5.0 PROJECT SUMMARY

The project summary that follows includes: (1) a discussion of preparatory work undertaken prior to the start of fieldwork; (2) a chronological summary of work completed in each year of the survey; (3) a discussion of survey objectives, field methods and limitations, and (4) a summary of the findings. The findings, which are described in detail in Volume 2, include a summary description of all of the historic properties that were identified in the survey; artifacts collected during the fieldwork, and a summary of other cultural resources that were found and recorded. The latter encompasses parts of the built environment that are suspected of being less than 50 years old and thus do not qualify as historic properties under Chapter 6E and the National Historic Preservation Act of 1966.

5.1 PRE-FIELDWORK TASKS

Two tasks in the SOW were started before going into the field: (1) development of an integrated spatial database, and (2) the preparation of a new site and feature recording forms and artifact recording forms. Minor changes to the forms were made as the survey progressed.

5.1.1 Development of an Integrated Spatial Database

Copies of all relevant existing reports pertaining to cultural resources in the Science Reserve were assembled and the information contained therein incorporated into a Geographical Information System (GIS) to facilitate information management, mapping, and general data access. Some unforeseen difficulties were encountered in the development of the database which thus remains a work in progress. A plan to complete it at a later date has been discussed with OMKM.

5.1.2 Preparation of Site and Artifact Recording Forms

Because virtually all of the previous archaeological surveys undertaken in the Science Reserve had been reconnaissance surveys (see summary of previous work in Section 3), the data that had been collected were in certain respects limited and incomplete. Review of the site records for the 95 sites recorded prior to the start of the current survey in 2005 revealed two major short-comings:

(1) The first was a predictable degree of unevenness in both the type and quality of data that were collected. In an effort to improve the quality of data, by ensuring that the same information would be recorded for every site, a decision was made during the surveys conducted by SHPD staff in 1995 and 1997 to use a site recording form for the first time. The form, which was primarily designed for the recording of shrines, was a first attempt to begin collecting more detailed information on this, the most common site type, in the Science Reserve. Some important information was omitted, however, and because of the lack of sufficient time and resources, some information was not recorded in a consistent manner.

(2) The second short-coming, in the opinion of the senior author, was the insufficient attention given in earlier surveys to the recording of the shape or form of the upright stones ("god-stones" called `*eho*) found on all of the shrines. The descriptions of some

of the sites recorded in the earlier surveys contain observations on upright shape and other attributes, such as size (McCoy 1984, 1999a), but the data were not recorded in a systematic fashion and were incomplete.

In an effort to use a more rigid approach to field recording along the lines recommended by Glassie (see Section 4), a number of new field forms were prepared during the course of the survey. These included a new site and feature form and forms for the recording of shrine attributes, adze quarry workshop characteristics, adze performs, and hammerstones.

A brief description of the attributes that were selected for characterizing each of the above is presented below in Section 5.4.2.1. An analysis of the attributes appears in Section 6 (Data Analyses and Results) of the report.

5.2 A CHRONOLOGICAL SUMMARY OF THE 2005-2009 SURVEY

A chronological summary of the 2005-2008 survey is presented below by field season. The summary includes the dates of each survey, names of the field crew, location and acreage of the survey and the number of sites and "find spots" identified in each season. Figure 5.1 shows the areas covered in each field season.

5.2.1 2005 Field Season

The 2005 survey was conducted over a 10-day period between August 29 and September 9, 2005 by Co-Principal Investigators Patrick McCoy and Dennis Gosser, and two other PCSI staff, Richard Nees, and Reid Yamasato. The primary objective of the first season of fieldwork was to resurvey the ca. 525-acre Astronomy Precinct. The survey of Survey Area 1, which includes the area set aside in 2000 Master Plan as the Astronomy Precinct (see Figure 5.1) began on the northwestern edge of the project area on August 29 and was completed on September 6, 2005. Fieldwork in Survey Area 2 (see Figure 5.1) was conducted on September 7-8, 2005. The final day of the 2005 project was devoted to the review and organization of field records and the downloading and logging of photographs on a computer at the Mid-Level Facility at Hale Pōhaku.

Forty five previously identified sites were relocated in the two surveys areas. All of the previously identified sites, most of which were found in reconnaissance surveys conducted in 1982 and 1984, were evaluated in terms of the completeness and adequacy of the existing maps and descriptions. A number of the maps were either redrawn or annotated with new observations.

Twelve new archaeological sites were found in the survey, which encompassed two separate areas, totaling approximately 1,200-acres. Nine of the twelve sites are interpreted as shrines based on ethnographic information and archaeological characteristics. One site, located on the south rim of Pu`u Māhoe, consists of three cairns that are believed to be either survey markers or memorials left by visitors in the historic period, or perhaps even more recently. The function of one site (21449), a small terrace located in the Astronomy Precinct, was recorded as unknown. The twelfth site, located outside the 2005 survey area on the rim of an unnamed cinder cone, is interpreted as a burial. Site 21209, which was found in 1999 on the rim of Pu`u Wekiu, south of the USGS marker, was found to have been effectively destroyed by recent activity (see site description in Volume 2). Site 21209 was the only previously identified archaeological site on the summit.

