Estimated average annual rainfall varies from less than 10 in (254 mm) at Kealaikahiki point, the west end of Kaho'olawe to slightly more than 25 in (635 mm) 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.

Feature 109

About one-quarter of the surface of Kaho'olawe (c.7,750 acres or c. 3136 ha.) has been severely eroded and subjected to severe erosion. The eroded area, this portion of the land, which is centers in the southeast quadrant of the island, with extentions

KDA
#60b
10 Ap 79

Feature 109A, like most of the features of central Kalwe is ~~es~~ erroneously layed ~~out~~ ~~stratigraphic~~ ~~The~~ The soil ~~in which~~ that once formed the context of Feature 109A has been totally ~~or~~ eroded away, leaving ~~the material durable or durable~~ non-perishable items on the hardpan. Most of these items are of stone, ~~though and it is per with~~ though a few of ~~these are shell~~ mollusc shells also remain. ~~It is likely that many of these~~ Decay and erosion have undoubtedly removed perishable items

~~Various processes of decay from~~ archaeological

Missing from the inventory of Feature 109A are those perishable items that have decayed and ~~those~~ the non-perishable items that were light enough to have been removed by sloperwash and ~~stream action~~ wind &c

626 763 4256 763 3493 3519 ROH #9 of 10 Apr 79 D-1

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 2x2 m 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 2x2 m. squares. Thus, grid square N3W5 is in the the third rank north

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of the origin point and the fifth row west of the origin point. ~~The location of~~ in 123 grid-squares.

A total of 6913 items were recorded during the investigation of Feature 1077. Of these, 1263 were fragments of metal, all of which, evidently are ~~presumed to have been deposited~~ remains of ordnance, deposited since 1941, when Kaho'olawe first became a target range.

The remaining 5650 were archaeological items, all of which were evidently deposited during the ancient Hawaiian use of the feature. A total of 751 of these items were artifacts, that is, objects that were worked by man. The remaining 4402 items include unworked

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basalt stones, marine mollusc shells ~~and fragments~~ and shell fragments and ~~as well as~~ fragments of coral. All of the artifacts, as well as the mollusc shell and coral material and three stones that appear to ~~have~~ be water-worn, were collected. The remaining items were counted, ~~and~~ recorded according to provenience and left in place. (See Table 1.)

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The flake scars may have been formed in 1472, or 1462 or any year between.

Hydration-rinds were measured on two different flake scars on ~~two~~ each of two artifacts from 109A, so that ~~a~~ a total of 56 dates-ranges ~~have~~ appear ~~in~~ table 2 and figure 1.

~~Ten dates~~ Five additional hydration rind measurements were attempted on basaltic glass samples from 109A. The range from one of these samples approximated 12,000 B.P. (Before Present) and may represent the ~~the~~ original formation of the glass or an early natural fracture. No hydration rind could be

626
9.63%

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detected on the other four samples analyzed. The following discussion refers to the fifty-six hydration-rind ranges that ~~identify reflect~~ provide a chronological framework for the use of Feature 109A.

The basaltic glass hydration-rind dates from 109A are arranged in chronological order of medians in Table 2 and in Figure 1. The numbers along the bottom of Figure 1 correspond with the sequential numbers that appear in the first column of Table 2.

1406 1640
23.4 1406
1429.4 234
2
211 17
58.5

1640
58.5
1581.5

24 dates in last 25% of period
43% dates in last 50% of period
36 dates in last 25% of period
6.7%

20% in last 10% of period

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#160h
2990 79
D-1

The dated desiccatic glaze samples are from eleven squares in the northeast-quadrant of the feature. The dates range from A.D. 1406±16 to 1640±18.

Twenty-one of the dated samples, including those with the earliest and latest dates, were recovered from square N1E2. The dated samples indicate a tendency toward more intensive occupation (or at least more N1E2. The dated samples tend to cluster increasingly toward the late end of occupation at feature 109A, as is indicated in fig 1. For example, the last 10% of the indicated period of occupation of 109A yielded 20% of the dates

43% of the samples, median date from the last 25% of the total occupation span as indicated by the

1406 23.4 1429.4 7%

1640 1406 234 2 117 2 58.5

1640 58.5 1581.5

24 dates in last 25% of period
43% dates in last 50% of period
6.4%

20% in last 10% of period

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The dated desiccate glaze samples are from eleven squares in the northeast-quadrant of the features. The dates range from A.D. 1406±16 to 1640±18.

Twenty-one of the dated samples, including those with the earliest and latest dates, were recovered from square N1E2. The dated samples indicate a tendency toward more intensive occupation (or at least more N1E2. The dated samples tend to cluster increasingly toward the late end of occupation at feature 109A, as is indicated in fig 1. For example, the last 10% of the indicated period of occupation of 109A yielded 20% of the dates

43% of the samples, median date, date from the last 25% of the total occupation span as indicated by the

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sample medians; and fully 20% of the medians are found to date from the final 10% of the indicated ~~time~~ occupation span, as compared with only 7% during the first 10% of the span. The data in hand seem to indicate that the ~~amount of~~ intensity of working of bracelet glass increased with time at 109A, ~~until the. The way and~~ and that this activity then ceased in the early 1600s. ~~A possible~~ ~~interpretation of these data is that use of 109A increased gradually grew more intensive intensified through two centuries and then the site was abandoned in the early 17th century. Interpre~~ The significance of these data will be discussed in the Interpretations section at the end of this report.

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D/

Spatial Distribution of Cultural Items

Analysis of the spatial distribution of cultural items in 109A provides valuable information concerning the ancient use of the feature as well as the effects of erosion on the ~~patterns of objects that once existed have been removed by the removal of the objects from their soil context by erosion~~ → the removal of these items from stratigraphic context and their subsequent movement by erosion. ~~As with these~~ These factors are, of course, essential for an understanding of ~~the~~ all of the ~~site~~ eroded and ~~partly eroded sites~~ ~~the prehistory~~ → the nature ~~and history~~ of all of the eroded and ~~so~~ sites ~~in~~ in the interior upland of Kaho'olawe, and to the prehistory of Kaho'olawe as a whole.

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29 Apr 29
D-1

The ~~distribution data~~ general patterns of distribution ~~concentrations~~ of unworked basalt, basaltic glass artifacts, basalt artifacts and mollusc shells ~~are shown in~~ are summarized in fig 2. The indicated hatching symbol appears in each square that contains a number of items equal to or greater than the mean per square for the whole feature. Fifty squares (c. 41% of the total) contain one or more symbols.

~~The hatchured squares represent the following data: 1) 39 of 72.2% of the~~ 72.2% of the unworked stones occured in 39 of the 120

~~Figure may be summ~~

~~The general distribution~~

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D-1

The concentrations of items shown in Fig — may be ~~summarized~~ summarized as follows:

1) ~~By~~ Unworked basalt stones were distributed throughout 120 squares, and 3437 of these (72.2%) ~~were found~~ occur in the 39 appropriately ~~hatched~~ marked squares.

2) 626 basaltic glass artifacts were distributed throughout 63 squares, and 496 (79.2%) ~~were~~ occur in the 18 ~~appropriately~~ appropriately ~~hatched squares~~ marked squares.

3) 125 basalt artifacts are distributed throughout 56 squares, and 72 (57.6%) of these occur in the 15 appropriately ~~hatched~~ marked squares.

