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~~Pages X Revision~~ Draft

~~I.~~ Introduction

In November 1976 and June 1978 intensive investigations were conducted at archaeological site 109 on the island of Kaho'olawe ~~were conducted~~ by archaeologists under contract to the U.S. Navy. ~~These investigations were part~~ The research at 109 and the analysis of the data retrieved was part of the survey of the historic resources of Kaho'olawe sponsored by the Department of the Navy in partial ~~fulm~~ fulfillment of its responsibilities under Federal 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). For further information concerning the Kaho'olawe survey and its results, the reader is directed to the National Register of Historic Places Inventory--Nomination Forms ~~site forms~~ for the 544 sites recorded during the

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survey, the National Register Multiple Resource Nomination Overview for the Historic Resources of Kaho'olawe (Hommon 1980b), "Kaho'olawe: A Cultural Resources Management Plan" (Ahlo and Hommon 1980), and Kaho'olawe: Final Report of the Archaeological Survey" (Hommon 1980a)

In 1976, when the Historic Sites Section, State Parks Division of the Hawaii Department of Land and Natural Resources was conducting the Kaho'olawe survey, feature A of site 109 was investigated by Dr. Robert J. Hommon (principle investigator), then Archaeologist of the Historic Sites Section; Mr. Farley Watanabe, then Historic Sites Specialist of the same agency; Dr. Maurice Morgenstein, Geologist and President of Hawaii Marine Research, Inc., H.M.R., a private

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research firm headquartered in Honolulu); and Dr. Patricia McCoy, Archaeologist on the staff of the B.P. Bishop Museum (Honolulu). The detailed results of the investigations

← The remaining three features (~~A, B, C, and~~ B, C and D) of site 109 were investigated in June, 1978, after HMR had been contracted by the Navy to complete the survey of Kahoolawe. The crew consisted of ~~Dr. Morganstein~~ Mr. William Barrera (principle investigator), Dr. Morganstein, Mr. Marcus Child (all of HMR) and Mr. Watanabe.

The data and preliminary results of the 109A investigations are presented in an earlier report (Hommon 1979). In the present document, the ~~results~~ the data from all four features are compared.

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The four archaeological features of site 109, like most of the 89% habitation features of Kaho'olawe's inland zone are "activity areas" that have ~~been~~ been extensively damaged by erosion. Little is known of the specific form and contents of such sites in Hawaii, or of their significance, since they have not been reported on the other Hawaiian islands. The purpose of the 109 investigations was to determine the nature and archaeological value of these features to contribute to an ~~understanding~~ understanding of the eroded activity area of Kaho'olawe as a general type.

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Setting

Kaho'olawe is the smallest of the eight major Hawaiian Islands, having a land area of 45 square miles (c. ~~46~~ 116.6 square kilometers). The summit of the island, Lua Makika crater, rises to an elevation of 1477 feet (c. 450 meters). Kaho'olawe is the most arid of the main islands both because its low relief limits orographic rainfall and because it is situated in the rain shadow of Haleakala (elevation 10,023 feet or c. 3055 meters), the mountain that forms the eastern part of Maui, 7 miles (c. 11.3 ~~kilometers~~ kilometers) to the north.

Estimated average annual rainfall varies varies from less than 10 inches (c. 254 millimeters) at Keoloikahiki

Point, at the western end of the island, to slightly more than 25 inches (635 millimeters) at Lua Makika. The dominant vegetation on the island includes the exotic kiawe (Prosopis pallida) tree and various grasses, including pili (Heteropogon contortus), an indigenous species of grass that was used by the ancient Hawaiians as thatching material. The soil mantle has been removed from about one-quarter of the surface of Kaho'olawe (c. 7,750-acres or c. 3136 hectares), exposing ~~bearing~~ ~~barren~~ saprolitic hardpan that is almost totally devoid of vegetation. Most of the eroded area is gently sloping land above ~~the~~ 750 feet (c. 229 meters) in altitude in what may loosely be ~~as~~ termed the central plateau of the island.