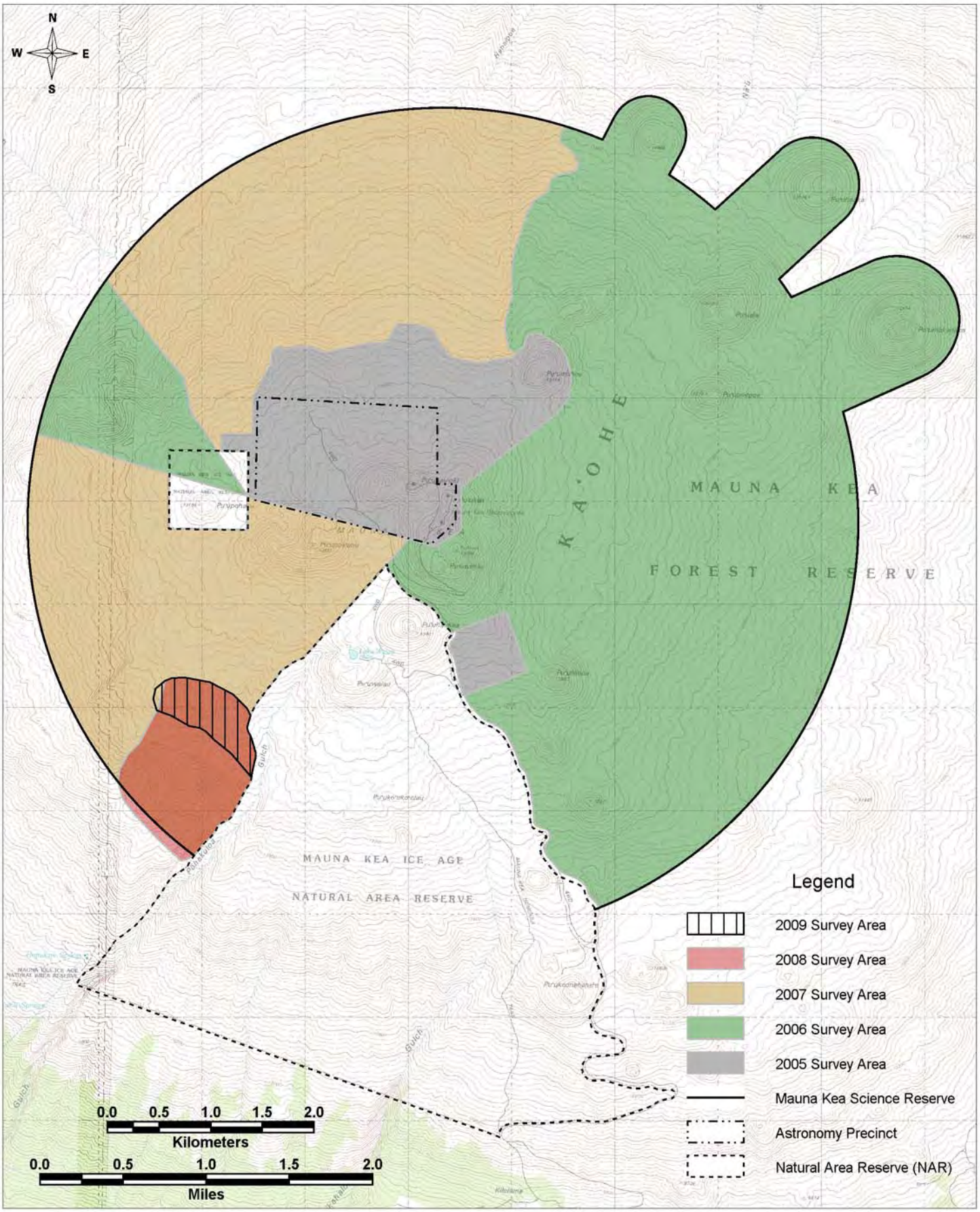

Figure 5.1 Location of 2005 - 2009 Survey Areas by Year.

Previous surveys identified a number of small overhang areas along the edge of some ridges or lava flow margins. Some may have been utilized as temporary shelters, although no artifacts or other evidence of human use have ever been found on the surface of any overhang. Still, there is a possibility that cultural materials may exist beneath the surface and have been simply buried by naturally occurring geomorphic or cultural processes. Small (50.0 cm) test probes were excavated at two overhangs on the north slope (Sites 16177 and 21205) in 2005. No cultural deposits or evidence of human use were found in either overhang.

The number of new sites (12) found in the 2005 survey is not surprising given that nine of these are located in areas that had not been previously surveyed. The finding of three new sites in the 1982 and 1984 surveys areas is also unsurprising given that both of the earlier projects were reconnaissance surveys. It does demonstrate, however, that though an area may have been surveyed on more than one occasion, the finding of a small number of new sites is to be expected, despite the intensity of the survey.

The 2005 survey also identified some 36 “find spots,” defined as man-made remains that are either obviously modern features (e.g., camp sites with tin cans, pieces of glass and other modern material culture items), or features that cannot be classified with any level of confidence as historic sites because of their uncertain age and function (e.g., a pile of stones on a boulder).

5.2.2 2006 Field Season

The 2006 survey was conducted in two increments and covered two geographically separate areas of the Science Reserve (see Figure 5.1). The first period of work, undertaken July 10-28, 2006 by a crew of four archaeologists (Patrick McCoy, Richard Nees, Keola Nakamura, and Jeanne Knapp), covered roughly 475 acres on the northwestern side of the mountain (Area 1) and an estimated 3,000 acres on the eastern slope (Area 2). The second period of work, August 28-September 16, 2006, utilized a crew of three to four archaeologists at different times (Patrick McCoy, Richard Nees, Sara Collins, Keola Nakamura and Eric Komori) and was focused on the eastern half of the Science Reserve. The survey extended down to the lower boundary of the Science Reserve at the roughly 11,800 +/- foot elevation, except for one section on the eastern slope where the survey stopped a little short. A total of roughly 6,744 acres were surveyed in 2006—5,269 acres on the eastern side and 475 acres on the western side of the mountain.

The 2006 survey identified a total of 73 new sites and updated the records for 29 previously recorded sites in the two survey areas. The sites in Survey Area 1 (see Figure 5.1) are located in the U.S. Geological Survey Ahumoa Quadrangle, and the sites in Survey Area 2, in the Mauna Kea Quadrangle. Several possible sites were also noted, but not recorded due to the lack of time to revisit them and make any kind of final determination. Because of the lack of time we were also unable to update the information for four other previously identified sites (Sites 16192, 21204, 21431, and 21432) and to complete the recording of several new sites.