4) 131 mollusc shells and shell fragments were distributed throughout 55 squares, and 82 (63%) of these occur in the 16 appropriately ~~hatched~~ marked squares.

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Two general patterns of concentration are readily apparent in fig ——. First, ~~there is a tendency for all items~~ four types of items tend to concentrate in the northeast quadrant of 109A. ~~extending high~~ ~~Second the unworked bas~~ Second, unworked basalt tends to be concentrated as well in an area that extends from the northwest quadrant into the southeast quadrant, ~~in a pattern where in an area of the feature with~~ where few other concentrations are found. ~~In each of these areas patterns are~~ ~~is a small~~ area is a

Within each of these areas is a nucleus of unworked basalt stones. Most of these stones are angular and are presumed to have been cracked by exposure to heat. They are probably remnant of large fireplaces or ~~imu~~ imu (underground ovens). Together, they contain nearly 1/3 of all the unworked basalt in only 10 square (32%) in the feature. Their ~~loc~~ locations are indicated and

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number of ~~stones are listed below~~: as follows:

~~northeast~~ west nucleus:

square	N3W3:	296	stones
"	N2W4:	134	"
"	N2W3:	175	"
"	N1W3:	154	"
"	N1W2:	100	"
		859	" (18% of the total)

Northeast nucleus:

square	N3E2:	238	stones
"	N3E1:	100	"
"	N4E2:	117	"
"	N4E3	113	"
"	N5E2	100	"
		668	" (14% of the total)

~~None of the~~ within the area of the northwest nucleus are no constructions, neither square N3W3, which contains the greatest number of unworked basalt stones in the feature, nor the other squares of the northwest nucleus includes ~~any~~ other items in greater than mean quantity. Square N3E2 and the other four squares of the northeast nucleus, on the other hand, contains greater than mean quantities of both basaltic gleve and basalt artifacts.

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~~#24~~
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Interpretations and Conclusions

On the basis of the mapping, dating and preliminary analyses certain tentative conclusions are possible regarding the nature of ~~site~~ feature 1094, its ~~s~~ archaeological context and its significance to an understanding of the archaeological pattern of the island.

History of the Feature.

~~Feature 1094~~ On the basis of presently available information, evidently ~~it represents~~ was occupied during feature 1094 ~~seems to represent~~ a major expansion ~~of settlement~~ into ~~and~~ of population, and greatly increased utilization of the inland ~~major~~ zone of Kaho'olawe. This expansion appears to have begun ~~about~~ around A.D. 1400 and the large scale use of interior sections appears to have been curtailed by ~~the~~ mid 17th century (Hommon ms., ~~Statement~~ Statement of Significance, pp 22-23) around ~~1650~~. As noted previously, the occupation of

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feature 1994 neatly brackets this time period. The most
(NIEZ)
thoroughly dated square, yielded both the earliest and latest
date ranges, as well as 19 dates distributed between them.
Neither these nor other data ~~suggest the~~ are sufficient
to suggest ~~a shifting use of the~~ differential use of various
sections of the feature through time.

~~A major research question in Hawaiian archaeology~~
~~has been the degree of permanence~~

The degree of residential permanence in habitation
sites is a major question in Hawaiian archaeology &
This is a vital research topic first. ~~Feature since both~~ because ~~a large~~ the majority of Hawaiian ~~many~~ habitation sites
appear to be too small and unsubstantial to have been
permanently occupied

This is a vital research topic ~~for~~ first because of the apparent

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discrepency between the high ~~developed~~ socioeconomic development on the one hand and the settlement pattern, which seems to ~~include~~ consist largely of small, insubstantial, and apparently temporary habitation structures. ~~Secondly~~, an accurate assessment of the degree of ancient residential permanence is essential to an understanding of ~~factors~~ a wide variety of variables such as economic productivity, population density, and social ranking.

~~Given the usage of more than~~ Given that feature 1094 was utilized over a span of at least 200 years, ~~the duration of residential permanence it seems~~ and that it gives the appearance of a

The present appearance of feature 1094, together with the evidence ~~that it was~~ of utilization over a span of at least 200 years ~~suggest that~~ this feature ~~is~~ provide data for a consideration of residential permanence on ancient Kaho'olawe.

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Feature 109A, like nearly all other inland Kaho'olawe features, appears to be the remnant of campsite or series of campsites, since it is relatively small and contains relatively little cultural material (considering the 2 century span) and includes no evidence of stone structures. ~~It should be noted, intermittent, rather than permanent occupation, then, seems likely the probable pattern at 109A.~~

~~Rather In the absence of chronological data~~

If no chronological information were available, ~~a few~~ two or three relatively short term uses of the feature ~~only~~ during a few decades would explain the archaeological distribution of contents, ~~and distribution~~ in the feature. However, the overall ~~range~~ span of the basaltic glass chronological data, as well as the distribution of ~~data~~ sample ranges throughout ~~the~~ this overall

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30 Apr 79
B-1

~~range~~ span indicate numerous occupations of the site ~~each of~~ ~~which may have been~~ separated from each other by a considerable period of time. ~~Since~~ If the hypothesis of intermittent use is accurate, then it is apparent that the dated samples would represent ~~at least~~ at least ~~a minimum~~ ~~&~~ six distinct ~~as~~ occupations of the ~~site~~ feature. ~~There must have~~ ~~These six uses of the~~ ~~The dates of these~~ ~~site usages~~ ~~can be determined by con~~

This minimum figure ~~is~~ ~~was~~ is arrived at by determining the smallest number of ~~years~~ dates that would include some part of the ~~ranges~~ of all dated samples. ~~These~~ ~~year~~ dates ~~are 1422, 1446, 1500, 1539, and 1591 and 1625~~

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There year dates and the number of samples each may be represented by ~~are as~~ are as follows (See Fig 1):

(6)

I. A.D. 1422: sample numbers 1-5, 7 (5 or 6 samples)
II. A.D. 1448: " " 5, 6-11 (6 or 7 ~~samples~~)
III. A.D. 1500: " " 12-19 (7 or 8 ")
IV A.D. 1539: " " 19-31 (12 or 13 ")
V A.D. 1591: " " 32-42, 46, 50 (11 or 12 or 13 samples)
VI. A.D. 1625: " " 39, 43-56 (12 or 13 or 14 samples).

If such a pattern ~~represents~~ were accurate, then use of the fea

note two-cracked mostly

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#104
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D-2

Introduction

This is a preliminary report on Project 109A, the collection of cultural data from Feature A of archaeological site 20-97-109, on the island of Kaho'olawe, Hawaii. This project was conducted by the State of Hawaii under contract with the U.S. Navy during the first phase of the Kaho'olawe Cultural Resources Survey, an ongoing project sponsored by the U.S. Navy, which uses the island for training purposes. The survey is being conducted to identify and evaluate the cultural resources of Kaho'olawe, nearly all of which are ancient Hawaiian archaeological sites. In sponsoring the survey, the Navy is fulfilling its responsibilities under Federal Executive Order 11593 and the National Historic Preservation Act of 1966.