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Kaho'olawe has been divided into three settlement zones on the basis of the differential distribution of ancient archaeological sites: the coastal zone (zone I), a strip of land, about 400 meters wide with its seaward boundary determined by the shoreline; the inland zone (zone III), an irregularly-shaped area ~~near the summit of the island~~ on the upper slopes of Lua Makika, mostly above the 325 meter contour; and the intermediate zone (zone II), which includes the rest of the island. Sites tend to be clustered in the ~~outer~~ coastal zone, especially at the mouths of major gulches and in the inland zone and are very sparsely scattered in the intermediate zone. In general, (Hommon 1980b: 47-48)

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it has been suggested that the ~~sites in the~~ coastal zone represents an emphasis on marine exploitation, perhaps supplemented by cultivation of the lower stream terraces; and that the sites of the inland zone represent ~~the~~ extensive ~~cultivation dry land~~ dry-land cultivation of ~~dry land~~ crops such as the sweet ~~po~~ potato (Hommon 1980: 57-60). Each of the zones is divided into subzones, designated by letters (e.g. subzone III-B) for descriptive convenience.

A four-phase model of Kaho'olawe's pre-Contact history has been developed on the basis of ~~data~~ information collected during the historic resources survey, including chronometric data derived from basaltic glass samples collected at 612 habitation features (Hommon 1980: 52-67). ~~It is suggested that during P~~ The tentative sequence

developed in this model ~~is~~ may be briefly summarized as follows: During Phase I (c. A.D. 1000-1400), the island was first colonized and the population of the ~~the~~ coastal zone grew to a few hundred. Phase II ~~(c.~~ (c. 1400-1550) saw the ~~expansion~~ continued use of the inland zone and an expansion of occupation into the inland zone. The population of the island is roughly estimated at about 725 around ~~1500~~ the year 1500. Phase III (c. 1550-1650) is marked by ~~the~~ apparent depopulation, especially marked in the inland zone. Geoarchaeological evidence ~~suggests~~ indicates that the large-scale erosion of the inland zone ~~was initiated during~~ that eventually resulted in the ~~removal of~~ extensive environmental

degradation in evidence today was initiated early in the 16th century. (Hommon 1980: 60-65) It is suggested that this degradation may have been associated with the extensive agricultural clearing of the inland zone during phases II and III. Phase IV spans the period 1650 to 1779, the year that the Cook expedition established contact with the Western world. During this phase, the inland is estimated population dropped from about 400 to about 60, ~~a phenomenon that resulted, it is suggested, directly and indirectly related result largely~~ largely, it is suggested, as a result of the continued degradation of the terrestrial and inshore environments. (Hommon 1980: 65-67)

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Site 109 is situated at an elevation of about 330 meters on gently sloping (about 6° grade) denuded saprolitic hardpan approximately ~~.83~~ 1.7 kilometers northeast of Kamohio Bay and 300 meters east of Kaneloa Gulch (Figure 1). The area of the site is totally devoid of vegetation, although kiawe (*Prosopis pallida*) trees and various grasses are found on nearby remnant soil hummocks.

Site 109 is one of the sites that define the southern boundary of settlement subzone III-B, to the south of which is the relatively broad expanse of subzone II-D where sites are sparsely ~~scattered~~. ~~It is apparent that the~~ Sites such as 109, 242, 115, 477, 474 and 615 ~~are~~ form the ~~fringe of the fringe of~~ scattered fringes of the inland zone, ~~which where sites~~ features are ~~[illegible]~~ packed rather ~~densely in such large complexes as 110, 112, 614, 616~~ and 618 (Figure 1)

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To the north and east of site 109, the archaeological features are relatively tightly clustered in large complexes such as 110, 111, 614, 616 and 618 (Figure 1). It is evident, however, in the case of such "fringe" sites as 109 that the conditions that resulted in the density of features in nearer the center of the inland zone were only minimally operable. ~~It, as has been suggested (Hamman 1980b:58) the clustering of habitation features in the inland zone can be correlated with~~

→ It was noted earlier that the ~~for~~ hypothesis that seems best to explain the clustering of sites in the inland zone ~~settlement pattern~~ is that the inhabitants of these sites were practicing dry-land agriculture on the upper slopes of the island. It has been suggested (Hamman 1980b:58)

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~~that not only~~ that the inland sites cluster in that ~~an~~ part of the island where rainfall was highest. ~~since the boundary~~

~~#~~ Most of the inland zone sites are ~~within~~ concentrated in that portion of the island where estimated rainfall is at least 25 inches annually. It is further suggested that beyond the boundaries of the inland ~~Further, it has been suggested that~~ zone the agricultural techniques being used were insufficient to produce crops ~~Thus, rainfall may have been the major factor determining efficiently~~ efficiently. ~~Site 109, then, may have been situated in~~

The inhabitants of site 109, then, may have cultivated crops at the very margin of the ~~inland~~ zone of extensive inland agriculture.

