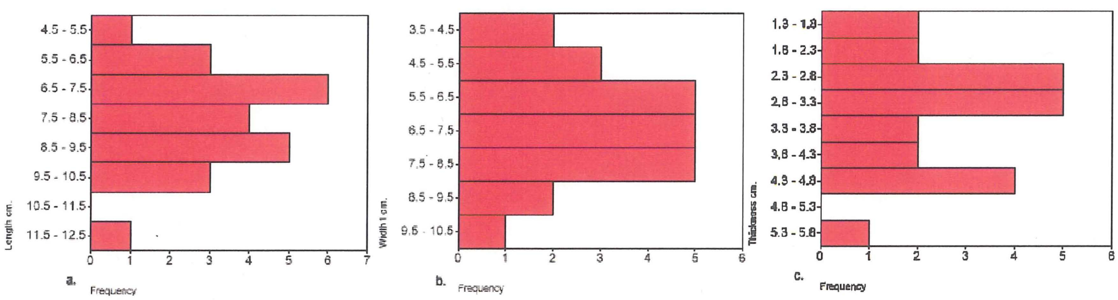


Figure 5-20: Measurements of Bifaces (n=61) Recorded in the K-1 Road Corridor

a. Length: min= 5.30 cm, max= 12.10 cm, mean= 7.9783 cm, std. deviation= 1.7045 cm, mode = even distribution
b. Width: min= 3.80 cm, max= 9.70 cm, mean= 6.6043 cm, std. deviation= 1.5850 cm, mode = even distribution
c. Thickness: min= 1.50 cm, max= 5.40 cm, mean= 3.1739 cm, std. deviation= 1.0467 cm, mode a= 2.80 cm, mode b= 1.80 cm

One and three tenths (n=6) of the artifact assemblage is represented by bread-loaf sinkers (Figure 5-21). Five of these sinkers are made of basalt and one is made of sandstone conglomerate. Measured along the long axis, the maximum length of bread-loaf sinkers equals 6.50 cm, and the minimum length equals 4.10 cm, for a mean of 5.06 cm. Maximum width measured along the short axis, equals 3.90 cm, and minimum width equals 2.70, for a mean width of 3.25 cm. Maximum thickness measured along the cross-section, equals 3.80 cm, and minimum thickness equals 2.00 cm, for a mean thickness of 2.62 cm.

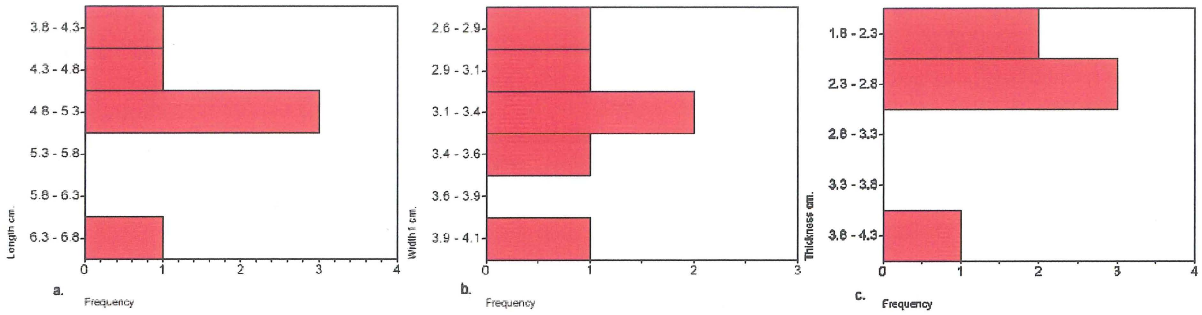


Figure 5-21: Measurements for Sinkers (n=6) Recorded in the K-1 Road Corridor

a. Length: min= 4.10 cm., max= 6.50 cm, mean= 5.0667 cm, std. deviation= 0.8066 cm, mode = even distribution
b. Width: min= 2.70 cm, max= 3.90 cm, mean= 3.250 cm, std. deviation= 0.4278 cm, mode = even distribution
c. Thickness: min= 2.0 cm, max= 3.80 cm, mean= 2.6167 cm, std. deviation= 0.6274 cm, mode = 2.60 cm

Basalt *`ulu maika* (n=9) comprise 2% of the artifact assemblage in the K-1 Road corridor (Figure 5-22). Maximum length, represented by the diameter, measures 6.50 cm, minimum length measures 3.40 cm, comprising a mean of 5.70 cm. A width measurement was taken on broken *`ulu maika*. The maximum measurement taken here is 6.50 cm, the minimum measurement taken was 2.20 cm, for a mean of 4.87 centimeters. A thickness measurement was taken on eight of nine recorded *`ulu maika*. Maximum thickness is measured at 4.40 cm and minimum is measured at 3.10 cm, for a mean of 3.81 cm.

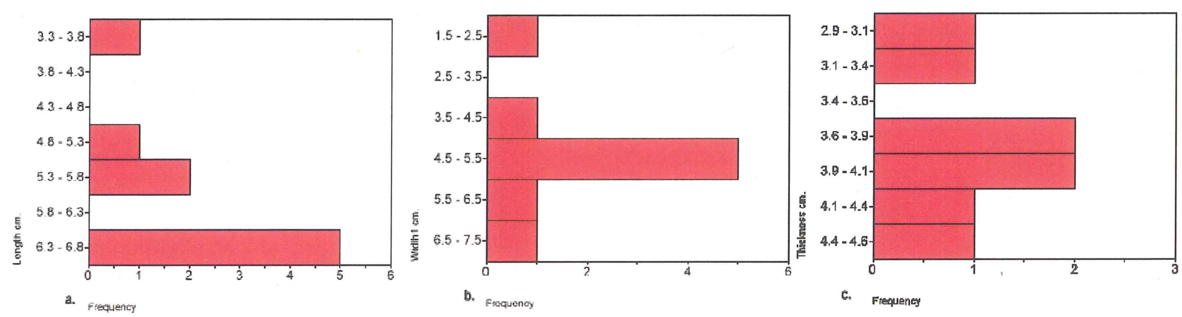


Figure 5-22: Measurements of *`Ulu maika* (n=9) Recorded in the K-1 Road Corridor

a. Length: min= 3.40 cm., max= 6.50 cm., mean= 5.6967 cm., std. deviation= 1.0090 cm., mode = even distribution
b. Width: min= 2.20 cm., max= 6.50 cm., mean= 4.8689 cm., std. deviation= 1.2364 cm., mode = 5.10 cm
c. Thickness: min= 3.10 cm., max= 4.40 cm., mean= 3.8075 cm., std. deviation= 0.4281 cm., mode = 3.90 cm

5.3.2.3 Manufacturing By-product

Cores (n=112), both basalt and volcanic glass, make up 24.9% of the entire artifact assemblage in the K-1 Road Corridor (Figure 5-23). This is a considerable increase in core frequency and percentage of artifact assemblage from the Lua Makika artifact assemblage. Length, measured along the long axis, of cores ranges from 17.00 cm to 2.80 cm for a mean length of 7.91 cm. Width, measured along the short axis, ranges from 14.70 cm to of 2.30 cm for a mean width of 0.65 cm. Finally, thickness of these items ranges from 12.30 cm at its maximum to 1.30 cm at its minimum, for a mean thickness of 4.60 cm.

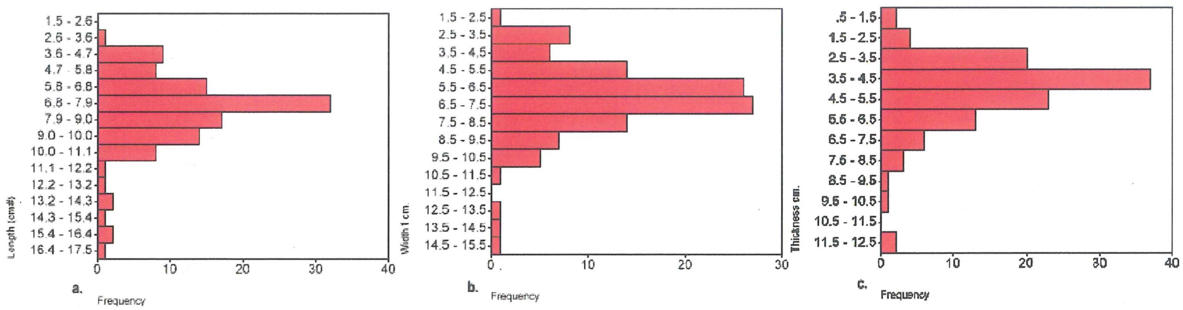


Figure 5-23: Measurement of Cores (n=112) Recorded in the K-1 Road Corridor

a. Length: min= 2.80 cm, max= 17.0 cm, mean= 7.9148 cm, std. deviation= 2.5646 cm, mode = 7.50 cm
b. Width: min= 2.30 cm, max= 14.70 cm, mean= 6.5621 cm, std. deviation= 2.1580 cm, mode = 2.80 cm
c. Thickness: min= 1.30 cm, max= 12.30 cm, mean= 4.5988 cm, std. deviation= 1.8695 cm, mode a= 3.70 cm, mode b= 4.30 cm, mode c= 5.0 cm

Basalt and volcanic glass flakes were observed at 92.7% of all sites and/ or features recorded within the K-1 Road Corridor. Overwhelmingly, 77.5% of these historic properties were low-density assemblages followed by medium-density assemblages at 17.6% and high-density assemblages at 4.9%.

5.3.2.4 Artifacts Associated with Food Preparation.

Scrapers (n=10) and utilized flakes (n=4) constitute 3.1% of the recorded artifact assemblage (Figure 5-24), a significant drop in frequency from the Lua Makika work area. Maximum length, width, and thickness for recorded scrapers measure in at 8.00 cm, 6.00 cm, and 4.50 cm respectively. Minimum length, width, and thickness measures in at 2.70 cm, 1.40 cm, and .90 cm respectively. Mean length, width, and thickness for scrapers equal 5.90 cm, 4.62 cm, and 2.15 cm respectively. Measured from proximal to distal end, the length of utilized flakes recorded in the work area ranges from 10.30 to 5.20 centimeters. Measured from edge to edge, width ranges from 7.60 to 2.60 centimeters. Finally, thickness of utilized flakes ranges from 3.60 to 1.10 centimeters. Because of the low number of recorded utilized flakes, mean was not calculated for length, width, and thickness. Low frequency of utilized/retouched flakes is due to the sampling and recording differences between the recording teams, whereby some of these items were recorded by one team and not by the other.

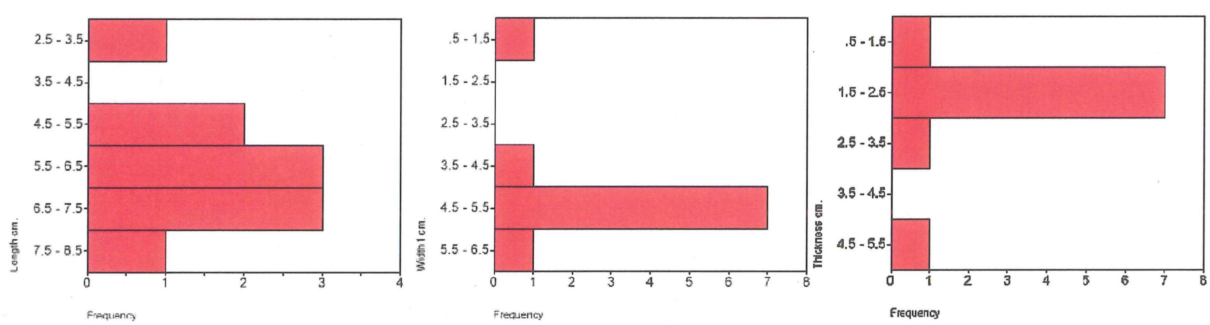


Figure 5-24: Measurements of Scrapers (n=10) Recorded in the K-1 Road Corridor

a. Length: min= 2.70 cm, max= 8.0 cm, mean= 5.90 cm, std. deviation= 1.4855 cm, mode = even distribution
b. Width: min= 1.40 cm, max= 6.0 cm, mean= 4.62 cm, std. deviation= 1.2726 cm, mode = even distribution
c. Thickness: min= 0.90 cm, max= 4.50 cm, mean= 2.150 cm, std. deviation= 0.9324 cm, mode = 1.90 cm

5.3.2.5 Other

Four and two tenths percent (n=19) of the artifact assemblage within the K-1 Road Corridor is made up of artifacts that do not fit into the above categories. Fourteen of these items are made of basalt, three of these items are made of shell, one item is made of ceramic, and one is made of glass.