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Project 109A fieldwork was conducted from the 19th through the 23rd of November 1976 by a research team consisting of principal investigator Robert J. Hommon, Archaeologist ~~of the staff~~ of the Historic Sites Section, State Parks Division of the ~~Dept~~ State Department of Land and Natural Resources; Farley Watanabe, Historic Sites Specialist of the same office; Maury Morgenstein, geologist and president of Hawaii Marine Research, Inc. (a private research firm); and Patrick Mc Coy, Archaeologist on the staff of the B. P. Bishop Museum.

The purpose of Project 109A was to record and preserve the cultural information available in Feature 109A through controlled recording, collection and

analysis to provide a context within which to assess the nature and significance of the hundreds of similar features situated in the central uplands of Kaho'olawe.

Environmental Setting

Kaho'olawe is the smallest of the eight major Hawaiian Islands, being 45 ~~square miles~~ (c. 116 ~~square kilometers~~ km.) in size. Its summit, Lua Makika crater, is 1477 ~~feet~~ ft (c. 450 ~~meters~~) high. It is the most arid island both because of its low relief ~~reduces~~ limits orographic rainfall and because it is situated in the rain-shadow of 10,023 ~~feet~~ ft. (c. 3055 ~~meters~~ m.) Haleakala, the mountain that forms east Maui, 7 ~~miles~~ (c. 11.3 ~~kilometers~~ km) to the north.

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#50
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D-2

to the north and west, is saprolitic hardpan, almost totally devoid of vegetation. Most of the eroded area is gently sloping land above the 750-ft. (c. 229m) contour that may be loosely termed the central plateau of the island.

termed

Feature 109A

Feature 109A is situated on gently-~~sloping~~ (c. 7% grade) eroded land ~~a~~ 6000 ft. (c. 1.85km) northeast of Kamohio Bay and 2100 ft. (600m) east of Kanaloa Gulch at about 1060 ft (c. 323m.) elevation. Though kiawe trees and grasses can be found on nearby remnant hummocks of soil and in the gulches, no vegetation grows on the feature itself.

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D-2

The boundaries of Feature 1094 were determined by the ~~Feature 1094~~ concentration of archaeological items lying on the surface of the hardpan. These items include ~~stone~~ artifacts of basalt and basaltic glass, ~~unworked pieces~~ pieces of unworked basalt and coral, and mollusc shells. ~~Coral~~ A sparse scatter of ~~such~~ archaeological ~~items~~ items could be found downslope (southeast) from the feature for a distance of more than 100 meters. Most of these items ~~have~~ probably have been transported by slope wash. The feature itself measures approximately 22 m (northeast-southwest) by 31 m ~~(NE-SW)~~ (northwest-southeast). ~~Although~~ The northwest-southeast dimension ~~has been~~ of the feature ~~has been~~ ~~undoubtedly~~ apparently has been elongated by

RJH
#8 ~~of~~
16 Dec 79
D-2

movement of archaeological material by sheetwash. The clearly discernible concentration of ~~item~~ ~~cultural~~ archaeological items that forms this and hundreds of similar features, as well as the differential distribution of items within the feature support the conclusion that spatial patterns within the feature have not been destroyed by the removal of their soil ~~matrix~~ matrix, but rather ~~distorted~~ horizontally distorted.

Method

Within the boundaries of the feature, a 2 by 2 meter grid, oriented with magnetic compass directions, was established to provide horizontal control for recording and collection.

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Chronological Data

A total of 54 basaltic glass items ~~~~ collected from Feature 109A (8.63% of the total) were subjected to hydration rind analysis to obtain chronological information concerning the occupation and use of the feature. A hydration rind is a chemically altered zone of the basaltic glass that begins to form when a fresh surface is exposed to the atmosphere. ~~The~~ ~~The~~ The thickness of the hydration rind, ~~The hydration process~~ which expands & inward from the surface of the basaltic ~~is initiated, for example, when~~ ~~Most basaltic glass~~ glass, is related in a known way to the length of time ~~artifacts and debris. The approximate date of manu~~ that has passed since the ~~flake~~ fresh surface ~~fracture of each basaltic glass artifact~~ was exposed.

Because fresh surfaces are almost ~~&~~ always exposed

during the flaking process used to produce basaltic glass artifacts, the approximate date of production of most artifacts, cores and waste flakes can be determined by measurement of the rind ~~of a thin section of the sample~~. thickness in thin section. The rind of each sample is measured in a number of places, producing a range of thicknesses, which reflects a range of possible ~~ages~~. dates. For convenience, basaltic glass hydration date ranges are usually presented in the form of the median date with a plus-or-minus factor in years. Thus, for example, A.D. 1442 ± 20 represents a range ~~from~~ of

RJH
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1422 to 1462, during which the hydration rind being measured began to form. The flake scar may have been formed in 1422, or 1462, or in any year between these two dates. Cf. Morgenstein and Ridley 1974).

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D-1

~~The two~~

It is apparent that ~~subsurface~~ feature 109 ~~was~~ occupied ~~used~~ by individuals or small groups of individuals at intervals ~~of as many as 5 2~~ ~~years~~ ranging up to as long ~~many~~ as 5 2 years. The postulated six occupations listed above are separated by an average of 40.6 years.

Today, the feature ~~site~~ and its environment ~~seem to~~ offer little evidence that would explain its repeated re-use. No ~~stone~~ ~~structu~~ evidence of stone structures, other than probable fireplaces, were found.

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D-1

The feature appears never to have been situated on a prominent physiographic point. It is unlikely that a ~~stream~~ source of fresh water was nearby. ~~The hardpan rises slightly to the north and it is possible that the feature~~

The slight rise in the hardpan to the north probably ~~represents a small~~ is the remnant of a ~~the~~ similar rise when the postulated soil mantle was intact in the 15th ~~century~~ and 16th centuries. This rise may have afforded some protection from

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the trade wind. ~~Trees or shrubs may~~ It might be speculated that trees or brush provided more protection, yet there ~~is no reason~~ seems no reason why such vegetation could grow here and not in the surrounding area.

~~At present,~~

On the basis of presently available concrete evidence, ~~the~~ it ~~is~~ is ~~reasonable to~~ suggest that a reason for the repeated ~~use~~ use of feature 109A was the presence ~~there~~ of ~~the~~ raw materials for the various

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activities that took place there. ~~The~~ For example, unworked basalt stones, used for lining and filling fireplaces and imu (underground ovens) ~~are rarely seen~~ occur rarely today on the landscape except ~~for~~ in archaeological features. It would be more convenient to ~~use the stones build a fireplace~~ re-use the stones at 109A than to carry stones from ~~the~~ Kaneloa Gulch, ~~several hundred~~ the nearest source of naturally occuring stones. In a similar way, cores ~~and~~ and flakes of basalt and basaltic glass at 109A left by earlier uses of 109A ~~[illegible]~~

may have been worked and utilized by later inhabitants of the feature

~~The evidence~~

The following activities are evidenced at feature 1094:

1) the construction of fireplaces and/or ~~ovens~~ ovens;

2) the consumption of the meat of marine molluscs;

3) the working of basaltic glass; and

4) the working of basalt.

~~The probable functions of the fireplaces include the production of heat and light and~~

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~~It is probable that the fires were for cooking as well as the production of heat and light.~~

Most of the pieces of unworked basalt, both vesicular and non-vesicular, are angular, rather than rounded by erosion. Evidence from a number of ~~other~~ Kaho'olawe features demonstrate that the angular fractures were caused by exposure to heat in fireplaces and imu. The 1094 fireplaces ~~and/or imu~~ probably served for cooking and the production of light and heat. If imu were present, they were used in baking.