A total of 20 new burial or possible burial sites were found in 2006—four in Area 1 and 16 in Area 2. All of the sites, which include a total of 37 separate features, are on the tops of cinder cones, except for Sites 25770 and 25774 which are in open areas on the eastern flank of the mountain. The largest number of burial sites is on Pu`u

Mākanaka where 17 features were found at nine sites. Four of the features are confirmed burials. Human remains had been found earlier at Site 16248, thus making a total of at least five unequivocal burials on Pu`u Mākanaka. Four sites containing six features, one of which is a confirmed burial, were found on Pu`u Ala. Three other burial sites were found on another cinder cone with no known name in the northeastern portion of the Science Reserve, near Pu`u Mākanaka and Pu`u Ala.

No sites were excavated in the 2006 survey, but a small number of artifacts, primarily adze preforms and manufacturing waste flakes or debitage, were collected. This was in large part a response to the vandalism of a previously recorded shrine in the 2005 survey area where artifacts had been removed, resulting in the loss of important information (see McCoy et al. 2005) and changes to sites at the VLBA noted in 1997 (McCoy 1999). Lithic artifacts were also collected for the more specific purpose of undertaking a geochemical analysis to determine the number of source areas. A total of 47 lithic artifacts and one historic artifact (a horseshoe) were collected in 2006. The lithic artifacts include 13 adze preforms, 33 flakes and 1 hammerstone. The 2006 survey also identified 189 new "find spots."

5.2.3 2007 Field Season

The 2007 survey was conducted in three increments and covered two geographically separate areas of the Science Reserve (see Figure 5.1). The first period of work, undertaken 18 July through 2 August by a crew of four archaeologists (Patrick McCoy, Richard Nees, Keola Nakamura, and Reid Yamasato), covered roughly 2,061 acres on the northwestern side of the mountain (Area 1) and an estimated 1,903 acres on the eastern slope (Area 2). The second and third periods of work, 20 August through 29 August, and 10 September through 17 September 2007, utilized a crew of three to four archaeologists at different times (Richard Nees, Sara Collins, Keola Nakamura, and Jeanne Knapp) and focused on the western and southwestern half of the Science Reserve. The survey extended down to the lower boundary of the Science Reserve at the roughly 11,800 +/- foot elevation, except for one section on the eastern slope where the survey stopped a little short. A total of roughly 3,964 acres were surveyed in 2007.

The 2007 survey identified a total of 66 new sites and updated the records for 21 previously recorded sites in the two survey areas. The sites in Survey Area 1 are located in the U.S. Geological Survey Ahumoa Quadrangle, and the sites in Survey Area 2 (see Figure 5.1), in the Mauna Kea Quadrangle.

No sites were excavated in the 2007 survey, but a small number of adze preforms and manufacturing waste flakes or debitage, were collected for the purpose of undertaking a geochemical analysis to determine source areas. The 2007 survey also identified 102 new "find spots."

5.2.4 2008 Field Season

The 2008 survey was conducted over a period of 5 weeks between 27 August and 2 October by a crew of three to four archaeologists (Patrick McCoy, Richard Nees, Keola Nakamura, Valerie Park, and Sara Collins). The survey, which was focused on recording an adze quarry complex discovered at the end of the 2007 field season covered roughly 387 acres on the southwestern side of the mountain.

Two excavations were conducted in 2008. The first was at Site 21449 which was found in the 2005 survey of the Astronomy Precinct and described as a terrace of unknown function (McCoy et al. 2005). It was assigned a SIHP number with some hesitation. Because of its location in the Astronomy Precinct and proximity to an area tentatively selected as the location of the proposed Thirty Meter Telescope (TMT), OMKM asked PCSI to excavate the "site" to obtain more information on which to make an informed interpretation of its possible function.

The second excavation was undertaken at Rockshelter 1, a component of Site 26253. This site is located in the newly discovered quarry complex in the Pōhakuloa Gulch area.

5.2.5 2009 Field Season

The 2009 field season was limited to 5 days within a two week period. The work, undertaken between 23 September and 3 October, was conducted in the southwest portion of the Science Reserve by a crew of four archaeologists (Richard Nees, Keola Nakamura, Valerie Park, and Melanie Mintmier). The fieldwork focused on finishing the recordation of the adze quarry complex discovered at the end of the 2007. The area investigated was roughly 111 acres.

5.3 Survey Objectives, Methods and Limitations

As noted in the summary of previous archaeological investigations in Section 3, with the exception of the adze quarry research in 1975-76, all previous archaeological surveys in the Science Reserve were reconnaissance surveys. In keeping with the definition of reconnaissance surveys, the coverage was partial and selective, rather than intensive and complete. A significant part of the work undertaken in the 2005-2009 survey was thus devoted to up-dating the information on the 95 previously recorded sites to ensure the accuracy and completeness of the data and to comply with SHPD requirements.

5.3.1 Survey Objectives

In addition to fulfilling SHPD requirements for archaeological inventory surveys, which are *minimal* requirements (HAR 13-276), the survey had other more specific objectives. Based on the senior author's conviction that archaeological surveys should do more, when possible, than simply meet regulatory requirements, an effort was made to collect data amenable to new and different kinds of analyses and the formulation of propositions and hypotheses. As mentioned above, more attention was given in the project to recording shrine and artifact attributes and making representative collections artifacts for sourcing and technological analyses.