5.3.3 K-1 Road Bypass

All artifacts recorded within this area, 100% of which are made of basalt, were recorded as isolated finds. Five basalt adz preforms/rejects, five basalt cores, and one basalt hammerstone, totaling 11 isolated finds, were recorded in the K-1 Road Bypass (see Appendix C, Table C-5).

5.3.4 OBOD

Artifacts recorded within the OBOD consist also of isolated finds these items were identified as one basalt core and a single metal fragment from a downed aircraft.

5.4 Determining Site Feature Function Based On The Artifact Assemblage

In Hawaiian archaeology, external architectural features across the cultural landscape are the means by which archaeologists have determined settlement and land-use patterns. Unfortunately, the archaeological record of the inland and intermediate zones of Kaho`olawe Island lack this beacon of interpretation, consisting mainly of artifact and midden scatters with few remnant external structures. This fact makes it difficult to interpret habitation duration and function of sites, features, and settlement areas. Therefore, we must rely on the artifacts and their attributes, site density, midden content, and oral traditions to give us insights into the activities that occurred within the inland and intermediate zones. While it may seem to be an interpretive obstacle, this detail affords us a unique opportunity to examine most of the material culture without the need to excavate and screen the soil as nature has already accomplished that for us.

In an attempt to refine the general functional determination of "activity area", on the basis of material culture, the following model (Figure 5-25) is proposed to evaluate the types of activities that occurred at a historic property or within a settlement zone. By gaining a clearer picture of site function, we will also be able to discern patterns of settlement and land use. This model is based on the surface artifact assemblage and previously described artifact categories.

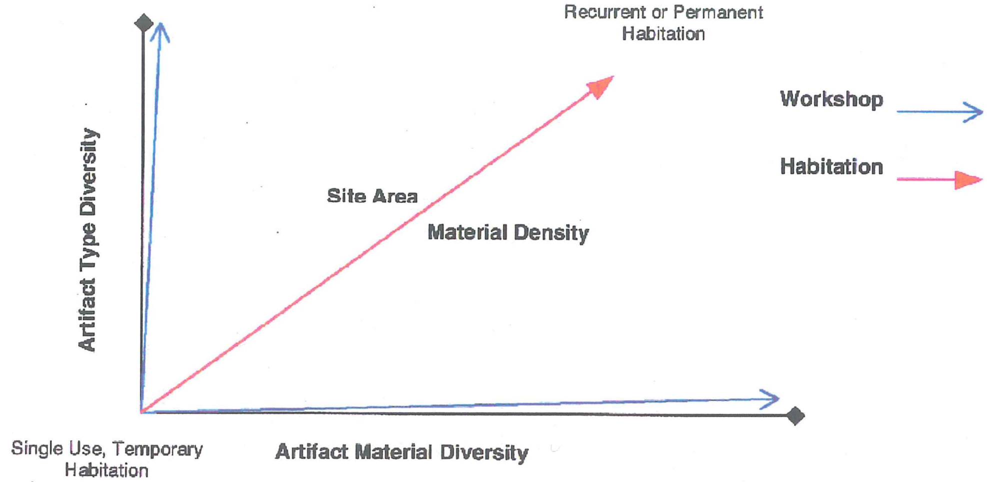


Figure 5-25: Visual Representation of a Site Function and Settlement Model Based on the Surface Artifact Assemblage

5.4.1 Quarries

The foremost distinguishing characteristic of a quarry is the presence of a raw material source followed by a single material type, in addition to implements reflecting a specialized toolkit (Figure 5-26 and Figure 5-27). An additional characteristic that may distinguish a quarry from other workshops is the absence of substantial midden deposits, earth ovens, or other artifacts associated with food preparation (McCoy et.al. 1993). To see if these scenarios are valid measures of function, we turn to the material content of positively identified quarries, lithic workshops, and habitation areas. The expected surface artifact assemblage of a quarry is not plotted in Figure 5-25 because the artifact type and material type diversity are uniform and the line plot would overlap the Y-axis.

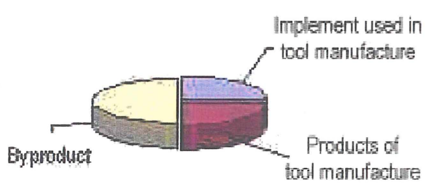


Figure 5-26: Probable Artifact Distribution at a Quarry According to Category.

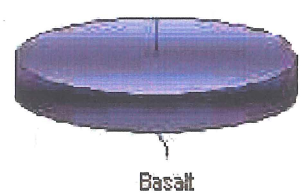


Figure 5-27: Probable Artifact Material Distribution at a Quarry.

Site Complex 108, located along the eastern flanks of Pu`umo`iwi, was recorded during the original NRHP survey; by Patrick McCoy, Akihito Sinoto, and Atwood Makanani (1993) during a Kaho`olawe Island Conveyance Commission survey; and finally by the Recording Team as a part of the current survey in the K-1 Road corridor. The largest and best known of all Pu`umo`iwi quarry sites, for many, Site 108 is synonymous with the Pu`umo`iwi Adz Quarry (McCoy et.al. 1993:65). The dikes exposed along the ridge of features C and D appear to be the quarry source (Appendix B Figure B-22). Looking at the descriptive statistics generated from information compiled by the Recording Team (Figure 5-28), we see that the material culture falls well within the parameters of the proposed model's quarry scenario. We have a homogeneous material type, as well as artifact types reflecting a single activity, that of adz manufacture. Other material characteristics include high artifact density at all three features, presence of a material source, presence of basalt flakes, presence of fractured basalt, and a conspicuous absence of midden remains. Site 108 with its corresponding features is the single historic property recorded in Task Order 07 that fits the profile of a quarry.

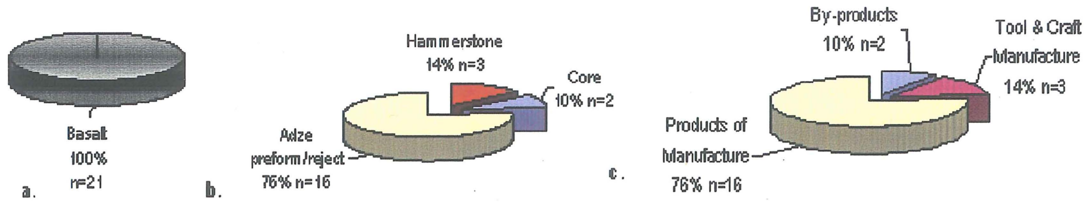


Figure 5-28: Artifact Distribution at Site 108 Features C, D, and H

a. Materials used for artifacts
b. Types recorded
c. Artifact category breakdown.

When we look at the information from the artifact assemblage of five sites at the Mauna Kea Adz Quarry on Hawai`i Island (Figure 5-29), we see a pattern similar to that of Site 108 on Kaho`olawe. Cleghorn (1982:104-106) sampled the artifact assemblage of five workshops at two chipping stations in the Mauna Kea Adz Quarry. When we look at the combined assemblage reported by Cleghorn, we see that this also falls well within the proposed model, with the exception of the absence of basalt cores. This absence of cores may be attributed to the ceremonial facet of adz production, as cores are commonly found on quarry shrines (Cleghorn 1981:104). Like Site 108, we see a single material type being used for artifacts and artifact types solely indicative of stone tool manufacture. Evidence of food consumption is absent, as no midden or artifacts associated with food preparation were reported. As can be expected, debitage was present at all sites sampled, constituting a blank/preform-to-flake mean-weight ratio of 0.54:1.0 grams. For a quarry, the proposed model appears to hold up.

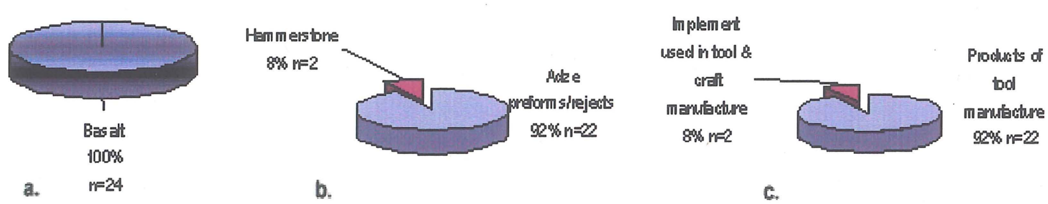


Figure 5-29: Artifact Distribution at Mauna Kea Adz Quarry (Cleghorn 1982:104)

a. Materials used for artifacts
b. Types recorded
c. Artifact category breakdown

5.4.2 Workshops

At a typical workshop, we should see a relatively homogeneous artifact type or artifact material assemblage (Figure 5-30 and Figure 5-31). We can then propose that for a workshop, artifact type diversity will increase while material type remains relatively constant, regardless of site area and density. The inverse of this may be possible in a special situation where you have a single type of toolkit (e.g., fishhook toolkit) and various types of material used (shell, bone, and wood). This scenario, however, would be the exception rather than the rule. It should be noted that workshops might also exhibit some characteristics of a temporary or recurrent habitation, as an extended amount of time may be spent at a particular workshop while in use.

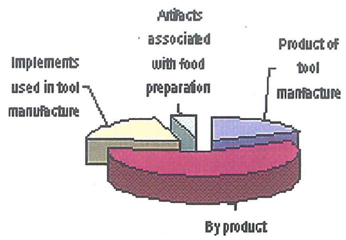


Figure 5-30: Probable Artifact Distribution for a Workshop by Categories

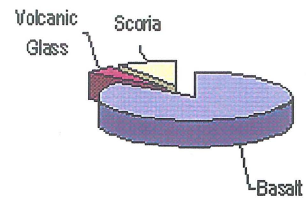


Figure 5-31: Diagram of Probable Materials Used for Artifacts at a Workshop.

Lithic workshops or quarry outlier sites are commonly found some distance from the quarry proper. This would mean that the raw material and/or tools associated with lithic reduction and manufacture have been purposively transported, and the work has been resumed in a new location (McCoy et.al 1993:52). The assemblage at these workshops may reflect those of other outlier lithic workshop sites from known quarry areas, such as Pu`u Kalepeamoa (McCoy 1991) and the Hopukani and Liloe Springs (McCoy 1986) sites on the Big Island. When compiling the artifact information from these assemblages, we see some evidence of food preparation, more so than at a quarry, in addition to tool manufacture. The bulk of the assemblage at Pu`u Kalepeamoa (Figure 5-32) confirms that the main activity was stone-tool manufacture. Basalt makes up 100% of the materials used, a significant amount of debitage was present at 100% of the sites and localities recorded, and the products of manufacture reflect a specialized activity, sinker manufacture. Evidence for food preparation activities at these localities, less than 10% of the entire assemblage, constitutes only a small fraction of the collection.