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Neither the basaltic glass nor the basalt samples have yet been analyzed for evidence of use, but it is probable that at least some of the flakes of both materials were used as implements at 109A. ~~for cutting and/or scraping.~~ The presence of two basalt adz preforms from 109A suggest that part of the adz-manufacturing process may have taken place here. ~~at 109A.~~ These adz preforms were probably carried from one ~~or more~~ of the adz quarries in the vicinity of Moaula, 1.3 to 2 mi northwest of 109A.

RDH
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19 Dec 79
D-1

It is of interest to note that 46 or about 74% of the basaltic glass items were identified in the field as cores rather than flakes. These data suggest that relatively few of the cores were ~~so~~ were worked at feature 109A, or that ~~many of~~ the majority of the flakes that were produced at 109A were carried elsewhere for use. It is also possible that more flakes than cores have been ~~completely~~ ~~removed from~~ transported away from the site by overland sheetwash. In this regard, it should be noted that 70% of the cores occur

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in the northern ~~portion~~ squares of the feature, while only ~~43%~~ 9% of the flakes occur in the same ~~portion~~ squares.

~~In conclusion,~~ While a ~~~~ variety of activities ~~can be~~ are demonstrated or strongly indicated by the materials from feature 109A, no direct evidence for agricultural activities ~~are available~~ is available. ~~Large scale agriculture is a major hypothesis hypothesis at the base~~ A major hypothesis of the research design of the Kaho'olawe survey is that the complex and extensive inland settlement pattern ~~was developed~~

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#396
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D-1

was based on the ~~subsistence~~ agricultural use of this area. Sweet potato is ~~believed to be~~ postulated as the staple crop, and land ~~preparation~~ is believed to have been prepared by slash and burn techniques (Hammon ms [1978] Statement of Significance, pgs. 22-23, 31-32, ff.). While a variety of activities are demonstrated or strongly indicated by the materials from feature 109-1, no direct evidence for agricultural activities is available at 109A.

References

Homman, Robert J.

ms. Historic Resources of Kaho'olawe (Partial Inventory: Prehistoric Sites and Historic Properties.) National Register of Historic Places Inventory-Nomination form. [1978]

Morgenstein, Maurice and Thomas J. Riley

1974 Hydration-Rind Dating of Basaltic Glass: A New Method for Archaeological Chronologies. Asian Perspectives., Vol. XVII, #2.

Table 1

~~PRELIMINARY~~ INVENTORY OF MATERIALS FROM ~~KHLWE 109~~ Kaho'olawe Feature 109A

#1 of 6

SQUARE	ARTIFACTS: Basaltic Glass: Cores	Basaltic Glass: Flakes	Basaltic Glass: Total	~~Unworked~~ Basalt: ~~Flakes~~ Cores	~~Unworked~~ Basalt: ~~Cores~~ Flakes	~~Unworked~~ Basalt: Adz Fragments	~~Unworked~~ Basalt: ~~Other~~	~~Total Artifacts~~	OTHER ITEMS ~~UNWORKED BASALT~~: UNWORKED BASALT: Non-Vesicular	Vesicular	Rounded Water-Worn	Total	Mollusc Shells	~~Patios~~ Coral	METAL: ~~Total~~ 25	Photos (B/W & Color)	Comments
N1W1									31	1	2	34	1		10	2-6, 2-24	B/W: Roll 2; Color: Roll 2
N1W2					1			1	90	9	1	100	2		11	2-7, 2-27	
N1W3									138	15	1	154			14	8/26	many wood
N1W4									47	6	6	59	1		4	9/29	
N1W5		1	1						32	2		34			11	10/30	
N2W1		2	2		1			1	28			28	2		7	11/31	
N2W2									53	6		59			7	12/32	
N2W3	1		1						157	18		175	1		10	13/33	
N2W4									123	11		134	1		13	14/34	
N2W5									42	1		43			10	15/35	
N3W1	12	4	16		8			8	72	3		75	4		7	16, 17, 24	Color: Roll 3
N3W2	1		1		1			1	50	4		54			5	18/5	angular stones & metal in plunge pool
N3W3	1		1						276	19	1	296			7	11 6	
N3W4					1			1	37	2		39			14	20 7	
N3W5	2		2						34			34	1		8	21 8	
N4W1	1	2	3		3			3	41			41			8	22 9	
N4W2	1		1						19			19			7	23 10	
N4W3				1				1	35			35			15	24 11	
N4W4	1		1						15			15			12	25 12	
N4W5	1		1		1			1	7			7	1		6	26 13	
N5W1									12			12			7	27 14	
N5W2					1			1	9			9			7	28 15	
N5W3									8			8	1		6	29 16	
N5W4									2	1		3			1	30 17	
N5W5															2	31 18	
	21			1	17							3					

1) Add Basaltic columns
2) Add Unworked columns
3) Ignore page totals
4) Columns should look like these on the page
5) Add dashes (-) where no entry or zero or "?"

PRELIMINARY INVENTORY OF MATERIALS FROM KHLWE 109

SQUARE	ARTIFACTS: Basaltic Glass: Cores	Basaltic Glass: Flakes	Basaltic Glass: Total	Unworked Basalt: ~~Flakes~~ ~~Cores~~	Unworked Basalt: ~~Flakes~~ ~~Cores~~	Pdz Fragments ~~Other~~	Total ~~Artifacts~~	UNWORKED BASALT: Non-Vesicular	Vesicular	Rounded Water-Worn	Total 22	Mollusc Shells	~~Ratios~~ Coral	Metal 23	Photos (BW/C)	Comments
N6W1					4		4	27			27			10	32 33 19	
N6W2					1		1	24			24	1		9	34 20	
N6W3								2			2			7	35 21	
N6W4														3546	36 22	(6 buried under alluvium)
N6W5								1			1			10+19	37 23	
N7W1								11		1	12			6	1 24	BW Roll 3 / Beach Pebble
N7W2								7			7			9	2 25	
S1W1								136	8		144			11	3 26	
S1W2	4		4					67			67	1		8	4 27	
S1W3					1		1	64	3		67	2	1	17	5 28	2 buried angulars / 1 mang. nodule
S1W4								38	11		49			11	5 29	BW #? / one of preceding. Series
S1W5					1		1	22	1		23			7	6 30	
S2W1	1		1					83	3		86			13	13 4-2	Subsurf: 3 angulars + 2 metal
S2W2					1		1	34	4		38	2		18	14 3	" " 1 metal / 1 mang. nodule
S2W3								35	2		37	3		17	15 4	
S2W4								21	1		22	1		18	16 5	2 mang. nodules
S2W5	1		1		1		1	11	2		13			14	17 6	1 " "
S2W6	1		1											?	— —	
S3W1								26	2		28	1		11	18 7	1 mang. nodule
S3W2								23			23	1		9	19 8	(complete thair) 5 ang. buried
S3W3					1		1	16	3		19	1		14	20 9	
S3W4								9	1		10	1		7	— —	nearly complete thair.
S3W5	1		1					6			6	1		7	— —	
S4W1	1		1					22	4		26	1		11	21 10	