5.3.2 Data Requirements

The definition of what constitutes an adequate database to achieve the objectives of most archaeological projects, including site surveys, is never a simple, straightforward matter. Much of the time the issue is simply ignored. The assumption is that there is a consensus amongst archaeologists on what is important to record and what is not. Charles Redman has referred to the minimal information necessary to characterize a site

as “baseline information,” which in his view is different from the information necessary to address a research problem:

> ...much of the fieldwork we do is designed to collect a common body of information that characterizes the site. I will refer to this as *baseline* information. Baseline information is the minimal set of information that most archaeologists agree must be retrieved from an excavation or survey (Redman 1987:257-258).
>
> Realistically, there are two genres of minimal data requirements with which one must be concerned: those that provide adequate baseline information, and those that solve the specific problems one has chosen to investigate (Redman 1987:259).

What Redman and many other archaeologists fail to recognize is that “baseline information” is theory dependent:

> Now, as all archaeologists know, or should know, there are a multitude of possible competing descriptions of an artifact, an assemblage, or any set of remains encountered in the archaeological record. The choice involved in the description of these remains is related to the theories used to understand them (Shanks and Tilley 1987:109).

If a person believes, for example, that nature is not real, but rather a socially constructed category or analytical construct, then the observations she or he will make will be different from those who hold to the view that humans adapt to a world not entirely of their own making. Lewontin describes how theories, or what he calls organizational metaphors, affect the kinds of observations that are made:

> The metaphor of construction replacing the metaphor of adaptation would completely change the problematic and the nature of evidence because many of the problems are the provision of the evidence of adaptation, looking for ways to show that an adaptation has occurred. But if we deny in the first place that an adaptation has occurred and change the metaphor to one of construction, how organisms have constructed the world in which we live, then we look for totally different kinds of observations (Lewontin 1994a:506).

The “archaeological record” itself oftentimes determines what are appropriate baseline data. The kinds of baseline data that are useful for characterizing quarry sites, for example, are quite different from those needed to present a description of a simple shrine. Simply put, different kinds of sites require different baseline data.

5.3.3 Site and Feature Definitions

No universally accepted definitions of site and feature exist in Hawaiian archaeology and it is unlikely that any ever will because of the architectural complexities of the archaeological landscape in many areas of the Hawaiian Islands, and the different perspectives that archaeologists hold on how the archaeological landscape should be observed and recorded. It is in fact rather uncommon to see a definition of site and feature in Hawaiian archaeological reports, especially those written in the last decade or so. Our impression is that there was more concern with definitions in the 1970s and 1980s. Rob Hommon is one of the few Hawaiian archaeologists to have offered a definition of site and feature:

> An *archaeological site* is a location with evidence of human activity in the past and consists of either a single feature or a complex of features. An

> *archaeological feature* is a spatially limited cluster of evidence of past human activities whose boundaries are determined by the extent of the evidence and/or by the boundaries of the artificial structure or natural land-form that contains it. An *archaeological complex* is a site composed of two or more features that appear to be related in some archaeologically significant way (Hommon 1980:37).

Though Hommon's definitions were never widely employed, perhaps because the distinguishing criteria are somewhat vague, he at least realized the importance of site and feature definitions. It is of interest in this regard that HAR 13-276 does not contain definitions of site and feature and does not even require them.

In our view site and feature definitions for project areas like the Mauna Kea Science Reserve need to be developed in the field and modified as seen fit, instead of trying to pigeonhole every find into a single, predetermined set of definitions. The site definitions and recording procedures employed in this report derive in part from decisions made in earlier surveys, which recognized a simple distinction between "simple" sites, such as shrines, and "complex sites" which refers specifically to the Mauna Kea Adze Quarry Complex where there are a number of different kinds of activity remains.

With the exception of a newly discovered area of the Mauna Kea Adze Quarry Complex, the vast majority of the known archaeological remains in the Science Reserve are single component activity remains. In the 2005-2009 survey each set of such remains, which are typically well separated from one another, was assigned an individual site number. In the case of shrines, where there is more than one set of uprights within 5-10 meters or so of each other, each set was assigned a feature number. Though obviously subjective, the use of a predetermined distance between features would have been just as subjective and would not have taken local circumstances into account.

In the earlier research on the Mauna Kea Adze Quarry Complex, a portion of which is located in the Science Reserve, a *site* was defined as a topographically discrete constellation of what were presumed to be functionally integrated *activity remains*, such as rockshelters, overhang shelters, workshops, shrines and locales with rock art (McCoy 1977; Cleghorn 1982). Each class of activity remains, which were interpreted as the result of groups of adze makers living and working in the quarry, was considered a *site component* and numbered sequentially within a site (e.g., Site 14, Rockshelter 1; Site 14, Shrine 1; Site 3, Shrine 1). Physically discrete portions of the larger, more complex activity remains were assigned f*eature* designations (e.g., Site 14, Workshop 15, Feature 2). In the case of the workshops, many of the features correspond to what are often called "chipping stations," where one or perhaps two individuals were engaged in adze manufacture.

Some archaeologists would probably have assigned either site numbers or feature numbers to each formal category (e.g., lithic scatter, rock overhang, upright stones). While some of these may have been grouped during the analysis of the field data, in order to talk about site structure it would have become necessary, for example, to describe Site X (an overhang) as possibly related to Site Y (an upright stone) and Site Z (a lithic scatter). If feature designations had been used for rockshelters, shrines, and other remains, this would have inevitably resulted in having to talk about features within features which is cumbersome, to say the least. The 1975-76 survey dispensed with this methodology because of the confidence that an upright or group of uprights

were a shrine and the obvious fact that shrines, as places where rituals were conducted, were an integral part of the adze manufacturing process and thus not a separate site. The same logic applied to the use of the term workshop instead of lithic scatter given the context and experience of senior staff in recognizing the debitage, unfinished adzes and hammerstones as a workshop area.