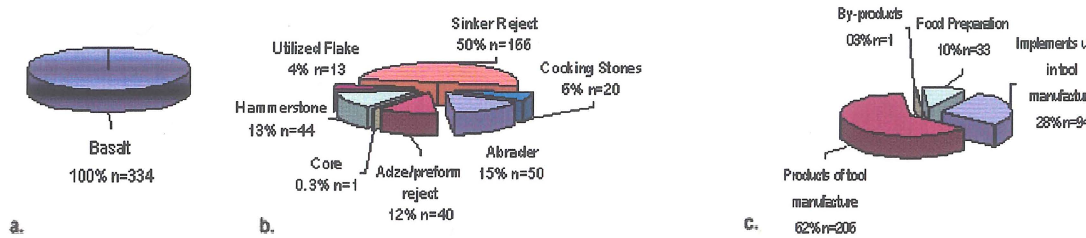


Figure 5-32: Artifact Distribution at Pu`u Kalepeamoa (McCoy 1987:41 and 146)

a. Materials used for artifacts
b. Types recorded
c. Artifact category breakdown

At Hopukani Springs Overhang, Hopukani Rockshelter, and the Liloe Springs Site, the bulk of the artifact assemblage consists of products of manufacture, all of which are adz preforms/rejects (Figure 5-33). Though no specific counts of each type were provided, the remainder of the assemblage consists of hammerstones, hammerstone/abraders, and hammerstone/anvils (McCoy 1986:30,56,and 84). Again, we see that the dominant material is basalt and the artifact types are indicative of a specialized activity, adz manufacture. Although there are no artifactual remains representing food preparation activities at Hopukani and Liloe, there is a small amount of bone (fish and mammal) and marine shell midden present to show that food consumption did occur at these sites. These sites also fall in well with the proposed functional model.

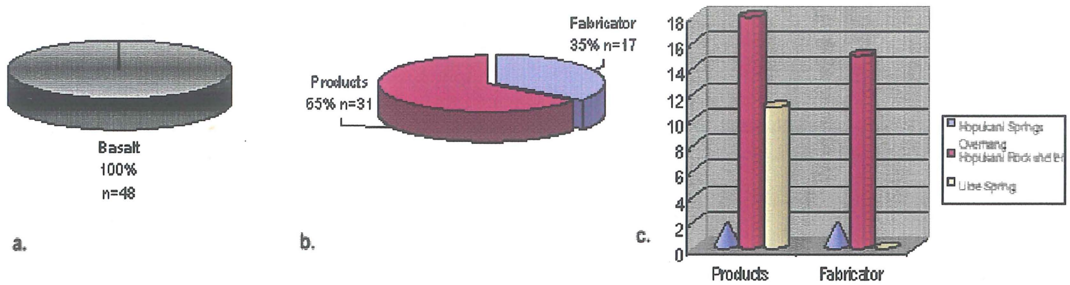


Figure 5-33: Artifact Distribution at Hopukani Overhang, Hopukani Rockshelter, and Liloe Springs (McCoy 1986)

a. Materials used for artifacts
b. Types recorded
c. Artifact category breakdown

Of the historic properties recorded for Task Order 07, Features 393B and 614I fall within the workshop profile. Other features have assemblages with characteristics somewhat indicative of a workshop and require further statistical analysis to verify correlation (see Appendix D).

5.4.3 Habitation

For a typical habitation site, we should see a range of activities represented by highly diverse artifact types and materials in the artifact assemblage (Figure 5-34 and Figure 5-35). We can then posit that as artifact type diversity, artifact material diversity, material density, and site area increases at a relatively even rate, then the length of habitation or recurrent use of the habitation increases.

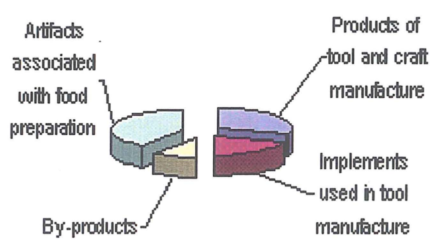


Figure 5-34: Probable Artifact Distribution by Categories for a Habitation Site.

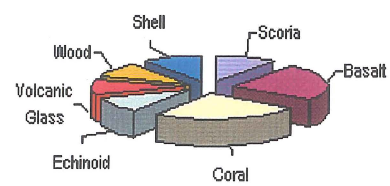


Figure 5-35: Probable Distribution of Artifact Materials Used for Artifacts in a Habitation Site.

As habitation length increases, then artifact content and midden density should also increase to reflect extended or recurrent residence. A further distinction between temporary and permanent habitations that may be used would be the presence of substantive firepits versus shallow overlapping firepits. If permanent habitation, we should see a single, lined firepit feature containing a considerable amount of ash and heat altered soils. If a temporary habitation, we should see a single, shallow firepit or multiple, overlapping firepit features.

If we look at the artifact assemblage of the single test unit laid down during the original NRHP survey at Site 359D, a habitation terrace in the Hakioawa Archaeological District of Kaho`olawe Island, we see that the model does not completely apply. The artifact distribution (Figure 5-36), as determined by the single test unit, reflects what we might expect of a fishhook workshop. However, the overall site description reports the presence of both basalt and volcanic glass cores (manufacturing by-products) scattered across the surface of the feature. Specific counts of these items were not reported and therefore could not be added to the counts depicted in the graphs. Nonetheless, noting these artifacts adds to the overall assemblage variability. Debitage from the test unit, both basalt (n=269) and volcanic glass (n=2097) was collected and counted, adding further to the by-product category and artifact material variability. Moreover, the density of midden that was reported for this test unit is remarkably high. Taken to 70 cmbs, the test unit yielded 3.95 kg of midden, consisting of shell, crustacean, urchin, fish and mammal bone, and miscellaneous items. These counts, however, do no take into account the variety and density that was observed on the surface. While the artifact counts of the single test unit reflect what we would expect of a fishhook workshop, the debitage density, midden density, and uncounted surface artifacts add to a picture of habitation.

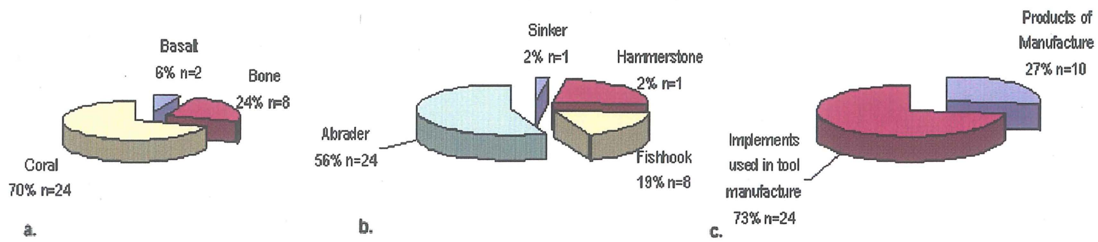


Figure 5-36: Artifact Distribution at Site 395D in the Hakioawa Archaeological District

a. Materials used for artifacts
b. Types recorded
c. Artifact category breakdown

Of the historic properties recorded during the Task Order 07 phase of work, the following sites and features fall within the habitation profile: Site 161, Feature 149 C, Feature 11A, Feature 104 B, Feature 149A, Feature 150 D, and 388 T (see Appendix D). Other sites may fit; however, the correlation would require further analysis of the data set.

Overall, the proposed functional model appears to be a valid predictor of site function as represented by the artifact assemblage. The only deviation from the model is habitation determination. In this case, as with all sites, it would not be prudent to examine the recorded artifact assemblage independently of the other features of the site. It would be wise to look at the overall material culture of the historic property and take into account other variables such as midden density, debitage density, and presence or absence of fireplaces. The proposed model is designed to be and will be used here as an aid, another piece of the puzzle, for site function determination in the upland zones.

5.5 Adz Manufacture for Domestic Use or Export

Shield volcanoes and basaltic magma are the most important elements in the development of the Hawaiian Islands; consequently, basalt was the chief material available for tool manufacture. Because the flaking characteristics of basalt are highly variable, even within a single source area, the material is fairly difficult to work with, compared to high-silica materials (e.g. chert and obsidian). These flaking qualities range from dense and fine-grained, to coarsely grainy, to completely un-flakeable (Whittaker 1994: 69). The most sought out type of basalt for tool and craft manufacture is extremely dense and fine-grained basalt with high silica content. Tool quality basalt is difficult to come by and occurs, for the most part, in small discrete patches throughout the island chain. Next to Mauna Kea Adz Quarry, Kaho`olawe Island possesses one of the premier quarrying sites in Hawai`i. Understanding the role this valuable resource may have played in the economic patterns of island use is key to understanding the overall lifeways of the people who lived on Kaho`olawe and their adaptations to the severe landscape of the island. The important question that addresses this unique resource and the exploitation of this resource is whether adzes were manufactured for domestic use or primarily for export. While discussion and modeling of adz manufacturing sequences have gained a fair amount of attention, modeling lithic procurement strategies in Hawaiian archaeology is a relatively recent development. Gaining insight into specialized lithic procurement strategies is essential when thinking about the archaeological record with regard to adz manufacture and its implications for the existence or non-existence of an adz export industry on Kaho`olawe. Patrick McCoy (1990) applied a variation of optimal-foraging subsistence models to lithic procurement strategies at the Mauna Kea Adz Quarry, the contention being that the term, subsistence, should be taken beyond food-getting activities and should encompass tool manufacture, clothing provisions, and shelter attainment. This concept and its potential application for addressing the economic patterns of resource exploitation on Kaho`olawe is explored further in this analysis.

Optimization pertains to the efficiency, relative to time or energy costs, with which certain activities are performed, working under the assumption that increased efficiency relative to a standard of performance leads to a relative increase in fitness (economic returns or rewards) (Winterhalder 1981). McCoy (1990) characterizes the Mauna Kea Adz Quarry as a course-grained patchy environment (Winterhalder 1981, 1987). He then postulates that the further removed from the raw material patch, the more uniform the waste flake assemblage. This would be the material correlate illustrating the adz makers' efforts to minimize the amount of energy expended in the transport of prepared blanks and preforms. Thus, adzes may become smaller with increasing distance from the source, because of the increasing transport costs (Lass 1994:14) of the larger items. If stone tools were being manufactured primarily for export and trade, a similar pattern may occur with the basalt resources of inland Kaho`olawe. When looking at Kaho`olawe in its political context, as an *ahupua`a* in the Honua`ula District (PBR Hawaii 1995:3-2), the basalt resources of the island can be regarded as a patch, as it is cut off from the rest of the district by Alalakeiki channel. Therefore, if adzes manufactured on Kaho`olawe were primarily for export, we could then presume that people would want to capitalize on their time spent at the quarry, whereby the goal is to maximize returns in the quantity produced for the amount of energy and time expended in the quarry and during transport. If this holds true, then we could expect the following:

- **Assumption**: The adz maker would want to maximize the amount of time spent in the quarry and workshop by reducing as many preforms as possible to an easily transportable size, rather than taking that time to take the adz to is final polished form.

  Material correlate: The frequency of adz preforms/rejects in the inland areas would be greater than the frequency of finished adzes.

- **Assumption**: The adz maker would want to maximize the amount of returns and minimize the cost of transport.

  Material correlate: The length, width, and thickness of preforms/rejects would lean toward small, uniform sizes and would plot accordingly. This would increase the number of transportable preforms and minimize the cost of transporting such items to the coast and across the channel for trade.