PRELIMINARY INVENTORY OF MATERIALS FROM KHLWE 109

SQUARE	ARTIFACTS: Basaltic Glass: Cores	Basaltic Glass: Flakes	Basaltic Glass: Total	Unworked Basalt: ~~Flakes~~ Cores	Unworked Basalt: ~~Cores~~ Flakes	Unworked Basalt: Adz Fragments	Unworked Basalt: Other	Unworked Basalt: Total ~~Artifacts~~	UNWORKED BASALT: Non-Vesicular	Vesicular	Rounded Waterworn	Total	Mollusc Shells	~~Ratios~~ Coral	Metal	Photos		Comments
N1E1	12	1	13						53	1		54	3		13	22	11	
N1E2	35	10	45		4	1		5	62	1		63	7	1	10	23	12	*1 coral; 1 adz preform
N1E3	25	5	30		5			5	36	1		37	2		10	24	13	FIRST SQUARE BY QUADS
N1E4	6	2	8		1			1	10			10			11	25	14	
N1E5	5		5		1				12			12	2		17	26	15	
N1E6									8			8				—	—	
N2 E1	25	5	30		2			2	67			67	7	1	11	27	16	etc.
N2E2	28	2	30		5			5	88	4		72	4	1	6	28	17	also 1pc. vesicular glassy scoria
N2E3	19	3	22		7			7	37			39	4		19	33	21	1" " " 1" " "
N2E4	17		17		1			1	23	2		25	4		18	34	22	BF retouched
N2E5									13			13			8+5	35	83	
N3E1	19	2	21						100			100		1	12	2	24	B WP-4 4
N3E2	25	12	37		8			8	231	7		238			18	3	25	
N3E3	37	4	41		5			5	37	1		38	3	1	17	4	26	
N3E4	6		6		2				12			12			7	5	27	
N3E5	1		1		1			1	4	2		6	1		13+3	6	28	
N4E1	1		1		1			1	43	1		44	1		1	7	29	
N4E2	6	2	8		3			3	117		1	118	1		14	8	30	Look, worn polish, possible
N4E3	11	2	13		1			1	113			113		1	12	9	1	1 flake tool
N4E4					2				16			18						
N4E5									6			6			2	11	33	
N5E1					1			1	15			18			12	12	34	
N5E2	13	1	14						[illegible]			[illegible]			12	2		
N5E3	3	1	4						57			61			14	1		[illegible]
[illegible]	214	5																

X 56 X1

PRELIMINARY INVENTORY OF MATERIALS FROM KHLWE 109

#46 E

SQUARE	ARTIFACTS: Basaltic Glass: Cores	Basaltic Glass: Flakes	Basaltic Glass: Total	~~Unworked~~ Basalt: ~~Flakes~~ Cores	~~Unworked~~ Basalt: ~~Cores~~ Flakes	~~Unworked~~ Basalt: ~~Rocks~~ Fragments ~~Other~~	~~Total Artifacts~~	UNWORKED BASALT: Non-Vesicular	Vesicular	Rounded w/ water-worn	Total	Mollusc Shells	~~Ratios~~ Coral	Metal	Photos	Comments
N6E1	4		4		2		2	80			80	1		16	15 1	
N6E2	5		5					83		1	83	1		13	16 -	Lava w/ worn pebble
N6E3								2			2			5	- -	
N7E1								12			12			2	- -	
N7E2								3			3			2	- -	
N7E3								2			2			5	- -	
N1W6					1		1	15			15			4		
N2W6								29			29			8		
N3W6								8			8			3		
S1W6					1		1	7			7			5		
S2W6								3			3			11		
N1W7								5			5			4		
N2W7								4			4			6		
S1E1	1	2	3					73	3		95	1		14	19 10	
S1E2	21	17	38		3		3	29	3		32	7		9	20 11	
S1E3	29	18	47		6		6	21	1		22	11		19	21 12	
S1E4	10	2	12					16			16	1		8	22 13	
S1E5	4	1	5					8			8			11	23 14	
S1E6	3		3		1		1	32			32			5+1	24 15	
S1E7								7			7			5	- -	
S2E1				1	2		3	117			117	1		3	25 16	Basalt core (minimal) (slotted core)
S2E2		1	1			1	1	39	1		40	3		13	26 17	Lava material (SW77, C. 18)
S2E3	20	23	43		4		4	23	1	1	25	11		12	28 27	
S2E4	7	2	9		1		1	3			3	2		21	29 30	
	114	116		X1	21	X1										

PRELIMINARY INVENTORY OF MATERIALS FROM KHLWE 109

#5 of 6

SQUARE	ARTIFACTS							UNWORKED BASALT									Comments
	Basaltic Glass			Unworked Basalt													
	Cores	Flakes	Total	~~Flakes~~ Cores	Flakes Cores	Adz Fragments Other	Total ~~Artifacts~~	Non-Vesicular	Vesicular	Rounded Water-Worn	Total	Mollusc Shells	~~Ratios~~ Coral	Metal	Photos		
S2E5	3	2	5		1		1	11			11			25	30	21	
S2E6	1		1		1		1	26			26			7	31	22	
S2E7	2		2					17			17			15+3	1	–	Both cores large
S3E1	3	1	4		1		1	48	4		52	1		5	32	23	
S3E2	2		2					61	2		63			6	33	24	
S3E3	3	5	8		1		1	39	1		40	1	1	13	34	25	
S3E4	9	18	27		1		1	8	1		9	4		17	35	26	
S3E5								6			6			11	36	27	
S3E6		1	1					6			6			15+2	1	28	FW tool 5
S4E1						1	1	24	2		26	1		12	2	29	Lade blank frag.
S4E2	3	1	4		2		2	47	1		48			10	3	30	
S4E3	1		1		3		3	70	1		71			7	4	31	
S4E4	2	4	6		1		1	6			6			0?	5	32	
S5E1		1	1		3		3	29	3		32	1		12	6	33	
S5E2		1	1					22	1		23	2		9	7	34	
S5E3					1		1	28	3		31			10	–	–	
S5E4	1		1					16			16			5	–	–	
XS6E1								8			8			7	–	–	
XS6E2								10			10			6			
XS6E3								21			21			8+1			
XS7E3					2		2	10			10			7			
XS5W1								15			15			11			
XN5E4														6			
	3	34		X	17	X1			11			1	1				