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Description

Site 109 is ~~roughly~~ triangular in shape and measures about 50 meters (east-west) by 135 meters (north-south) by 190 meters (northwest-southeast). ~~The~~ Features A, C and B ~~forms~~ determine the east, west and north corners of the site and feature D is near the center of the triangle (Figure 2). ~~Each of the features, each of which is on a discrete cluster of culturally related items resting on the saprolitic hardpan, are~~. The four features are erosionally lagged; that is, the soil that once formed the stratigraphic context of the cultural items has been totally eroded away, ~~Each feature is a discrete cluster of~~ leaving the items resting on the saprolitic hardpan. Each feature is a discrete cluster of such items. The items belong to four general categories: ~~angular chunks~~ 1) angular fragments of unworked basalt; ~~most~~

2) unworked marine mollusc shells; 3) ~~fragments of worked artifacts and~~, fragments of ~~worked~~ coral; 4) ~~flaked~~ artifacts, flakes and cores of basalt; and 5) flakes and cores of basaltic glass.

Abundant evidence collected during the Kaho'olawe survey indicates that the ~~fractured~~ angular unworked basalt stones found in these and other activity areas of the inland zone were ~~cracked~~ fractured by heat in fireplaces and imu (underground ovens). In general, stones of any size are rare in the hardpan areas of the inland zone and much of the intermediate zone. It is ~~evident that~~ probable that the unworked stones, like all other items in the occasionally-lagged features were carried in by the inhabitants of these features. Most of the more than ~~8~~ 150 fireplaces presently being

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exposed by erosion in the inland zone contain angular unworked stones. It is reasonable to suggest that virtually all of the angular unworked basalt stones found in the features of site 109 were once in fire places and/or ~~use~~ use. These stones will be referred to here as "fire-cracked rocks"

Most of the unworked marine mollusc shells ~~probably brought to site 109 as fresh food~~ are probably the cast-off shells of food

are probably the remains of fresh ~~marine~~ food ~~to~~ carried from the coast and eaten by the inhabitants of site 109. Although artifacts of shell have been found at other inland sites, none of the ~~inland shells~~ shells found at site 109 show any evidence of having been worked.

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Coral ~~has been found~~ occurs in Kawaiian archaeological sites as construction materials (walls, ~~ornaments~~ and pavements), as a symbol of sanctity in shrines (usually unworked pebbles and cobbles used for large unworked branched fragments) and as artifacts (~~usually~~ most commonly as files or abraders of various shapes). The fragments of coral from 109 are ~~so~~ badly weathered so that their original form cannot be discerned. ~~This~~ All are probably ~~abraders~~ Their rarity and small size, ~~together with the fact that~~ suggest that they served neither as construction materials nor as sacred symbols. It is likely that these items are abraders or waste products disposed of during the manufacture of abraders. ~~Since~~

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~~The worked basalt, found as which occurs as~~

The basalt flakes, ~~and~~ and cores, ~~as well as three~~ adz fragments ~~are~~ are of a finer-grained basalt than are the prefractured rocks. Some of the flakes may ~~have to the~~ have resulted from the trimming of adz preforms carried to the site from site 108 ~~##~~ or ~~another adz quarry~~ one of the other adz quarries.

~~Basalt~~ Small basaltic glass flakes about the size of a thumbnail were ~~evidently~~ probably used by the ancient Hawaiians ~~as fine cutting tools~~ for a variety of ~~cutting~~ tasks requiring a fine cutting edge. ~~Artifacts of basalt to glass Hydration~~ The Kaho'olawe chronology has been constructed primarily on the basis of hydration rind analyses of items of basaltic glass. ~~He dated.~~ The

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~~results of the analysis of~~

chronometric data derived from site 109 basaltic glass items are discussed in a later section.