If adzes manufactured on Kaho`olawe were primarily for domestic use, then we could expect the following:

- **Assumption**: The adz maker would be producing adzes for immediate use and consequently take the adz to its final form as a part of the manufacturing process.

  Material correlate: The frequency of adz preforms/rejects occurring with artifact assemblages in the inland zones would be comparable to the frequency of finished adzes.

- **Assumption**: The adz maker would want to produce adzes for various day-to-day tasks occurring on the island – from tree felling to fine wood carving.

  Material correlate: The range of sizes would vary from the very large to very small and would be charted on a scatterplot accordingly.

The artifact information that was gathered during the Task Order 07 phase of this project might help us to sort out these assumptions. For the purpose of this section, the artifact assemblage of Lua Makika and K-1 Road is analyzed by work area and as a combined assemblage representing the cultural material of the upland zones. Items around Pu`umo`iwi are considered to be in the intermediate zone; however, they are analyzed along with the rest of the assemblage as these items are directly related to the quarrying industry.

5.5.1 Finished Adzes to Adz Preforms/Rejects

Strictly examining the artifact assemblage recorded during Task Order 07, the numbers reflect what we would expect of an export industry. By work area (Figure 5-37), the ratio of finished adzes to adz preforms/rejects at Lua Makika is 1:7.57. The ratio of finished adzes to adz preforms/rejects is dramatically different in K-1 Road Corridor at 1:61.5. This difference in numbers is not surprising, considering the proximity of K-1 Road to the main quarry of Pu`umo`iwi. You would expect that there would be a significant increase of preforms/rejects to finished adzes near the main manufacturing area if they were not residing near the quarry or taking tools to the final finishing stages. Regardless of the differences between the two numbers, the fact remains that, within the overall recorded artifact assemblage (Figure 5-38), for every one finished adz in the upland area covered by Task Order 07 there are upwards of ten adz preforms/rejects. This material assemblage correlates with the assumption posed for the export scenario. The adz maker(s), in an attempt to maximize time spent at the quarry and the overall returns, increased the production of adz preforms, rather than sacrificing that time at the quarry to finish and polish an adz.

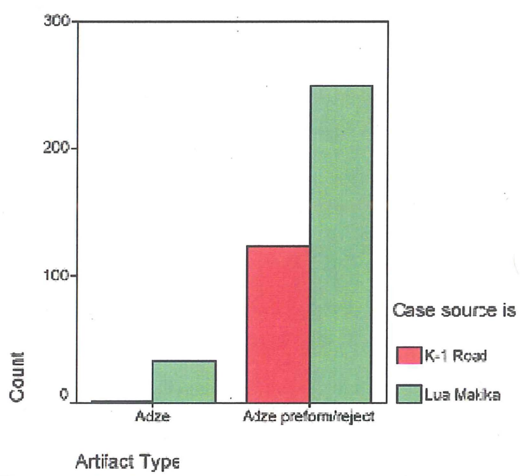


Figure 5-37: Breakdown of Adz and Adz Preform/Reject Frequency by Work Area

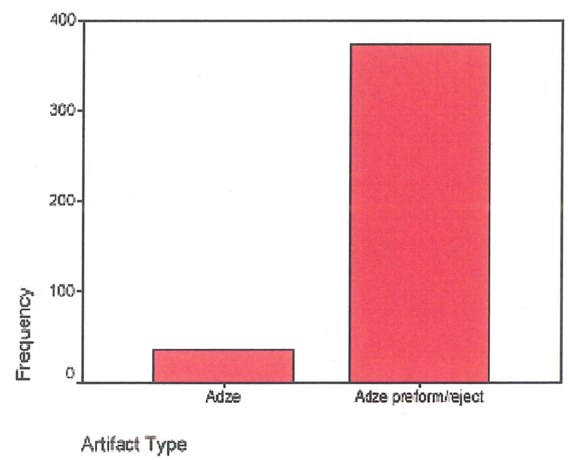


Figure 5-38: Breakdown of Adz Preform/Reject Frequency for the entire inland assemblage recorded for Task Order 07

5.5.2 Analysis of size

An additional avenue of inquiry into this question of adz production for domestic or trade purposes, would be an analysis of artifact dimensions. If the primary intention of adz production was for export and trade, then the following assumption can be made:

The adz maker would want to increase economic returns by minimizing the cost of product transport.

The material correlate of this statement would be represented by a uniform length, width, and thickness of preforms/rejects leaning toward smaller sizes. This would increase the number of transportable preforms and minimize the cost of transport of such items to the coast and across the channel for trade or use, logically following that it is more costly to transport large, heavier blanks than it is to transport smaller prepared preforms. If, however, adzes were being made for use of island residents, the following statement would hold true:

The adz maker would want to produce adzes for various day-to-day tasks occurring on the island, from tree felling or shrub clearance to fine woodcarving.

In the artifact assemblage, this would be represented by a wide range of adz preform/reject dimensions, from the very large to the very small. This would plot randomly, with no major point clusters or with several point clusters throughout the scatterplot.

For purposes of analysis, length was disregarded when considering the actual size of adz preform/rejects, as a large number were partial length measurements due to breakage. Using actual length in examining size would skew the data and give a false representation of adz preform size. To rectify this, the ratio of mean width to mean thickness was calculated to try to get at mean length. The result was a mean width to thickness ratio of 2:1 for Lua Makika, 3:1 for K-1 Road Corridor, and overall 2:1 for the entire assemblage of adz preforms/rejects. McCoy (1981) recorded a mean length:width:thickness ratio of 4:2:1 for whole preforms collected from shrines at Mauna Kea Adz Quarry. It is this ratio that is used to calculate size.

When the assumed length, actual width, and actual thickness are plotted (Figure 5-39) we see first that the dimensions of the Lua Makika preforms/rejects, for the most part, plots on top of the dimensions of preforms/rejects in the K-1 Road corridor, with only a few outliers. The second trend we see is the clustering of preforms/rejects around the mid-size range instead of being evenly and randomly distributed throughout. Like the frequency analysis of preforms/rejects to finished adzes, the size range also follows that which might be found in areas focusing on an export industry.

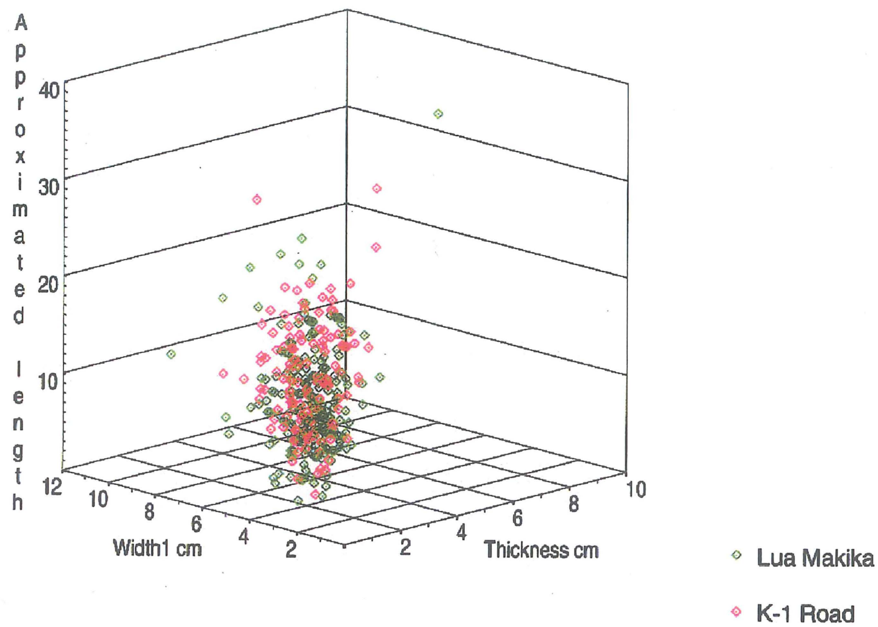


Figure 5-39: Dimensions of Adz Preforms/Rejects at Lua Makika and K-1 Road Corridor With Approximated Length.

To test this line of inquiry further, actual width and thickness measurements were plotted, using the *Statistical Product and Service Solution* program, with a fit line running through the subgroups and total population (Figure 5-40). Again, the trend is similar, with the distance between the regression line of the sub-groups being minor and that of the total population fitting nicely between the two. When weighting the cases to determine the goodness of fit, all cases fall well within a normal distribution. Accordingly, what we have here is an emphasis on or preference for a specific size rather than a variation of sizes. The adz preform/reject assemblage recorded during the Task Order 07 phase of work correlates to what we might expect to find in an export-focused adz-manufacturing industry. The assumption again is that the adz maker, in an effort to increase their yield and thus maximize the returns or rewards, would try to minimize the cost of transport across the landscape or channel. This effort would result in the predominance of uniformly sized and easily transportable adz/preforms.

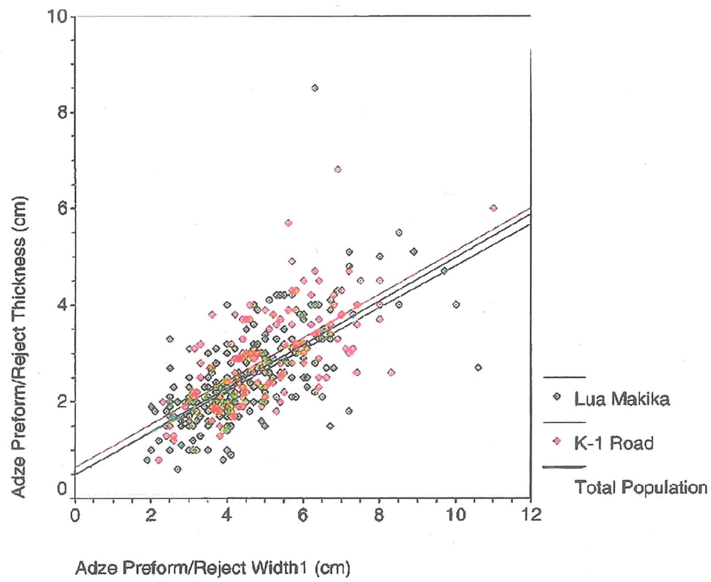


Figure 5-40: Scatterplot of Actual Width and Thickness (Note that the fit lines for Lua Makika and K-1 Road are close in proximity and that the fit line for the mean population falls between the two.)

If we then turn to hammerstone dimensions, we can see that the focus was indeed on manufacturing smaller prepared preforms over a more diverse assemblage. Here we assume that large hammerstones were used for primary reduction and removal of cortex to get at the fine-grained dense material. As the reduction sequence became more intricate with the removal of smaller flakes, the hammerstone being used would also be smaller thus adding to the manufacturer's control for size and direction of flake removal. When we look at the overall size of the hammerstone assemblage for both work areas (Figure 5-41), we don't see any size difference between the K-1 Road and Lua Makika work areas thus illustrating an overall preference for small to mid-sized hammerstones. When we then plotted the width and thickness measurements, as length of a hammerstone would be incomplete due to the nature of its use, an interesting trend came up in the scatterplot. There appears to be a preference for two size types (Figure 5-42). A small number of hammerstones in the assemblage falls in to the one-to-three centimeter size range. Hammerstones of this size is often associated with volcanic glass reduction. The small size would allow for greater flaking control over this delicate material. The majority of the assemblage, however, falls in to the four-to-eight centimeter size range. It is this size hammerstone that would have allowed for better control of the lithic reduction process for the manufacture of smaller adz preforms, as well as, the final reduction stages of the adz manufacturing sequence. When a fit line was run through the points of each work area, we see that, again, they lie in close proximity to each other and converge at the furthest point thus showing no significant distinction between hammerstone size according to work area. With all of this in mind, it can be concluded that in the Task Order 07 work areas there is a an overall preference for hammerstones that are conducive to the production of smaller more uniformly sized adz preforms, rather than a range of adz preform sizes.