The 2005-2009 survey utilized the same general site designation scheme as the 1975-76 project, with a several modifications:

> 1) A decision was made to dispense with workshop feature designations and to number all workshops consecutively from 1 - # within a site.
>
> 2) Diffuse debitage scatters, some of which occupy the spaces between sites and thus complicate the determination of site boundaries, were identified in the field, plotted on a map and described as “flake scatters.”
>
> 3) Isolated lithic artifacts and scatters located outside of the geologic source areas of tool-quality basalt were given site designations for reasons explained below.

Site boundaries were established based on topographic location, spatial discreteness and clustering, inferred functional differences and obvious differences in age. This does not mean that a site had but one function. On the contrary, some sites include remains with multiple inferred functions. The underlying assumption, of course, is that the material remains are contemporaneous. The function of a number of features and sites, as might be expected, is either simply unknown, or the level of confidence is such that a site is classified, for example, as a possible burial or possible shrine.

The decision to record isolated finds as sites was based on the context of the artifacts, which include adze preforms, adze manufacturing waste flakes and hammerstones far removed from a known geological source. There are a number of differing perspectives amongst archaeologists on how isolated finds, such as these, should be treated and managed. The authors’ followed the lead of the National Park Service regarding isolated Early American or Paleoindian artifacts:

> Because documenting isolated finds is so critical for research purposes, they are here viewed as a specific Paleoindian property type. It is also strongly recommended that all isolated finds of Late Pleistocene age should be formally recorded in state site files, as either sites or in a special isolated find category, and that they should receive the same level of written documentation as true sites (National Park Service Archaeology Program, The Earliest Americans Theme Study).

Burtchard et al. (1994) present an interesting discussion of sites and isolated finds in a report on the John Day Fossil Beds National Monument in Oregon:

> Sites are distinguished from isolated finds on the basis of artifact density. As identified here, prehistoric archaeological *sites* contain multiple chipped stone flakes and fragments with or without stone tools. Presence of lithic debitage suggests some form of direct or sustained use of the locality. Increasing density and/or duration of use is roughly reflected by increasing artifact density and variety. *Isolated finds* typically are individual tools without evidence of associated use of the immediate area. Isolated artifacts generally are assumed to be spent shots or tools lost in more generalized use of the landscape. It is important to note that the distinction is arbitrary. <u>All</u> localities are archaeological sites of value for understanding human land-use processes. They are separated here to ease

> management efforts and to distinguish between direct versus generalized use of the landscape. All known sites and isolated finds are treated in similar fashion in dealing with larger land-use issues (Burtchard et al. 1994:6, footnote 5).

In the end Burtchard and his colleagues recognized isolated artifacts as a site type, but did not assign each find a state site number (Burtchard et al. 1994: Table 1.1).

5.3.4 Survey Methodology

In the field of archaeology generally, and in Hawaiian archaeology in particular, there is evidence that archaeological field methods tend on the whole to be taken for granted. The unstated assumption is that the observations made in the field do not differ from one archaeologist to another and that "standard archaeological recording procedures" are universal and known to every archaeologist. This is obviously not the case as a review of the literature would demonstrate. There is always an element of subjectivity, combined with objectivity, in field methods and, as discussed above, the process of defining on the ground the boundaries of sites in a large quarry like that on Mauna Kea.

The problems with doing archaeology without reflecting on field techniques and methods are highlighted in this statement made by Bradley:

> The practice of archaeology is not as objective as fieldworkers would like to believe; nor is it as subjective as theorists often suppose. Its procedures employ a mixture of objectivity and subjectivity…The observations made in the field depend on a whole series of assumptions that are not discussed because they are taken for granted. It is only when those ideas are challenged that archaeologists can recognize their own vulnerability. All their primary observations are influenced by their knowledge and experience, but what they accept as knowledge, and what they think of as relevant experience, will change when the assumptions behind them are questioned. The methods used in the field constrain the interpretations formed at the time, and those techniques may not be the best ones for investigating different problems (Bradley 1998:3).

5.3.4.1 Description and Interpretation and the Importance of Context

Description can no longer be regarded as a totally objective and purely methodological undertaking. In deciding what is important to record and why it is clear that description is an interpretive act. Peacock (1986) notes how description is not only inseparable from interpretation, but how interpretation is also theory-laden:

> The impossibility of making a carbon copy of reality and therefore the necessity of interpreting even as one describes is true in all sciences. One definition of the fact captures this point: A fact is a percept viewed through a frame of reference. The observer-describer brings to his object of observation his own theories and questions as well as implicit biases and attitudes, and these set a framework for his perceptions (Peacock 1986:66-67).

Hodder notes how description and interpretation are both subject to being contested:

> Descriptions seem obvious and undisputed. Interpretations involve the selection of information according to certain criteria, and they involve judgements that can be contested by others. However, all description involves selecting and ordering information (Hodder 1999:67).

> All description involves an interpretive component. But equally, all interpretation involves trying to link sense to data. Interpretation is always interpretation of something. Thus it is always partially a description (Hodder 1999:67).

The philosopher Richard Shusterman elaborates on the questionable distinction between describing and interpreting and notes that the distinction can only be relative:

> First of all, we must remember that every description of a work of art involves an interpretation of it, since it involves a selection of what to describe, what aspects of the work are important as to be worth describing. No description describes everything, egalitarianly reflecting all that can said truly about a work. But what more acutely undermines the idea of any firm and distinct distinction between descriptive truth (presenting the work's core of incontrovertible properties) and interpretive elaboration is that what is taken as descriptively true (the so-called hard fact on which interpretation is based) will often shamelessly depend on which interpretation of the work we come to adopt...More generally, we can be led from what we originally see as simple facts about the work to reach an interpretation of the work which dislodges or recasts the facts by showing the work in such a way that the original descriptions no longer ring true or adequate (Shusterman 1992:71).
>
> Thus, any distinction between describing and interpreting (as between understanding and interpreting) can only be relative and formal. It must be a pragmatic, shifting, heuristic distinction, not an unchanging one which would provide a firm and incorruptible core of determinate truth for simple and final description. In other words, it is not that we all agree how to describe the facts and differ only in what interpretations we elaborate from them. It is rather that the descriptive facts are simply whatever we all strongly agree upon, while interpretations are simply what commands less consensus and displays (and tolerates) wider divergence (Shusterman 1992:71-72).