The four erosionally-lagged activity areas of site 109 consist of those items that have survived the effects of erosion and weathering. Some of the original contents of these features have disintegrated and/or have been ~~carried away~~ removed by overland runoff. Fragile ~~remains~~ material such as charcoal have been removed entirely by ~~the~~ the action of water and wind. Observations of features in various stages of destruction by erosion during the survey indicates that ~~the~~ the smaller, more-fragile marine mollusc shells, such as those of ~~the~~ ~~the~~ Nerita, picea, ~~Cerastes~~ ~~disintegrate~~

are weathered rather rapidly and disintegrate into fragments that are small enough to be washed or blown away. In features that have been exposed to the elements, ~~the~~ only ~~those~~ the largest and ~~thicker~~ those with the thickest cross-sections survive.

What remain in the four features of site 109, as in all of the erosionally-lagged features of Kaho'olawe, are those items that are ~~too~~ sufficiently durable and massive to have escaped disintegration and/or removal by the forces of erosion. These items have been removed from their original archaeological context, that is, their spatial relationships with each other, ~~and~~ with other items and materials that have perished and removed, and with the soil strata within which they once existed. As the soil matrix of these features

eroded away the remaining contents were deposited on the ~~floor~~ hardpan, where they were exposed to further disturbance by wind and overland runoff.

Each of the four features is described below in terms of ~~the~~ size ~~and contents and distribution~~ and the nature and distribution of its contents (Figures 3, 4 and 5).

~~Feature A. By far the largest feature~~ Feature A

← Feature A. ~~This is the largest~~ Feature A, by far the largest of the site 109 features (~~and~~ measuring 31 meters by ZZ meters), contains more items in ~~general and~~ in all categories than do the other features. A sparse scatter of erosionally-transported cultural items, especially small ones is commonly found extending downhill from an erosionally-lagged feature.

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In the case of feature A, ~~the~~ the scatter was ~~traced~~ found to extend at least 300 meters. Feature A includes cultural items ~~cultural items~~, in all of the categories discussed above.

~~F~~

Feature B. The extreme dimensions of feature B are 23 ~~by~~ meters (north-south) by 21 meters, (east-west) within which are ~~with most of the~~ a concentration of cultural items measuring about 13 meters by 7 meters and areas to the north and south with sparsely scattered items. The feature consists almost entirely of fire-cracked rocks.

Feature C. ~~Feature C~~ This is the smallest of the features in site 109, measuring only 10 meters by 10 meters overall. ~~The main concentration of cultural~~ ~~It consists entirely of a concentration fire-cracked~~

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~~rocks~~

It consists entirely of fire-cracked rocks which are concentrated primarily in ~~the area~~ the central portion of the feature, which measures 10 meters by 3 meters.

Feature D This feature measures 28 meters (north-south) by 16 meters (east-west) overall, with the ~~main area~~ cultural items concentrated primarily in an area measuring roughly 10 meters by 9 meters at the north end. ~~To the~~ South of this concentration, which consists almost entirely of fire-cracked rocks, is a large area in which items are sparsely scattered; ~~containing. Within this southern area is one flake~~. General items of basaltic glass were found within this southern area.

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Methodology draft

The formal aspects of features such as those of site 109 have been, both simplified and distorted ~~considerably simplified by the rain~~ the effects of erosion. Not only has the soil matrix of the features been removed, along with all perishable evidence, but also ~~all~~ any significant (such as stratification) vertical relationships that once existed have been entirely destroyed and all horizontal relationships between the individual elements of the feature have been disturbed.