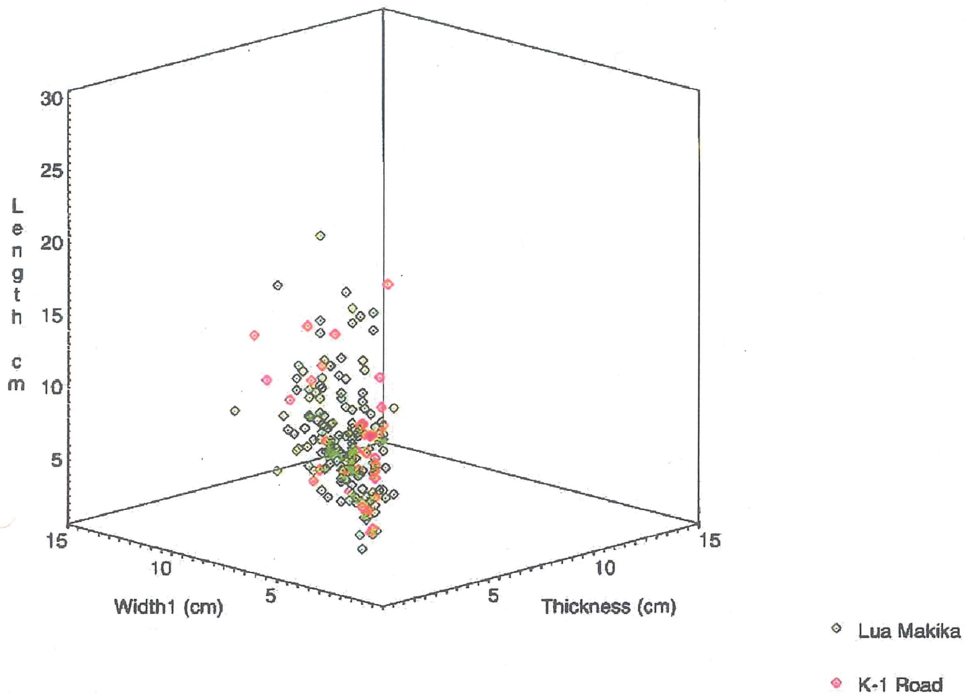


Figure 5-41: Dimensions of Hammerstones at Lua Makika and K-1 Road Corridor.

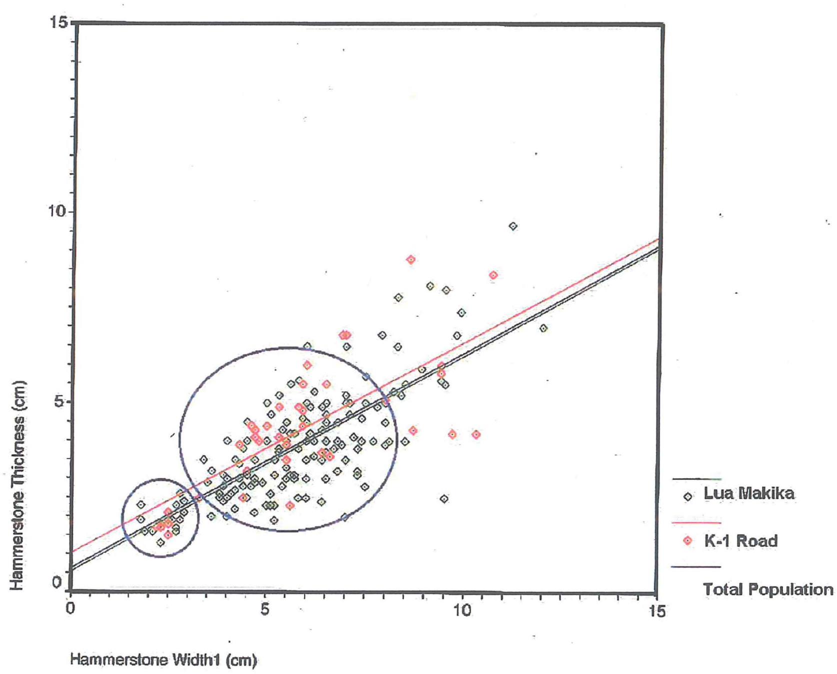


Figure 5-42: Scatterplot of Hammerstone Width and Thickness (Note that the fit lines for Lua Makika and K-1 Road are close in proximity, merging at the furthest point, and that the fit line for the mean population aligns with Lua Makika.)

5.5.3 Discussion of results

In the context of this analysis and within the limits of this project and phase of work, the artifact assemblage, where adz manufacture is concerned, reflects a focus on adz export. The prevalence of adz preforms/rejects over finished adzes and the marked uniformity in size of these items in both of the major work areas of this task order strongly supports this notion. Manufacture of basalt tools for export on Kaho`olawe is compatible with its political context, as a part of the Honua`ula District. One could argue that uniformity in size preference is a function of adz manufacture for a specified task (e.g., canoe building). If uniformity in size is a reflection of a preferred size for canoe building or house building, it does not rule out the adz manufacture for export hypothesis but may in fact support it further. Given the extreme aridity of Kaho`olawe Island, as the entire island sits in the rain-shadow of Haleakala, it is likely that the native vegetation consisted primarily of scrub forest (Warren and Aschmann 1993, Myhre 1970, Warren et.al. 1994) comparable to that of leeward environments on other Hawaiian Islands. It is unlikely that canoe building on the island was a common task, as much of the wood required (see Kamakau 1976: 118-122) for canoes would not be found on Kaho`olawe, but elsewhere within the district. If canoe builders came to Kaho`olawe to make the adzes used in their work, they were likely taking the items off the island. Further work and the accumulation of artifact information from future Task Orders may serve to refine the current hypotheses with regards to adz manufacture. However, the information available from Task Order 07 recording supports the likelihood of an export industry.

Section 6 Significance and Recommendations

6.1 Significance Assessments and Recommended Treatments

The four categories used in the site significance evaluation process are based on the National Register criteria for evaluation, as outlined in the Code of Federal Regulations (36 CFR Part 60). These criteria are also used by the State Historic Preservation Office to evaluate historic and cultural properties. Two bulletins prepared by the National Park Service are followed during the evaluation process. The four National Register criteria of significance (A through D) are outlined in *How to Apply the National Register Criteria for Evaluation* (National Register Bulletin 15). Historic properties that are considered significant due to their *cultural* value are assigned significance based on any of the four criteria, following the application of the *Guidelines for Evaluation and Documenting Traditional Cultural Properties* (National Register Bulletin 38). Sites may be considered significant under one or more of these criteria, which are briefly discussed below.

Historic properties may be evaluated as significant according to criterion A if they "are associated with events that have made a significant contribution to the broad patterns of our history" (National Register Bulletin 15:12). Events are defined as either "a specific event marking an important moment in American prehistory or history (or) a pattern of events or a historic trend that made a significant contribution to the development of a community, a state, or the nation" (ibid.).

Historic properties may be evaluated as significant according to criterion B if they "are associated with the lives of persons significant in our past" (National Register Bulletin 15:14). Significant persons in our past "refers to individuals whose activities are demonstrably important within a local, State, or national historic context" (ibid.).

Sites may be evaluated as significant according to criterion C if they "embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction" (National Register Bulletin 15:17).

Historic properties may be evaluated as significant under criterion D "if they have yielded, or may be likely to yield, information important in prehistory or history" (National Register Bulletin 15:21). Criterion D generally applies to sites "that contain or are *likely* to contain information bearing on an important archaeological research question" (ibid.).

A Traditional Cultural Property is a location "that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history and (b) are important in maintaining the continuing cultural identity of the community" (National Register Bulletin 38:1). Traditional Cultural Properties, as well as all historic properties, may derive significance under one or more of the four National Register criteria.

6.1.1 Specific Assessments and Recommendations

Significance assessments and recommendations for the sites in each of the Task Order 7 work areas are summarized in Tables 6-1 through 6-4. Because all historic properties are located within the Kaho`olawe Archaeological District, they are all considered significant for their information content and research potential under National Register criterion D. However, many of the properties are significant under multiple criteria. Following is a brief discussion of each of the groups of historic properties that have similar significance assessments.

Three Traditional Cultural Properties (TCP) have been identified by the Kaho`olawe Island Reserve Commission: Kealaikahiki, Site 773; Pu`umo`iwi, Site 772; and Moa`ulanui, Site 771. Based on the above Federal criteria, the Traditional Cultural Properties are considered significant under National Register criterion A being associated with a pattern of events that made a significant contribution to the development of the Hawaiian community.

Sixty-five of the sites in the Task Order 7 work areas (Base Camp=13; K-1 Road=49; OB/OD=1; Seagull=1) are assessed as significant for information content only under National Register criterion D (Tables 6.1 through 6.4)). These sites contain information that, if collected, may assist in the research of questions relating to the history and prehistory of Kaho`olawe Island, as well as to Hawaiian history in general.

A majority of the sites and features (Base Camp=1; K-1 Road=70; Lua Makika=161) are assessed as significant for information content (criterion D) and for their association with events that have made a significant contribution to the broad patterns of Hawaiian history (Criterion A). Feature C of Site 712 is a World War II era bunker and is assessed as significant for its association with a significant event in history. The remaining 231 of these sites are assigned significance under criterion A because they are located in one of the three Traditional Cultural Properties that either partially or entirely comprise the Lua Makika, K-1 Road, and Base Camp work areas.

The final seven sites and features derive significance from National Register Criteria A, C, and D, meaning that they are important for their information content and research potential, as excellent or unique examples of a site or property type, and for their association with significant historical events or patterns of events. Features A and B of Site 712 are World War II era bunkers that are in excellent states of preservation and are associated with a significant event in history (World War II). The other five sites and features (Sites 101, 102, 103 Feature A, and 149 Features A and B) are all artifact scatters in the Lua Makika work area (Moa`ulanui TCP) that are excellent examples of the habitation/activity area and ceremonial sites around the rim of the Moa`ulanui crater in the Inland Settlement Zone.

6.1.2 Recommended Treatments

To facilitate management decisions regarding the treatment of historic properties, CSH has made specific recommendations for each site and feature that are summarized in Tables 6.1 through 6.4. The treatments of the historic properties during the cleanup process are regulated by the Site Protection Agreement contained in the Regulatory Framework Pursuant to the May 6, 1994, Memorandum of Understanding Between the United States Department of the Navy and the State of Hawai`i Concerning the Island of Kaho`olawe, Hawai`i. The primary guiding principle of the Site Protection Agreement is that historic properties be protected from adverse impacts during the cleanup process. Because all sites and features recorded in the Task Order 7 work areas are considered significant under one or more of the National Register Criteria , archaeological monitoring of all activities relating to Tier 1 clearance has been recommended. Due to the nature of the Tier 1 clearance activities, it was determined that monitoring would be sufficient to effectively mitigate all potential adverse impacts to the historic properties. Decisions regarding the exact mitigation measures to be employed during Tier 2 clearance activities must be made on a site by site basis, depending on the precise nature of the anticipated impacts and on the nature of the historic property.

The scatters of aircraft wreckage will be collected during Tier I clearance activities and will not require further treatment recommendations for Tier 2 clearance or any future actvities.