Archaeological interpretations are not only theory-laden, they are also heavily dependent on context (Hodder 1987; Papaconstantinou 2006). Glassie has written that "To explain the object the analyst needs to know something of its meaning, and to know its meaning he needs some understanding of its context" (Glassie 1975:116). Richard Gould argues that "Anthropology's greatest and most lasting contribution to the social sciences lies in its recognition that context [interrelated conditions in which something exists or occurs] is everything in explaining variability and change in human behavior," and that "when disagreements arise in archaeological interpretation, they usually spring from different assumptions about what constitutes the relevant context: Not all archaeologists can agree on what contextual variables to control for, with the result that there may be widely divergent explanations for the same archaeological assemblages" (Gould 1990:5).

There are, of course, many different kinds of context, such as the culture-historic context of the project area described in Section 2. There is also the environmental context, which can be broken down into a number of specific contexts, such as the physiographic or geomorphological context.

The periglacial environment of the summit region is of major importance because of the dominance of frost-activated mass-movement slope processes (primarily gelifluction) and the effects these have on the spatial integrity of sites and quarry workshops in particular. The surface area of many workshops, for example, is in part a result of the downslope movement of flakes, cores, adze preforms and hammerstones. The problems created by the long-term, cumulative effects of post-depositional

movement in determining workshop and site boundaries cannot be overemphasized, even in areas with a gentle slope (Figure 5.2). A salient characteristic of gelifluction is the abnormally low angle over which material is transported (Davies 1972:1). The extent or degree of disturbance, which includes both horizontal and vertical displacement of surface material (i.e., burial in the geological matrix of gelifluction lobes and terraces), cannot be accurately determined without excavation.

In some cases it is possible to distinguish the natural and the cultural without excavation (cf. Williams 1973; Tilley et al. 2000). For example, with experience it becomes possible to distinguish with some degree of confidence a gelifluction terrace, which occur in such numbers that they are essentially uncountable, from a man-made terrace of which there are relatively few in the Science Reserve (see Figure 2.5). As discussed elsewhere (McCoy 1999b), while an understanding of natural site formation processes (Schiffer 1983, 1987) helps to understand some aspects of the archaeological record, it is by itself never adequate to fully comprehend the meaning of the artifact assemblages found on a gelifluction terrace, for example.

5.3.4.2 Field Techniques

The techniques employed during the survey were on the whole rather uniform, with the exception of the adze quarry (discussed below in site recording procedures). Based on the results of the earlier surveys, ridge tops and other areas of high relief were the focal points of the most intensive search for sites, since this is where the vast majority of sites had been found. Apart from this fact, the tops of lava ridges and lava domes also provide excellent vantage points from which to scan the terrain below with the eye or binoculars. It is important to note in this regard that “archaeological visibility” in the summit region, indeed on the whole top of the mountain above the tree line, is exceptionally good. Areas of low relief, such as the glacial drift deposits and moraines, can be scanned very quickly to determine the presence/absence of historic sites.

While the survey methods employed in earlier projects had proven to be generally successful, the current survey also employed the use of systematic transects, following either a set azimuth or more often, topographic features (ridge tops), to ensure that the coverage was as complete as possible. The spacing of individuals within transects varied and was determined by the kinds of landforms present in a given area. In open areas with no rock outcrops, individual crew members were more widely spaced, whereas areas of relief required closer spacing.

Beginning with the 1982 reconnaissance survey (McCoy 1982; McEldowney 1982) the practice in all subsequent archaeological surveys in the Science Reserve has been to not test possible burial features to determine the presence/absence of human remains. This same practice was adhered to in the current project out of respect and because the sites are being preserved. One result of this decision is that many structural features believed to be burials are classified in this report as “possible burials” because no human remains were observed at the time the site was recorded.

Figure 5.2. Photographs Showing Adze Manufacturing Debitage in an Active Geligluction Lobe.

Because of the lack of ready access in most areas of the Science Reserve, some logistical planning was needed. The OMKM rangers assisted the survey crews as much as possible in executing vehicle drop-offs at strategic locations, so the crew could depart from one place and walk back to a vehicle by another route. This not only saved time and energy, it also meant that some areas, such as the east slope, were surveyed in a crisscross pattern, thus adding to a sense of more complete survey coverage.

5.3.5 Site Recording Methods and Procedures

Previously identified sites were relocated using GPS locational data recorded by SHPD in 1995 and 1997. New GPS readings were taken at all sites. Field observations were recorded on the Site Recording Form developed prior to the start of fieldwork. The completeness and, thus, adequacy of the 95 site records that existed at the start of the survey, including maps and descriptions, were evaluated in the process of filling out a new form for each site. Most of the sites required a new scaled map to replace the sketch maps made during the earlier reconnaissance surveys. In a few cases it was possible to annotate an existing map with new information.

Digital photographs were taken of all sites. The general location and direction of each photograph was marked on site maps to serve as photographic reference points. The purpose in establishing such points is to provide future land managers and researchers with a guide for taking new photographs from the same places on a site to assist in the monitoring of changes in site condition. The large number of workshops in the quarry precluded taking a photograph of every one.

The magnitude of the gelifluction process in the quarry forced us to reconsider how to map and describe workshops. In the end a new descriptive category was adopted to deal with the problem of dispersed manufacturing by-products, primarily waste flakes, some of these areas, termed “flake scatters” cover large areas.