PRELIMINARY INVENTORY OF MATERIALS FROM KHLWE 109

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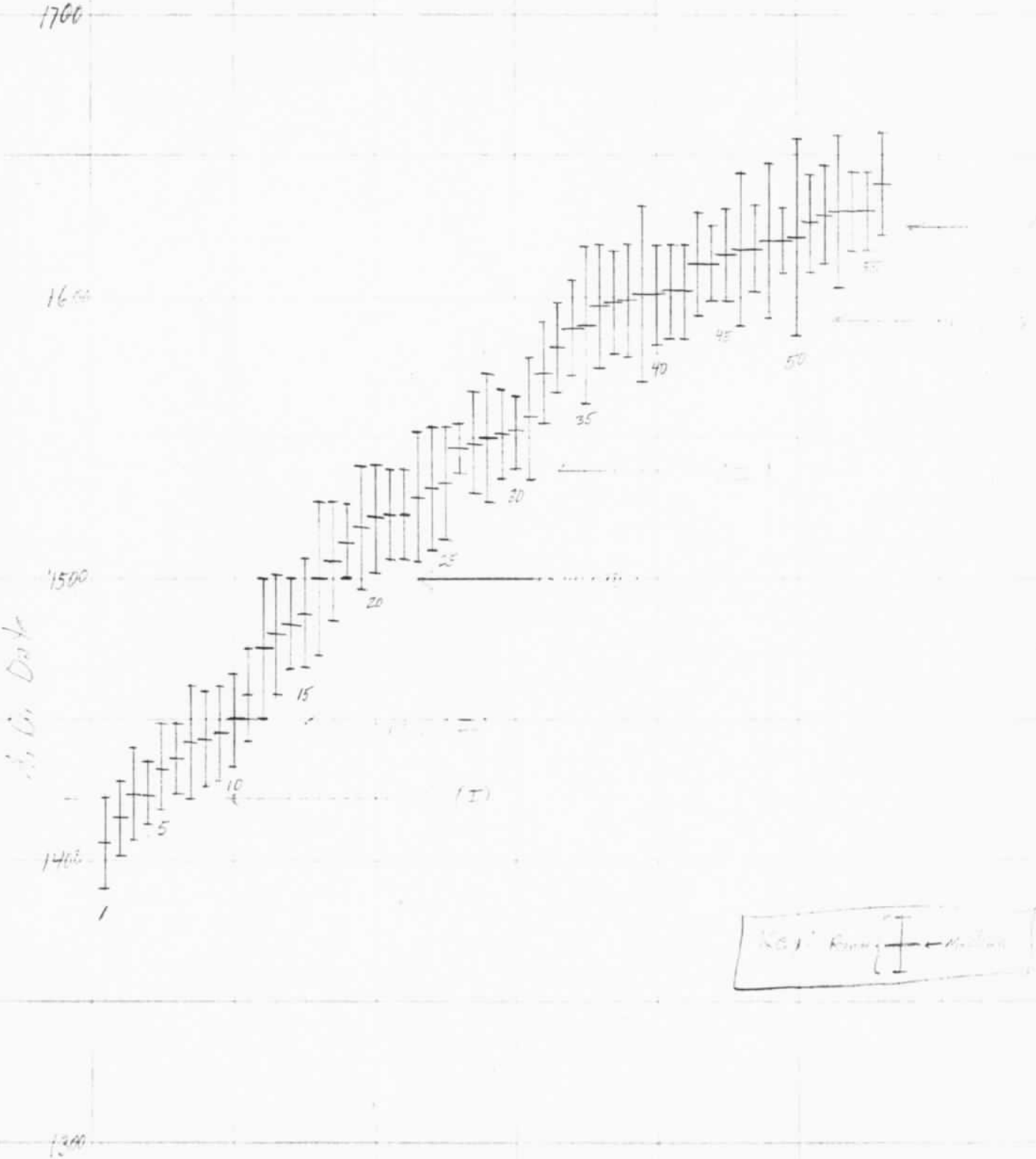
SQUARE	ARTIFACTS							UNWORKED BASALT								
	Basaltic Glass			Unworked Basalt												
	Cores	Flakes	Total	~~Flakes~~ Cores	~~Cores~~ Flakes	~~Pol. Fragments~~ Other	Total ~~Artifacts~~	Non-Vesicular	Vesicular	Rounded	Total	Mollusc Shells	~~Ratios~~ Coral	Metal	Photos	Comments
56 E4					1		1	40			40	3		7		
57 E4								8			8	1		1		
56 E5	1		1		3		3	4			4	1		3		
TS.B.	3	3	6		1		1	7			7		1			Temporary Siltation Basin
TOTALS	462	164	626	2	120	3	125	112	12	133	4759	121		12 63		

Figure 1
Basaltic Glass Hydration Rind Medians + Ranges from Kaho'olawe Feature 109A



Dated Basaltic-Glass Samples in chronological order

Basaltic Glass Hydration-Rind Dates
from Kaho'olawe Feature 109A

KJH
#1 of 3
22 Apr 79
D. 1

Number	Median A.D. Date and ± Factor	Total A.D. Range	Grid Square	HMR No.	Comment
1	1406 ± 16	1390-1422	N1E2	999	
2	1415 ± 14	1401-1429	N3E2 (SW)	1040	
3	1424 ± 16	1408-1440	N1E4 (SE)	1042	
4	1424 ± 11	1413-1435	N1E2	996	
5	1433 ± 15	1418-1448	N1E3 (NW)	1007	
6	1436 ± 12	1424-1448	N1E2	995	
7	1442 ± 20	1422-1462	N3E2 (SW)	1043	
8	1443 ± 17	1426-1460	N2E2 (SW)	1029	
9	1445 ± 17	1428-1462	N3E4 (SW)	1031	
10	1450 ± 16	1434-1466	N2E2 (NE)	1035	
11	1459 ± 16	1443-1475	N1E3 (SW)	1009	
12	1475 ± 25	1450-1500	N1E2	991	
13	1480 ± 21	1459-1501	N1E1	987	
14	1484 ± 16	1468-1500	N1E2	974	
15	1488 ± 19	1469-1507	N3E3 (NE)	1032	
16	1500 ± 27	1473-1527	N1E3 (SE)	983	
17	1506 ± 21	1485-1527	N1E1	988	
18	1513 ± 13	1500-1526	N1E2	1000	
19	1518 ± 22	1496-1540	N1E2	973	
20	1521 ± 19	1502-1540	N1E3 (NE)	1005	
21	1523 ± 16	1507-1539	N1E2 (NW)	980	
22	1523 ± 16	1507-1539	N2E2 (SW)	1025	