Table 6-1. Summary of Significance Assessments and Recommended Treatments; Base Camp Work Area

★SIHP Number	Feature	Feature Type	Feature Function	Probable Age ‡	Subsurface Cultural Materials	Significance †	Research, Educative, Interpretive Potential	Recommended Treatments ✱	
								Tier 1 Clearance & Tier 2 Detection	Long Term
131	A	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
131	B	Enclosure	Activity Area, Ceremonial	PH	Observed	D	Med-High	M	PAI
131	D,F	Scatter	Activity Area	PH	Observed	D	Med-High	M	P
131	E	Scatter	Activity Area	PH	Potential	D	Low	M	P
131	G*	Complex	Activity Area	PH	Observed	D	Med-High	M	P
265	-	Complex	Indeterminate	PH	Potential	D	Low	M	P
266	-	Enclosure	Indeterminate	PH	Potential	D	Med-High	M	P
267	A,B	Enclosure	Indeterminate	PH	Potential	D	Med-High	M	P
268	A	C shape	Habitation, Activity Area	PH	Potential	D	Med-High	M	P
268	B	Terrace	Habitation, Activity Area	PH	Potential	D	Med-High	M	P
268	C	C shape	Habitation, Activity Area	PH	Potential	D	Med-High	M	P
270	-	Platform	Ceremonial	PH	Potential	A, D	High	M	PAI
710	-*	Complex	Shelter	PH	Potential	D	Med-High	M	P
712	A*	Bunker	Storage	H	No Potential	A, C, D	Med-High	M	PAI
712	B*	Bunker	Storage	H	No Potential	A, C, D	Med	M	P
712	C*	Bunker	Storage	H	No Potential	A, D	Med	M	P
714	-*	Modified Outcrop	Indeterminate	I	No Potential	D	Med-High	M	P

★State Inventory of Historic Places (SIHP) numbers are five-digit numbers prefixed by 50-20-97

* Newly discovered site/feature

‡ Probable Age

PH: Prehistoric
H: Historic

† Significance Categories

A = Important for historical contribution to significant events and/or broad patterns of history
B = Important for association with the lives of significant persons in history
C = Excellent or unique example of a site type, period of occupation, or method of construction
D = Important for information content for research potential

✱ Recommended Treatment

M = Monitoring
P = Preservation
PAI = Preservation "as is"
DR = Further Data Recovery required
EDR/S = Sites or features that may require emergency data recovery or stabilization efforts to prevent the loss of firepit features or intact cultural deposits observed eroding out of the unstable edges of hummock

NA = Not Applicable

Table 6-2. Summary of Significance Assessments and Recommended Treatments; K-1 Road Work Area

★SIHP Number	Feature	Feature Type	Feature Function	Probable Age ‡	Subsurface Cultural Materials	Significance †	Research, Educative, Interpretive Potential	Recommended Treatments ✱	
								Tier 1 Clearance & Tier 2 Detection	Long Term
103	A	Scatter	Activity Area	PH	Observed	A, C, D	High	M	PAI
103	B	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P
103	C	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
103	D	Scatter	Activity Area	PH	No Potential	A, D	Low	M	P
103	E	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
103	F	Scatter	Activity Area	PH	No Potential	A, D	Low	M	P
108	C	Scatter	Quarry	PH	Observed	A, D	High	M	PAI
108	D	Scatter	Quarry	PH	Observed	A, D	High	M	PAI
108	H	Scatter	Quarry	PH	Observed	A, D	High	M	PAI
111	A	Scatter	Habitation, Activity Area	PH	Observed	D	Med-High	M	P
111	N	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
111	O	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
111	C	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
111	L	Scatter	Activity Area	PH	Potential	D	Low	M	P
111	P	Scatter	Activity Area	PH	Potential	D	Low	M	P
111	U*	Scatter	Activity Area	PH	No Potential	D	Med-High	M	P
195	O	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
195	P	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
195	Q	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P
195	R	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
195	S	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
195	AA	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
195	AC	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
195	BK	Scatter	Activity Area	PH	No Potential	A, D	Low	M	P
195	BM	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
195	BN	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
195	BO	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
195	BP	Scatter	Activity Area	PH	No Potential	A, D	Low	M	P
195	BQ	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
195	BR	Scatter	Activity Area	PH	No Potential	A, D	Low	M	P
195	BS	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
195	BT	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
195	BZ	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
195	CA	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
195	CB	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
195	DI	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
195	DJ	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
195	DL	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
195	DN*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P

★SIHP Number	Feature	Feature Type	Feature Function	Probable Age ‡	Subsurface Cultural Materials	Significance †	Research, Educative, Interpretive Potential	Recommended Treatments ✱	
								Tier 1 Clearance & Tier 2 Detection	Long Term
195	DO*	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
196	A	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
196	B	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
196	C	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
196	D, E, F	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
196	G	Scatter	Activity Area	PH	Observed	D	Med-High	M	P
196	S	Scatter	Activity Area	PH	No Potential	D	Low	M	P
196	T	Scatter	Activity Area	PH	No Potential	D	Med-High	M	P
196	U	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
196	V	Scatter	Activity Area	PH	No Potential	D	Low	M	P
196	W	Scatter	Activity Area	PH	No Potential	D	Med-High	M	P
196	X	Scatter	Activity Area	PH	Observed	D	Med-High	M	P, EDR/S
196	Y	Scatter	Activity Area	PH	No Potential	D	Med-High	M	P
196	Z	Scatter	Activity Area	PH	No Potential	D	Med-High	M	P
196	AA, AB	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
196	AD	Scatter	Activity Area	PH	No Potential	D	Med-High	M	P
196	AF	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
196	AG	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
196	AH	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
196	AI	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
196	AK	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
204	-	Scatter	Activity Area	PH	No Potential	D	Med-High	M	P
205	E	Scatter	Activity Area	PH	Potential	D	Low	M	P
205	F	Scatter	Activity Area	PH	Potential	D	Med-High	M	P, EDR/S
205	G	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
205	H	Scatter	Activity Area	PH	No Potential	D	Low	M	P
214	A	Scatter	Activity Area	PH	Potential	D	Med-High	M	P, EDR/S
214	B	Scatter	Activity Area	PH	No Potential	D	Med-High	M	P
214	C	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
214	D*	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
248	A	Scatter	Activity Area	PH	No Potential	D	Med-High	M	P
248	B	Scatter	Activity Area	PH	Potential	D	Low	M	P
281	-	Cairn	Marker	H	Potential	D	Low	M	P
385	A	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
385	B	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
385	C	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
385	D	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P

★SIHP Number	Feature	Feature Type	Feature Function	Probable Age ‡	Subsurface Cultural Materials	Significance †	Research, Educative, Interpretive Potential	Recommended Treatments ✱	
								Tier 1 Clearance & Tier 2 Detection	Long Term
385	E	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
385	F	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
385	O	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
385	P	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
388	A	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
389	A	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
389	B	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
390	A	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P
390	B	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
390	C	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P, EDR/S
391	A	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
391	B	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
391	C	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P
391	D	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P, EDR/S
392	B	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
392	D	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
392	E	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
393	A	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
393	B	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
614	A,B	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
614	C	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
614	D	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
614	E	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
614	F	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
614	G	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
614	H	Scatter	Activity Area	PH	Potential	A, D	High	M	P
614	I	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
614	J	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
614	AA*	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
614	AB*	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
614	AC*	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
737	*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
740		Scatter	Activity Area	PH	Potential	D	Med-High	M	P
741	*	Scatter	Habitation, Activity Area	PH	Potential	A, D	Med-High	M	P
744	*	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
745	*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
746	*	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
747	*	Scatter	Activity Area	PH	Potential	D	Med-High	M	P
752	-*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
753	-*	Scatter	Indeterminate	PH	No Potential	D	Low	M	P
754	-*	Fence	Animal Husbandry	H	Observed	D	Low	M	P
755	-*	Fence	Animal Husbandry	H	Potential	D	Low	M	P

★SIHP Number	Feature	Feature Type	Feature Function	Probable Age ‡	Subsurface Cultural Materials	Significance †	Research, Educative, Interpretive Potential	Recommended Treatments ✱	
								Tier 1 Clearance & Tier 2 Detection	Long Term
756	-*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
757	-*	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P

★ State Inventory of Historic Places (SIHP) numbers are five-digit numbers prefixed by 50-20-97

* Newly discovered site/feature

‡ Probable Age

PH: Prehistoric
H: Historic

† Significance Categories

A = Important for historical contribution to significant events and/or broad patterns of history
B = Important for association with the lives of significant persons in history
C = Excellent or unique example of a site type, period of occupation, or method of construction
D = Important for information content for research potential

✱ Recommended Treatment

M = Monitoring
P = Preservation
PAI = Preservation "as is"
DR = Further Data Recovery required
EDR/S = Sites or features that may require emergency data recovery or stabilization efforts to prevent the loss of firepit features or intact cultural deposits observed eroding out of the unstable edges of hummock

NA = Not Applicable

Table 6-3. Summary of Significance Assessments and Recommended Treatments; Lua Makika Work Area.

★SIHP Number	Feature	Feature Type	Feature Function	Probable Age ‡	Subsurface Cultural Materials	Significance †	Research, Educative, Interpretive Potential	Recommended Treatments ✱	
								Tier 1 Clearance & Tier 2 Detection	Long Term
101	-	Complex	Habitation, Activity Area, Ceremonial	PH	Observed	A, C, D	High	M	PAI
102	-	Scatter	Habitation, Activity Area	PH	Observed	A, C, D	High	M	PAI
104	A	Scatter	Habitation, Activity Area	PH	Observed	A, D	Med-High	M	P
104	B	Scatter	Habitation, Activity Area	PH	Observed	A, D	Med-High	M	P, EDR/S
104	C	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
104	D	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
104	E	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
104	F	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
104	G	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
104	H	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
104	I	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
104	J	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
104	K	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
104	L	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
104	M	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
133	A	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
133	B*	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
144	-	Scatter	Activity Area	PH	No Potential	A, D	Low	M	P
149	A	Scatter	Habitation, Activity Area	PH	Observed	A, C, D	High	M	PAI
149	B	Scatter	Habitation, Activity Area	PH	Observed	A, C, D	High	M	PAI
149	C	Scatter	Habitation, Activity Area	PH	Observed	A, D	High	M	P
150	A	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
150	B	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P
150	C	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P
150	D	Complex	Habitation, Activity Area	PH	Observed	A, D	High	M	PAI
150	E	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
150	F	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
150	G	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
150	H	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
150	I	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P
150	J	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
150	K	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P
150	L	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P

★SIHP Number	Feature	Feature Type	Feature Function	Probable Age ‡	Subsurface Cultural Materials	Significance †	Research, Educative, Interpretive Potential	Recommended Treatments ❋	
								Tier 1 Clearance & Tier 2 Detection	Long Term
150	M	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
150	N	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
150	O	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P
150	P	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
150	Q	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
150	R	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
150	S	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
150	T	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
150	U	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P
161	-	Scatter	Habitation, Activity Area	PH	Observed	A, D	High	M	P, EDR/S
381	-	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
382	-	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P
386	-	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
387	-	Scatter	Activity Area	PH	No Potential	A, D	Low	M	P
388	B	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
388	C	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
388	D	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
388	E	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
388	F	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
388	G	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
388	H	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
388	I	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
388	J	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
388	K	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
388	L	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
388	M	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
388	N	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
388	O	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
388	P	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
388	Q	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
388	R	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
388	S	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
388	T	Scatter	Habitation, Activity Area	PH	Observed	A, D	High	M	P, EDR/S
389	C	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
393	D	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
393	E	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
394	A	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
394	C	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
394	D	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
394	E	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P