5.3.5.1 Primary Site Information

As described in Section 5.2, a site and feature recording form was developed at the beginning of the project for use in the field and for creating a site database. The form, which was based in part on an earlier form developed by SHPD in 1997, was aimed at ensuring that all of the normal site information (e.g., location, area or size, etc.) would be systematically recorded. Some minor revisions to the form were made during the course of the survey. The baseline site data that were recorded included:

***Site Number*:** Unfortunately, the sites recorded in the 1982 and 1984 surveys have several numbers---a Bishop Museum number and a State number that were assigned in the 1982 survey and used in the 1982 report, and another State number that was mistakenly assigned by Cordy in his synthesis of the Hāmākua District (Cordy 1994). Because Cordy’s publication has been widely circulated, a decision was made to use the number he assigned.

***State Site Number*:** The Mauna Kea Science Reserve is located within portions of two USGS quadrangles (Mauna Kea and Ahumoa) and there are thus two different prefixes for the sites in the Reserve: 50-10-22- for the Ahumoa Quad and 50-10-23- for the Mauna Kea Quad.

***Bishop Museum Site Number*:** The Bishop Museum (BPBM) site numbers assigned in the earlier surveys (see **Section 3**) are all prefixed by 50 (Hawaii)-Ha (Hawaii Island)-G (Hāmākua District) and 28 (Ka`ohe Ahupua`a): example 50-Ha-G28-2.

***Temporary Field Number*:** The number assigned during fieldwork, prior to the assignment of a State number.

***GPS File Number*:** These are the field readings, which can be converted to either northing/easting, UTM, or Lat./Long.

***Elevation*:** The site elevations used in this report are based on the USGS quadrangle map plots that were determined using GPS field readings. The elevations for most all sites are believed to be accurate within 5 feet. A different set of elevations, sometimes nearly identical to those on the contour maps but often considerably higher, appear in the field records and in the GPS logs. In deciding to use the USGS map data as the standard for presenting elevation data, there is recognition of the fact that USGS contour maps may contain errors, especially in areas of high relief, and that the true elevations of the sites on Mauna Kea are essentially unknown or open to question.

***Formal Site Type*:** See definitions below.

***Functional Site Type*:** See definitions below.

***Feature Number*:** Feature numbers, when used, were numbered sequentially within a site.

***Site Dimensions*:** Most of the sites in the Science Reserve are not bounded or circumscribed by anything, such as a wall, thus making the determination of site size problematic; the dimensions presented in the site descriptions are the maximal area encompassed by a feature or set of features; they should not be interpreted as necessarily reflecting the area of a site or the boundary of the ritual activities performed, in the case of shrines.

5.3.6 Artifact Recording and Collection: Philosophy, Objectives and Methods

We do not subscribe to the “no collection strategy” advocated by various public and private agencies (see comments in Butler 1979). Instead, we hold to the opposite view for several reasons, among which is that we think it is naive to think that the artifacts in areas with high surface visibility, such as the adze quarry complex on Mauna Kea, will always be there for study in the future (Butler 1979:796; Schaafsma 1989). At the same time we think that in the case of quarry sites, where there is an abundance of surface artifacts, we must also consider alternatives to collecting.

The recording of attribute data in the field is one alternative to collecting. The primary rationale for this particular kind of data collection approach, which was used in 1985 in the context of a data recovery project in the Hopukani and Liloe Springs area of the Mauna Kea Adze Quarry Complex (McCoy 1986) and at the Pu`u Moiwi Adze Quarry on Kaho`olawe (McCoy et al. 1993), is that it is a quick and efficient method of obtaining useful data for:

1) recognizing general patterns, such as inter-site assemblage variability;

2) making informed interpretations on reduction strategies, and

3) developing hypotheses for future work.

It is necessary to emphasize that this method is *not* a substitute for permanent collections. The great value of permanent collections, of course, is that they can be studied over and over from different perspectives and with new and different techniques.

5.3.6.1 Sampling Design and Recording Procedures

In the adze quarry, the primary objective was to make systematic and, to the extent possible, "representative" surface collections. Representative collections should be made using an appropriate sampling design of the kind suggested by Sullivan, who has useful things to say as well about the matter of redundancy in sites such as quarries:

> Not only must individual collections possess characteristics that make them useful for continuing research, the aggregate sample of the archeological record preserved in collections must allow continuing study of the broadest possible range of research problems (Sullivan 1992:4).
>
> While a certain level of redundancy in collected information is necessary for research purposes, excessive redundancy in collected materials may exist for some types of sites and projects. Sites with large and highly redundant sets of materials, e.g., quarry sites and brickyards, pose questions of trade-offs between large samples and costs of facility space...What constitutes a sufficient sample of material from these sites? Regional variation in the archeological record must be considered since redundancy at the regional level, e.g., regions with many quarry sites, may allow conservatism in sample size at the site level. Consideration of sample size and composition leads to a second key factor in ensuring a satisfactory database for future research--the overall representation of the archeological record in curated collections (Sullivan 1992:4).

The artifact recording and collecting "sampling design" was dictated in large part by time and personnel limitations. The selection criteria varied from site to site and were dependent in large part on assemblage size (i.e., the number of specimens of a class of artifacts). On sites with larger assemblages we were forced to reduce the sample size and make more choices in terms of what was either recorded or collected. In some cases we tended to pass over irregular-shaped, hard to classify specimens. Some of the collections consist of just "grab samples."

Two different methods were employed in mapping and collecting artifacts. In the adze quarry, artifact locations were plotted on a scaled map. Each class of artifacts was numbered consecutively 1 - # for each workshop. Measurements were made with tape measures and rounded off to the nearest millimeter.

A total of 76 artifacts, primarily adze preforms and hammerstones were collected in the survey.