~~The archaeological~~
~~The condition of these features~~
~~The archaeological procedure was reduced~~
~~The wide range of archaeological procedures~~

a broad range of archaeological procedures, including ~~removal of soil~~ excavation ~~and~~ of soil matrix and recording vertical relationships were precluded by the nature of the features. It remained necessary to record the contents of each

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feature and the ~~distribution~~ horizontal distribution of the various categories of ~~each~~ cultural items. ~~These distribution patterns were recorded by recording and collecting~~ The general procedure that was followed ~~was~~ in order to record these patterns of distribution was to impose a ~~rectangular~~ rectilinear grid on each feature with ~~the~~ compass and tape and to collect and or record all cultural items found within each square. ~~The details of the procedure, which varied from feature to feature are discussed~~ all material except for the unworked basalt and metal below. fragments from feature A were

Feature A.

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squares of the
~~The grid imposed on feature A measured 2 by~~
2 meters on a side

The grid imposed on feature A is oriented according to the ~~east~~ cardinal magnetic compass directions, with lines at 2 meter intervals, (Figure 3) ~~Each grid-square~~ The following description of the labeling system is taken from the report on feature A (Hammon 1979:4):

Grid-lines were established by compass and tape. Each grid-square was assigned a letter and number designation indicating its direction and distance from an origin point established arbitrarily near the center of the feature. The first part of the grid-square designation indicates whether it is north(N) or south(S) of the origin point; the second indicates the distance from the origin point in 2 x 2 meter squares; the third indicates whether it is east(E) or west(W) of the origin; and the fourth indicates the distance from the origin point in 2 x 2 meter squares. Thus, grid-square N3W5 is in the third rank north of the origin point and the fifth row west of the origin point.

Indent & Single Space

The grid-line interval in the other four features was

(Figures 4, 5 and 6)

one meter rather than 2. In these feature grids, the origin points ~~were~~ were placed outside of the features. One axis was assigned numbers and the other letters so that square designations were letter-and-number combinations such as K6. The long axes of the ~~feature~~ grids of features B and D are ~~255°~~ oriented at 255° magnetic and that of feature C is oriented at 240°. ~~In each of feature~~ The gridded area of feature B measures 13 meters by 7 meters; that of feature C, ~~10 meters~~ by 3 meters; and that of feature D, 10 by 9 meters. Sparse scatters of cultural items outside of the ~~gridded~~ main feature concentrations were labelled north south and southeast sections in feature B, north and south sections in feature C and south section in feature D.

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~~All of the cultural item were from all features were~~
All cultured items except the metal fragments ~~were~~
~~counted collected~~
~~from~~ in the four features and the unworked basalt
from feature A were collected, labelled according to
grid square provenience and ~~returned to~~ removed
to ~~Oahu~~ Honolulu for laboratory analysis. All items,
including the unworked basalt from feature A, were
counted. In addition, the unworked basalt from features
B, C, and D were weighed.

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Analysis

Feature Contents

A total of ~~1355~~ 6913 items were recorded in the (i.e. 492 square meters)
123 grid squares of feature A. Of these 5650 were archaeological items deposited during the ancient Hawaiian occupation of the feature. They include 4759 pieces of unworked basalt, 626 basaltic glass flakes and cores, 125 items of worked basalt, 131 mollusc shells and shell fragments and 9 pieces of coral (Table 1). The remaining 1263 items were ~~fragments~~ pieces of metal, all of which seem to fragments of ordnance deposited ~~during~~ since 1941, when the island first became a target range.

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Feature 8 contained a total of ~~1545~~ 1549 cultural items, of which 1529 were pieces of unworked basalt. The remaining ~~15~~ 20 items ~~were~~ included ~~15~~ 17 mollusc shells and shell fragments and one basalt core. The distribution is summarized by number and weight of unworked basalt, ~~with regard to weathering and~~ in table 2. The basalt core was found in square J-12. Sixteen of the mollusc shells and shell fragments ~~from locations~~ were collected from the south section. These included one ~~whole~~ nearly complete, example ~~and~~ limpet (Cellana sp.) ~~shell~~ ~~shell~~ and 7 fragments of limpet (Cellana sp.) shells, two fragments of cowrie (Cypraea sp.) shells, one fragment of a thais (Thais aperta) shell and five unidentified fragments of shells. In addition one complete limpet (~~Cp~~ Cellana sp.) shell ~~was collected~~ and

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~~two fragments of limpet shells~~
was collected from the north section and ~~two additional~~
a single limpet shell fragment ~~were~~ was recovered from both squares
J-11 and J-14.