★SIHP Number	Feature	Feature Type	Feature Function	Probable Age ‡	Subsurface Cultural Materials	Significance †	Research, Educative, Interpretive Potential	Recommended Treatments ❋	
								Tier 1 Clearance & Tier 2 Detection	Long Term
394	F	Scatter	Activity Area	PH	No Potential	A, D	Low	M	P
394	G	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
394	H	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
394	J	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
394	K	Scatter	Activity Area	PH	No Potential	A, D	Low	M	P
394	M	Scatter	Activity Area	PH	No Potential	A, D	Low	M	P
395	A	Scatter	Activity Area	PH	No Potential	A, D	Low	M	P
395	B	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
395	C	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
395	D	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
395	E	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
395	F	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
397	A	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
397	B	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
397	C	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
397	D	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
398	A,B	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
398	C	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
399	A	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
399	B	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
399	C, D	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
399	E	Scatter	Activity Area	PH	Potential	A, D	High	M	P, EDR/S
399	F	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
399	G	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
400	A	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P, EDR/S
400	B	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
400	C	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
400	D	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
401	A	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
401	B	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
401	C	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
401	D	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P, EDR/S
401	E	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
401	F	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
401	G	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
401	H	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
401	I	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
401	J	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P

★SIHP Number	Feature	Feature Type	Feature Function	Probable Age ‡	Subsurface Cultural Materials	Significance †	Research, Educative, Interpretive Potential	Recommended Treatments ✱	
								Tier 1 Clearance & Tier 2 Detection	Long Term
401	K	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
401	L	Scatter	Activity Area, Midden	PH	Potential	A, D	Med-High	M	P
401	M	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
401	N	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
402	A	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P, EDR/S
403	A	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
403	B	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
413	-	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P, EDR/S
416	A	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
473	-	Scatter	Activity Area, Ceremonial	PH	Potential	A, D	Med-High	M	P, EDR/S
534	-	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
702	-*	Fence	Ranch Wall	H	No Potential	A, D	Low	M	P
703	-*	Scatter	Indeterminate	H	No Potential	A, D	Low	M	P
704	-*	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
705	-*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
707	-*	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P, EDR/S
709	-*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
715	A*	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
715	B*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
715	C*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
715	D*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
715	E*	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P, EDR/S
715	F*	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
715	G*	Scatter	Activity Area	PH	No Potential	A, D	Low	M	P
715	H*	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
715	I*	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P
715	J*	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
715	K*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
715	L*	Scatter	Habitation, Activity Area	PH	Observed	A, D	High	M	P, EDR/S
716	-*	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
717	-*	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
718	-*	Scatter	Activity Area	PH	No Potential	A, D	Low	M	P
719	-*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
720	-*	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
721	-*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
722	-*	Scatter	Activity Area	PH	Observed	A, D	Med-High	M	P
723	-*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P

★SIHP Number	Feature	Feature Type	Feature Function	Probable Age ‡	Subsurface Cultural Materials	Significance †	Research, Educative, Interpretive Potential	Recommended Treatments ✵	
								Tier 1 Clearance & Tier 2 Detection	Long Term
724	-*	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
725	-*	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
726	-*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
727	-*	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
728	-*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
729	-*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
730	A*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
730	B*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
730	C*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
730	D*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
731	-*	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
732	-*	Scatter	Habitation, Activity Area, Quarry	PH	Potential	A, D	High	M	P
733	-*	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
734	-*	Scatter	Activity Area	PH	No Potential	A, D	Med-High	M	P
735	-*	Scatter	Activity Area	PH	Potential	A, D	Low	M	P
736	-*	Scatter	Activity Area	PH	Potential	A, D	Med-High	M	P
739	-*	Aircraft Wreckage	Aircraft Crash	H	Observed	D	Med-High	M, DR	NA

★ State Inventory of Historic Places (SIHP) numbers are five-digit numbers prefixed by 50-20-97

* Newly discovered site/feature

‡ Probable Age

PH: Prehistoric
H: Historic

† Significance Categories

A = Important for historical contribution to significant events and/or broad patterns of history
B = Important for association with the lives of significant persons in history
C = Excellent or unique example of a site type, period of occupation, or method of construction
D = Important for information content for research potential

✵ Recommended Treatment

M = Monitoring
P = Preservation
PAI = Preservation "as is"
DR = Further Data Recovery required
EDR/S = Sites or features that may require emergency data recovery or stabilization efforts to prevent the loss of firepit features or intact cultural deposits observed eroding out of the unstable edges of hummock

NA = Not Applicable

Table 6-4. Summary of Significance Assessments and Recommended Treatments; OB/OD and Seagull Work Areas.

★SIHP Number	Feature	Feature Type	Feature Function	Probable Age ‡	Subsurface Cultural Materials	Significance †	Research, Educative, Interpretive Potential	Recommended Treatments ⁕	
								Tier 1 Clearance & Tier 2 Detection	Long Term
700	-*	Scatter	Activity Area	PH	No Potential	D	Low	M	P
815	-*	Aircraft Wreckage	Aircraft Crash	H	Observed	D	Med-High	M, DR	NA

★State Inventory of Historic Places (SIHP) numbers are five-digit numbers prefixed by 50-20-97

* Newly discovered site/feature

‡ Probable Age

PH: Prehistoric
H: Historic

† Significance Categories

A = Important for historical contribution to significant events and/or broad patterns of history
B = Important for association with the lives of significant persons in history
C = Excellent or unique example of a site type, period of occupation, or method of construction
D = Important for information content for research potential

⁕ Recommended Treatment

M = Monitoring
P = Preservation
PAI = Preservation "as is"
DR = Further Data Recovery required
EDR/S = Sites or features that may require emergency data recovery or stabilization efforts to prevent the loss of firepit features or intact cultural deposits observed eroding out of the unstable edges of hummock

NA = Not Applicable

6.1.3 Long Term Recommendations

Pursuant to the requirements of the contract, CSH has made long term recommendations for general treatment of the historic properties once the UXO clearance process has been completed. These recommendations also are summarized in Tables 6.5 through 6.6. The long-term treatment of the historic properties in the Kaho`olawe Archaeological District, once the cleanup process is completed, will be governed by the applicable Federal and Hawai`i state laws protecting historic properties. Given the status of the sites as a part of a National Register District, as well as the intended use of the island as an educational and cultural reserve, preservation of sites as part of long-term treatment should be given the highest priority.

Based on the managerial and regulatory framework briefly outlined above, all historical properties in the Task Order 7 work areas will require, at a minimum, further data recovery according to an approved Archaeological Research Design prior to any undertaking that is anticipated to have an adverse effect on the property. For example, revegetation efforts at Moa`ulanui - although they would constitute an adverse effect within historic properties - could affect archaeological sites only minimally with limited ground disturbance and hand reseeding. However, mechanical planting involving plowing of furrows in historic properties could have major impacts on the condition of scattered cultural materials and the integrity of the property as a whole. It is reasonable to expect that revegetation with limited ground disturbance would ultimately stabilize the exposed activity areas. This could be interpreted as a long- term benefit to a property that would otherwise continue to be exposed to erosion. Stabilization and revegetation would be a reasonable form of partial preservation for a selection of features following appropriate data recovery to mitigate adverse impacts. The exact nature of the data recovery will depend on the research potential of the property and the degree of the anticipated impacts to it. To further assist the client during any future management decisions regarding the treatment of historic properties, CSH has ranked the research, educative, and interpretive potential of each site and feature (see Tables 6-1 through 6-4).

The purpose of data recovery would be to retrieve information that could be forever lost through adverse impact to the sight. Sites with low research, educative, and interpretive potential may require little or no data recovery if it is determined that their research potential has been exhausted through the collection of the data recorded for this project. Other properties may require minimal levels of mitigation, such as the collection and subsequent replacement (or curation) of the mapped and recorded tools and tool fragments from the eroded hardpan surface. Further data recovery at historic properties with medium to high research, educative, and interpretive potential may include more detailed recording and/or limited excavations to mitigate adverse impacts. Historic properties with high research, educative, and interpretive potential and/or significance under National Register criteria A or C may require multiple techniques of data recovery or, more likely, preservation "as is."

In addition to the general data recovery treatments recommended above, 17 historic properties are further recommended for emergency data recovery or stabilization measures (Table 6-5). These are sites or features that have firepit remains or intact cultural deposits observed in the banks of remnant soil hummocks within their boundaries. The edges of these hummocks are unstable, and all indications are that these firepits/deposits are vulnerable to destruction by the nearly constant harsh winds and periodic heavy rains. Some of these sites previously have been recommended for emergency data recovery measures and have had a limited number of their features excavated (cf. Hommon 1982; Rosendahl *et al*, 1987). It is recommended here that these sites receive further data recovery or stabilization efforts before they are forever lost. Because there are so few Inland sites with intact cultural deposits, the information gathered from additional data recovery efforts has the potential to greatly expand our understanding of the Inland Settlement Zone. In addition, the chronology of occupation potentially can be refined by using the improvements that have been made to dating techniques.

Twelve historic properties are recommended for preservation "as is," primarily as excellent examples of historic property types (Table 6-6) (Plates E-IV, E-IX, and E-X through E-XIX). Following UXO clearance, sites recommended for preservation "as is" should not be impacted by any construction, island restoration or development activities because of their high potential for use for cultural and educational purposes. The immediate environs of these sites should be included in any preservation efforts, in order to retain the integrity of the setting. Some of these sites have firepit remains or intact cultural deposits observed in the banks of remnant soil hummocks within their boundaries, and should be considered for stabilization efforts. Site 101 is a large and densely concentrated scatter of cultural materials surrounding a hummock with the standing remains of a basalt cobble and boulder structure. It is the only site in the vicinity of the Moa`ulanui crater with structural remains, and it should be preserved under all circumstances. Site 102 is a densely concentrated scatter of artifacts surrounding a hummock, and it contains a relatively high quantity of branch and finger coral fragments, indicating that it functioned as a shrine. Site 149 also has a scatter of boulders that are likely structural remains (Feature B), but they are not nearly as complete as those of Site 101. However, the density of cultural materials and the quantity and variety of tools and tool fragments indicate a duration or intensity of occupation exceeding most all other artifact scatters in the Moa`ulanui crater vicinity. Features A and B at least should be preserved as excellent examples of inland habitation site features. The Site 108 features belong to the Pu`umo`iwi tool-quality basalt quarry and Traditional Cultural Property and are eligible for preservation. Site 712 is a complex of concrete bunkers constructed during World War II in 1942. Feature A is in excellent condition and Feature B is in good condition; at least one of them should be preserved as an excellent example of this type of structure associated with a very significant event in world history. Site 270 is a *ko`a* shrine in the base camp work area, and it should be preserved as an excellent and unique example of a Hawaiian religious site in the Kealaikahiki area.

It should be noted that the above assessments and recommendations are preliminary, based on the data collected during the Assessment Phase of the ordnance cleanup process. Information made available and collected during subsequent phases of the project may improve our understanding of individual sites or features or the archaeological and historical setting in which they exist. Certain adjustments to the significance assessments and/or recommended treatments may be necessary subsequent to the collection of additional information.