RJH
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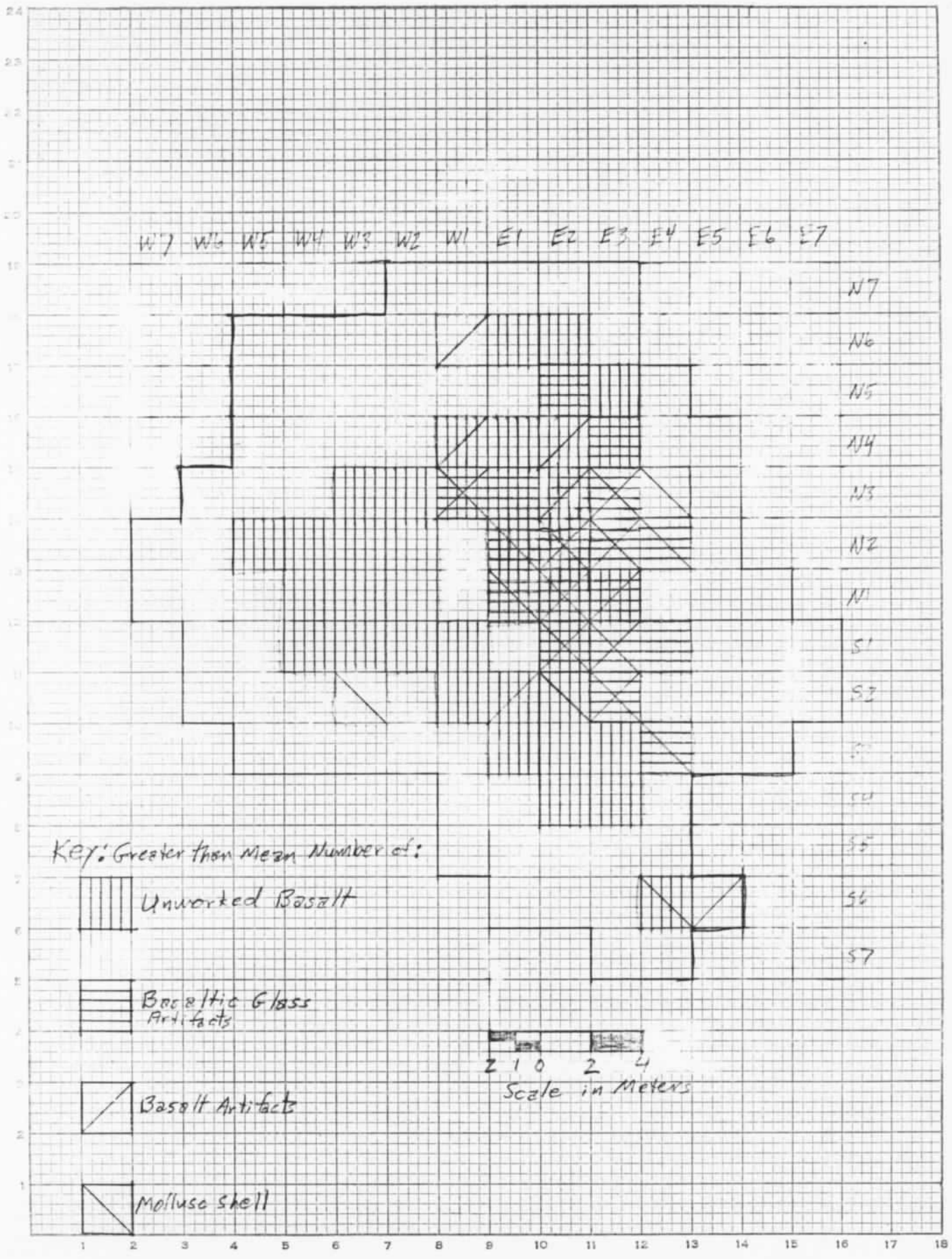
D-1

Number	Median A.D. Date and ± Factor	Total A.D. Range	Grid Square	HMR No.	Comment
23	1529±23	1506-1552	N2E1 (SW)	1038	
24	1532±22	1510-1554	N1E1	985	
25	1534±20	1514-1554	N1E3 (NE)	1004	
26	1546±9	1537-1555	N1E2	997	
27	1548±18	1530-1566	N1E2	979	
28	1550±23	1527-1573	N4E3 (NW)	1028	
29	1551±16	1535-1567	N1E2	994	
30	1552±13	1539-1565	N1E2	1002	
31	1557±22	1535-1579	N1E1	971	
32	1573±18	1555-1591	N1E1	986	
33	1582±16	1566-1598	N2E2 (SW)	1026	
34	1589±17	1572-1606	N1E2	990	
35	1590±28	1562-1618	N2E1 (SW)	1041	
36	1597±22	1575-1619	N1E3 (SW)	982a	One of two readings on sample
37	1598±18	1580-1616	N1E2	976	
38	1599±20	1579-1619	N1E3 (NW)	982b	One of two readings on sample
39	1601±31	1570-1632	N1E3 (NW)	982a	One of two readings on sample
40	1601±18	1583-1619	N1E2	1001	
41	1602±17	1585-1619	N1E2	972	
42	1602±17	1585-1619	N1E3 (SW)	981b	One of two readings on sample
43	1612±18	1594-1630	N1E1	989	
44	1612±13	1599-1625	N5E2 (NE)	1027	

RJH
#3 of 3
22 Apr 79
D-1

Number	Median A.D. Date and ± Factor	Total A.D. Range	Grid Square	HMR. No.	Comment
45	1615±16	1599-1631	N2E1 (NE)	1037	
46	1617±27	1590-1644	N1E3 (SW)	1010	
47	1617±15	1602-1632	N2E2 (NW)	1034	
48	1620±27	1593-1647	N1E2	977	
49	1620±11	1609-1631	N1E2	998	
50	1621±35	1586-1656	N1E3 (NE)	1003	
51	1626±17	1609-1643	N3E2 (SW)	1039	
52	1629±17	1612-1646	N1E2	975	
53	1630±27	1603-1657	N1E2	993	
54	1630±14	1616-1644	N2E2 (SE)	1033	
55	1630±14	1616-1644	N5E2	1030	
56	1640±18	1622-1658	N1E2	978	
	—	—	N1E3 (SW)	984	No Hydration Rind
	—	—	N1E2	992	Hydration Rind Not Visible
	—	—	N1E3 (NW)	1006	" " " "
	—	—	N1E3 (SW)	1008	" " " "
			N2E2 (NE)	1036	12,000 B.P.: Geological Date.

Figure 2 Concentrations of Artifacts and Other Items in Kahe'eloue Feature 109A



Kaho'olawe Feature 109A

~~Collection~~ Inventory

[- RJ Hommon 14 Apr 1979]

Basaltic Glass Cores	462		
Basaltic Glass Flakes	164		
Total Basaltic Glass ~~Items~~ Artifacts		626	
Basalt Cores	2		
Basalt Flakes	120		
Adz Fragments	3		
Total Basalt ~~Items~~ Artifacts		125	
* Total Artifacts			751

Non-Vesicular Angular Unworked Basalt	4551		
Vesicular Angular Unworked Basalt	192		
Rounded Basalt	13		
* Water-Worn Basalt	3		
Total Unworked Basalt		4759	
* Total Mollusc Shells & Fragments		131	
* Total Coral Fragments		9	
Total Midden			4899
Total Archaeological Items			5650

751

~~Total Metal Fragments~~

Total Metal Fragments			1263

*=collected=874 items

Total Items	6913

1st Draft

I. Archaeological Items	5660		
A. Artifacts		751 ~~748~~	
1. Basaltic Glass			626
a. Cores			462
b. Flakes			164
2. Basalt			~~122~~ 125
a. Cores			2
b. Flakes			120
C. Adz fragments			3
B. Midden		~~4402~~ 4899	
1. Unworked Basalt			4756
a. Non-Vesicular Angular			4551 } 4743
b. Vesicular Angular			192 }
c. Rounded			13
2. Mollusc Shells Frags			131
Coral			9
3. ~~Other~~ Water worn			~~15~~
II Metal Fragments	1263		
Total Items	6913		

~~AD 1422: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,~~

I A.D. 1422: 1-5, 7 5 or 6

26 yrs

II 1448: ~~6~~ 5, 6-11 6 or 7

52 yrs

III 1500: 12-19 7 or 8

39 yrs

IV 1539: 19-31 12 or 13

5 2 yrs.

V ~~1555~~ 1591: 32-42, 46, 50 11, 12 or 13

34 yrs.