Table 6-5. Summary of Sites and Features Recommended for Emergency Data Recovery

★SIHP Number	Feature	Feature Type	Feature Function	Probable Age ‡	Subsurface Cultural Materials	Significance †	Research, Educative, Interpretive Potential	Recommended Treatment (Long Term) ✱	Work Area
196	X	Scatter	Activity Area	PH	Observed	D	Med-High	P, EDR/S	K1
205	F	Scatter	Activity Area	PH	Observed	D	Med-High	P, EDR/S	K1
214	A	Scatter	Activity Area	PH	Observed	D	Med-High	P, EDR/S	K1
390	C	Scatter	Activity Area	PH	Observed	A, D	Med-High	P, EDR/S	K1
391	D	Scatter	Activity Area	PH	Observed	A, D	Med-High	P, EDR/S	K1
104	B	Scatter	Habitation, Activity Area	PH	Observed	A, D	Med-High	P, EDR/S	LM
161	-	Scatter	Habitation, Activity Area	PH	Observed	A, D	High	P, EDR/S	LM
388	T	Scatter	Habitation, Activity Area	PH	Observed	A, D	High	P, EDR/S	LM
399	E	Scatter	Activity Area	PH	Observed	A, D	High	P, EDR/S	LM
400	A	Scatter	Activity Area	PH	Observed	A, D	Med-High	P, EDR/S	LM
401	D	Scatter	Activity Area	PH	Observed	A, D	Med-High	P, EDR/S	LM
402	A	Scatter	Activity Area	PH	Observed	A, D	Med-High	P, EDR/S	LM
413	-	Scatter	Activity Area	PH	Potential	A, D	Med-High	P, EDR/S	LM
473	-	Scatter	Activity Area, Ceremonial	PH	Observed	A, D	Med-High	P, EDR/S	LM
707	*	Scatter	Activity Area	PH	Observed	A, D	Med-High	P, EDR/S	LM
715	E*	Scatter	Activity Area	PH	Observed	A, D	Med-High	P, EDR/S	LM
715	L*	Scatter	Habitation, Activity Area	PH	Observed	A, D	High	P, EDR/S	LM

★State Inventory of Historic Places (SIHP) numbers are five-digit numbers prefixed by 50-20-97

* Newly discovered site/feature

‡ Probable Age

PH: Prehistoric
H: Historic

† Significance Categories

A = Important for historical contribution to significant events and/or broad patterns of history
B = Important for association with the lives of significant persons in history
C = Excellent or unique example of a site type, period of occupation, or method of construction
D = Important for information content for research potential

✱ Recommended Treatment

M = Monitoring
P = Preservation
PAI = Preservation "as is"
DR = Further Data Recovery required
EDR/S = Sites or features that may require emergency data recovery or stabilization efforts to prevent the loss of firepit features or intact cultural deposits observed eroding out of the unstable edges of hummock

Table 6-6. Summary of Sites and Features Recommended for Preservation

★SIHP Number	Feature	Feature Type	Feature Function	Probable Age ‡	Subsurface Cultural Materials	Significance †	Research, Educative, Interpretive Potential	Recommended Treatment (Long Term) ✻	Work Area
101	-	Complex	Habitation, Activity Area, Ceremonial	PH	Observed	A, C, D	High	PAI	LM
102	-	Scatter	Habitation, Activity Area	PH	Observed	A, C, D	High	PAI	LM
103	A	Scatter	Activity Area	PH	Observed	A, C, D	Med-High	PAI	K1
108	C	Scatter	Quarry	PH	Observed	A, D	High	PAI	K1
108	D	Scatter	Quarry	PH	Observed	A, D	High	PAI	K1
108	H	Scatter	Quarry	PH	Observed	A, D	High	PAI	K1
149	A	Scatter	Habitation, Activity Area	PH	Observed	A, C, D	High	PAI	LM
149	B	Scatter	Habitation, Activity Area	PH	Observed	A, C, D	High	PAI	LM
150	D	Complex	Habitation, Activity Area	PH	Observed	A, D	High	PAI	LM
270	-	Platform	Ceremonial	PH	Potential	A, D	High	PAI	BC
712	A*	Bunker	Storage	H	No Potential	A, C, D	Med-High	PAI	BC

★State Inventory of Historic Places (SIHP) numbers are five-digit numbers prefixed by 50-20-97

* Newly discovered site/feature

‡ Probable Age

PH: Prehistoric
H: Historic

† Significance Categories

A = Important for historical contribution to significant events and/or broad patterns of history
B = Important for association with the lives of significant persons in history
C = Excellent or unique example of a site type, period of occupation, or method of construction
D = Important for information content for research potential

✻ Recommended Treatment

M = Monitoring
P = Preservation
PAI = Preservation "as is"
DR = Further Data Recovery required
EDR/S = Sites or features that may require emergency data recovery or stabilization efforts to prevent the loss of firepit features or intact cultural deposits observed eroding out of the unstable edges of hummock

Section 7 Summary and Conclusions

Task Order 07 comprises the first assessment task order of the ordnance clearance for the entire island of Kaho`olawe over the next four to five years. As a result of this assessment, 304 individual historic property sites/features have been identified, located, and recorded. Of these, 231 were correlated to previously identified sites/features and 72 are newly identified. NRHP forms for these newly identified sites will be filled out at the close of this project upon the State Historic Preservation Department's concurrence of the assignment of new SIHP numbers.

Given the approximate 12,800 grids on the island, this first assessment – with 935 grids – represents only 7% of the total assessment work task for the entire island clearance. However, clearly a far higher percentage of the total number of historic properties (counted by either site or feature) is represented in this first task order. The high density of sites in the Lua Makika and Upper K-1 Road Work Areas account for this fact. In the Lua Makika area alone, it was calculated that over 26% of the total land area lies within the boundary of a historic property.

The expanded inland region of the work areas of Moa`ulanui and Upper Hakioawa in Task Order 015 are also high-density site areas. At the completion of Task Order 015 assessment, nearly all of the historic properties of the inland zone will be documented.

These initial task orders contain not only areas of high site density, on the island but a significant percentage of the total number of historic properties extant on the island as a whole. Because of this, the historic preservation component of the clearance operation has been presented with the following challenges:

a. To keep to the work schedule in spite of delays caused by start-up, job training, lack of equipment and facilities

b. To continuously develop, improve, and simplify the procedures for field and office operations without interruption of schedules (e.g. having the recording team record site boundaries rather than having them initially defined by the discovery team through land survey)

It is important to continue to view the special characteristics of this first task order in the broader context of the survey of the entire island. Development of data collection and recommendations should meet the immediate needs of the clearance operation and also be compatible with the long-term needs of historic preservation management, following the completion of the clearance project.

The KIRC cultural coordinator, Ms. Hokulani Holt- Padilla, defined five separate Traditional Cultural Properties (TCPs) within the Task Order 07 and 015 Work Areas. Three of these five areas, the Kealaikahiki, Pu`u o Moa`ulanui, and Pu`umo`iwi TCPs, lie within the Task Order 07 Work Area. Each of these TCPs are recognized as places with special significance within the context of Native Hawaiian Culture, therefore certain restrictions regarding clearance activities may apply.

Through change and improvement of procedures, the historic preservation operation has developed a level of recording that is appropriate and practical for the entire island clearance. The systematic coverage of land areas in the context of the staked grid system has shown a clear advantage in the quality of coverage over the previous methods of island survey. The result of the task order 07 assessment completed by this method clearly shows that some land areas were simply not covered by the previous island-wide survey. Some historic properties have been identified in areas where pre-investigative studies have shown no previously recorded sites. An example is a lithic scatter (Site 700) in an unvegetated portion of the Seagull

Work Area. More common examples are previously unrecorded sites in regions with heavy vegetation (e.g., Base Camp Work Area). In these cases, previously unidentified sites are recorded that are either adjacent to known sites or in isolated areas.

It is important to continuously recognize the cumulative nature of data collection and interpretation. Explanations for settlement will be expanded from those presented in this report as future task orders are completed and more archaeological information becomes available. The sample will be larger, with the site categorization process refined, leading to a broader perspective in view of the research goals.

Even at this point it is difficult to avoid concluding that the upland settlement at Moa`ulanui was supported by seasonal or opportunistic agriculture, which was focused within and around the Moa`ulanui Crater. There are enough sites distinguished by size, density, and diversity of artifact forms to be identified as habitations, rather than workshops.

Through analysis of artifact categories and characterization of individual site assemblages, it was possible to distinguish three different functional profiles, according to a site settlement model based on artifact type and material type frequencies (see Section 5.4). These three profiles characterize quarries, workshops, and habitations. Only one quarry site has been positively identified. Two lithic workshops have been positively identified through this model, as well as seven habitation sites/features, six of which are in the Lua Makika Work Area.

In spite of the disrupting effects of long-term erosion on the distribution of cultural materials, the simple fact that material scatters cover over 25% of the total land area (205 hectares) would argue for habitation supported by agricultural resources. The heavy distribution of cultural materials around the rim of Moa`ulanui Crater (with a gap on the exposed windward side) emphasizes the importance of the crater soils and their moisture-retaining characteristics in providing a rich growing environment.

This assessment of the role of traditional agriculture on the Kaho`olawe settlement patterns (Hommon 1980; Barrera 1984; Rosendahl et. al. 1987) will be ongoing. Further perspective on this issue will result from the consideration of the sites in the Task Order 15 work areas.

An additional inquiry into the economic patterns of Kaho`olawe Island consists of the use of the rich lithic resource of Pu`umo`iwi Adz Quarry, were adzes being manufactured for island use or export (Hommon 1980, Barrera 1984). By measuring and analyzing the frequency of adz preforms to finished adzes, as well as the uniformity of adz preform/reject and adz and hammerstone size, it was possible to address this question. On the basis of information gathered during Task Order 07 recording, the tentative conclusion reached is that adz quarrying was focused on as an export industry. This interpretation will be further refined with the additional information from Task Order 015.

Military research was conducted during this task order, which enabled the identification of features that met the age qualifications for historic properties (i.e., older than 50 years). After it was determined that the bulk of the ground-troop training occurred after World War II, particularly 1960-1975, the many fox holes and stone structures in the Seagull and Base Camp areas were eliminated from historic property status. Initially, the concrete structures at Seagull and Basecamp were thought to be World War II era observation towers (Denfeld 1996a and 1996b). However, plans (catalogue numbers 584947, 820040, 7005115, and 7005116) for various structures were provided by the Historic Preservation Naval Technical Representative from the Naval Facilities Engineering Command Plans and Files, Building 258, Makalapa, Pearl Harbor. These plans date to 1953 thusly indicating that the observation tower at Basecamp was constructed either later that year or sometime after 1953. Likewise, plans for the tower at Seagull date the initial construction of that structure to after 1965 and the addition of a second story parapet and ladder to 1972. Therefore, neither of these structures qualify as historic properties. At present, only three military structures in Task Order 07 work areas have historic property status. These properties consist of three concrete bunkers by the Rocky Road, northwest of Base Camp. The dates "1942" are clearly inscribed in the concrete of the bunkers. Plans dated at 1958 show that these three structures were already in existence and that they were constructed from three separate sections transported from Pearl Harbor. Military research conducted for Task Order 07 also included a one-week search of the National Military Archives in the Washington D.C. area. Although no written material concerning Kaho`olawe military history was obtained, a series of photographs showing aerial views of the island during the World War II era were located and copied for future use during this project. Two aircraft crash sites (one at Lua Makika and one at the Open Burn Open Detonation Area) are potential historic properties, pending final identification of the age and model of the aircraft. The members of the Maui Military Museum tentatively identify the crash at Lua Makika as a post-World War II Skyraider. The aircraft wreckage parts will be collected during sweep operations and subject to further identification with the aid of Maui Military Museum members.

The recording of the historic properties of Task Order 07 has allowed for categorization of these properties in view of long-term management considerations. Especially important are those properties that are considered especially significant in that normal survey documentation and further data recovery are not efficient to address their significance. These will hopefully be preserved through special effort and will play important roles in the long term educational and cultural use of the islands. A more complete summary of the archaeology of Kaho`olawe and more substantial conclusions will be developed with the addition of information from future task orders.

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