VI 1625: 39, 43-56 ~~13 14 or 15~~ 12, 13 or 14

203 yrs. total

40.6 yrs. average interval

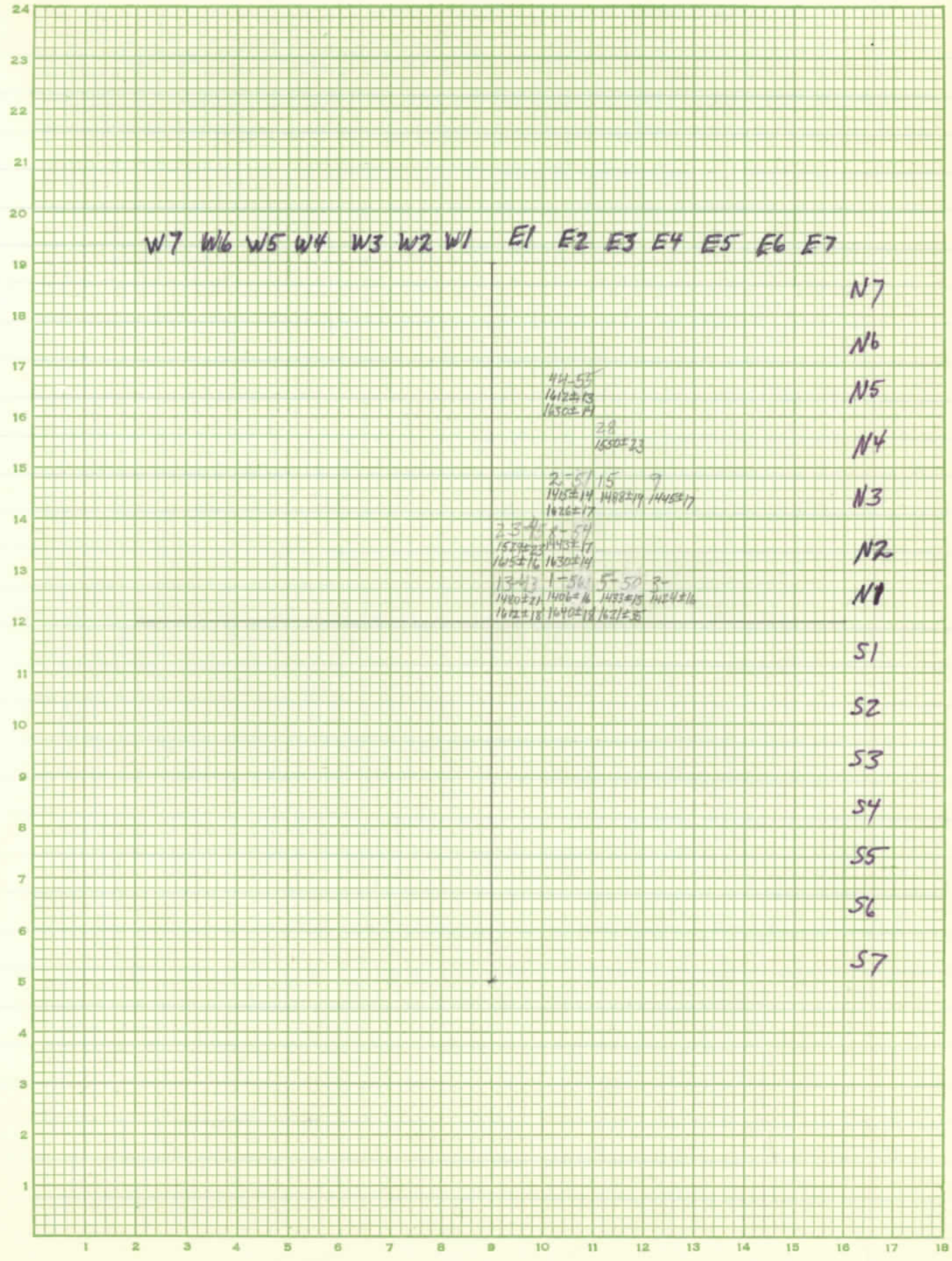
~~ = date ranges that could refer to the same use

N5E2	NE VI 44, 55	2
N4E3	NW IV 28, SW I, SW VI	1
N3E2	2, 7, 51	3
N3E3	NE III 15	1
N3E4	SW II 9	1
N2E1	SW IV, SW V, SW V, NE VI 22, 23, 35, 45	4
N2E2	SW II, NE V, SW V, NW VI, SE 8, 10, 33, 47, 54	5
N1E1	III, IV 13, 17, 24, 31, 32, 43	6
N1E2	I, III, NW IV, V, VI 1, 4, 6, 12, 14, 18, 19, 21, 26, 27, 29, 30, 34, 37, 40, 41, 48, 49, 52, 53, 56	21
N1E3	II SW, SE, NE IV, NE, SW, NW, NW V, SW, SW, NE 5, 11, 16, 20, 25, 36, 38, 39, 42, 46, 50	11
N1E4	SE I 3	1
		56
	without archaeological data:	5
		61

HMR-

#	Date Range	HMR	Comment

Dated Glass Samples



Cores in North

21
12
35
25
6
5
25
28
14
17
19
25
37
6
1
1
6
11
13
3
4
5

324 of 462 = 70%

Flakes in North

9
28
2
12
4
2
2
1
1
4
5

70 of 164 = 43%

RJH
#130h
25 Apr 79
D-1

~~a tool by flaking~~.

Thus a range of A.D. dates within which a flake was formed can be ~~determined~~ derived from an analysis of the range of thickness of the hydration rind as observed in a thin-section of the artifact. ~~Along~~ For convenience, basaltic glass hydration date ranges ~~dates~~ are usually presented ~~as the~~ in the form of the median date with a plus-or-minus factor ~~of~~ in years. Thus, for example, A.D. 1442±20 represents a range of 1422 to 1462 during which the hydration-rind being measured ~~is~~ began to form on a fresh flake-scar of the dated artifact.

RJH
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Chronological Data

~~(8.63%)~~

A total of 54 ~~samples of~~ basaltic glass artifacts (8.63% of the total) collected from feature 109A were subjected to hydration-rind analysis to obtain chronological ~~info~~ data about the occupation and use of the feature. ~~A total of~~ ~~The~~ hydration rind is a chemically altered zone of the ~~Fifty-six data~~ data ranges ~~have been obtained~~ basaltic glass that begins to form when ~~a~~ ~~or unaltered~~ ~~from the 54 samples~~ ~~In this process the~~ ~~range in~~ ~~the~~ a fresh ~~flake~~ surface is exposed to the atmosphere as by the removal of a flake in the preparation or use of the unaltered ~~The~~ thickness of the hydration-rind on a ~~was produced~~ flake scar of a basaltic glass artifact is in a known way ~~indicative~~ ~~directly~~ related to the length of time that ~~it~~ has passed since the flake scar ~~was formed~~ ~~by human agency. in the process of producing~~ was formed in the tool-making process.

RUH
#86
10 Apr 79
D-1

of fire-cracked rocks and artifacts, ~~respectively~~ respectively. This will be discussed later in the report.

~~A total of 7539 archaeological items were recorded along with within the boundaries of Feature 109A.~~

~~Salvage of Feature 109A~~

Method

~~Each~~ After the approximate boundaries of the feature had been determined, ~~a metric horizontal control was~~ a 2x2-meter ~~metric~~ grid was imposed on the feature to provide horizontal control for recording, ~~and~~ and the collection ~~out~~ of items. ~~All artifacts were recorded~~ The location of each artifact was recorded according to the ~~NE~~ square meter ~~in~~ from which it was recovered.