5.3.7 Excavation Methods and Procedures

Controlled excavations were undertaken at two sites. Excavation of Site 21449, a small terrace located in the Astronomy Precinct, was conducted in the hope of retrieving information to aid in the determination of site function. A single 1.0 m by 1.0 m test unit was excavated. The unit was positioned to include a portion of the possible facing and the level area south of the facing in order to determine the presence/absence of subsurface cultural materials, features, and layers. A single test unit (TU-1) was placed at the entrance to Rockshelter 1 at Site 26253 to determine the presence/

absence and vertical extent of any subsurface cultural deposits. TU-1 measured 1.0 m by 0.5 m and was positioned parallel to the long axis of the dripline (see description in Volume 2).

Standard excavation procedures were used in the text excavations at both sites. Excavations were conducted by natural stratigraphic layers and arbitrary 10.0 cm levels within each layer. All excavated material was sifted through a 1/8 inch wire mesh screen. All soils and sediments were documented and described based on standard USDA soil descriptions; including soil color (Munsell 2000), texture, consistency, and plasticity (Schoenenberger et al. 1998). Color photographs were taken before, during, and after excavation.

The excavations are discussed in detail in Volume 2. The flake debitage, charcoal and faunal remains from Site 26253 are analyzed in Section 6.

5.3.8 Survey Limitations

Though the whole 11,288-acre project area was surveyed, it is impossible to claim, as is the common practice in Hawaiian archaeological inventory surveys following on the minimal requirements set forth in HAR 276, that all historic properties were identified and recorded in the Science Reserve. The authors, based on years of cumulative field experience on Mauna Kea, agree with Cowgill that it is a mistake to think that an archaeological survey, surface collection or excavation is ever "total" or complete in terms of, for example, identifying or recovering every single artifact (Cowgill 1986:378; 1989a; 1989b). Cowgill referred to one specific case to make his point:

> Plog et al. (1978) show that although the large and conspicuous sites may be reliably found in open landscapes, no surveys have yet reached the level of intensity at which a still more intensive survey fails to reveal additional inconspicuous but significant occurrences of archaeological data. In order to be able to even begin to compare the results of one survey with another, we must *routinely* describe the exact procedures used, and recognize that more intensive survey would always modify the picture (Cowgill 1986:379).

Cowgill's remarks hold especially true of stone tool quarries of the size and complexity as those found on Mauna Kea. While what is often called "archaeological visibility" is excellent because of the absence of a vegetative cover, the vast size of the project area, combined with a geomorphological regime dominated by slope movement, means that many inconspicuous artifacts (e.g., flakes and even adze preforms) may be alternately exposed and buried. So one survey may observe a small cluster of flakes while a survey of the same intensity conducted at different time would observe no artifacts on the same ground surface. There is, in effect, an inverse relationship between archeological visibility overall and the ability to see or observe small artifacts and even small sites, such as single uprights where the upright may have fallen onto a bedrock surface amongst a mass of other stones.

While the entire 11,288-acre project area was covered, the intensity of coverage was not uniform. This is in part a result of the history of previous archaeological surveys in the Science Reserve. The areas that have been surveyed most intensively are those that have been covered in more than one project. This would include the 1982 and 1984 survey areas which were partially covered again in 1995 for the purpose of obtaining site locations using GPS. The Astronomy Precinct falls within the area of more intensive survey coverage.

The one part of the landscape that was not systematically surveyed was the steep slopes of cinder cones. A systematic, intensive survey of an entire cinder cone would have required a huge expenditure of time and effort. Such an effort would have resulted in extensive scarring of the slopes and the probable disturbance of large areas of *wekiu* bug habitat. In addition, while there is ethnographic evidence to suggest the possible existence of human skeletal remains in buried contexts on the lower flanks of cinder cones, the massive size of these landforms and the instability of their steep-sided slopes effectively precluded survey and subsurface testing as a means of determining the presence or absence of burials or any other possible subsurface features. The survey of cinder cones was limited to the rims.

Another factor that posed a problem in conducting the survey were the effects of high altitude on the field crews. The project area is unlike any other in the Hawaiian Islands in terms of the kinds of physical and mental challenges it presents for fieldworkers. At elevations ranging from roughly 11,800 to over 13,000 ft a person will experience high altitude hypoxia, which is produced by the reduction in partial atmospheric pressure with increasing elevation. The effect is a significant decrease in aerobic working capacity (Grover 1974, 1979). In the project area, the aerobic working capacity varies between 82% and 77% of the value at sea level (Figure 5.3). Sudden changes in weather conditions also occur. Fog and other forms of ground condensation occur with some regularity, typically in the afternoon, and depending on the amount of moisture and temperature change can leave a person at risk of hypothermia. Dense fogs can also cause a person to become disoriented. In addition to the usual effects of high altitude on work performance, day-time temperatures on a number of days remained in the 30s and 40s. It is clear from our own field experiences that the old adage, “night is the winter of the tropics,” frequently applies to the day as well. Field conditions were made even more uncomfortable on many days because of high winds. Wind and cold presented problems in terms of mapping and writing field notes and may have contributed to more than the usual amount of mental errors that are virtually impossible to avoid at high elevations.

5.4 Summary of Survey Findings

The 2005-2009 inventory survey recorded a total of 263 sites (Appendix C). This number includes the 95 previously identified sites and 168 new sites. Figure 5.4 shows the general distribution of historic properties, including a few located outside of the Science Reserve boundary. The latter sites have been included in the inventory of historic properties because of the uncertainty of the GPS elevations and accuracy of the USGS quadrangle contour maps. Figure 5.5 is an oversized map showing all of the historic properties with site numbers. It is included in a pocket at the back of the report.

Of the 263 sites 181 (68.82%) are single component of feature sites; the other 82 (31.17%) are multi-component or feature sites. A list of formal and functional categories by site is presented in Appendix D. A brief description of site types is presented below. Detailed site descriptions, including illustrations, are presented in Volume 2. An analysis of the site data is presented in Section 6.

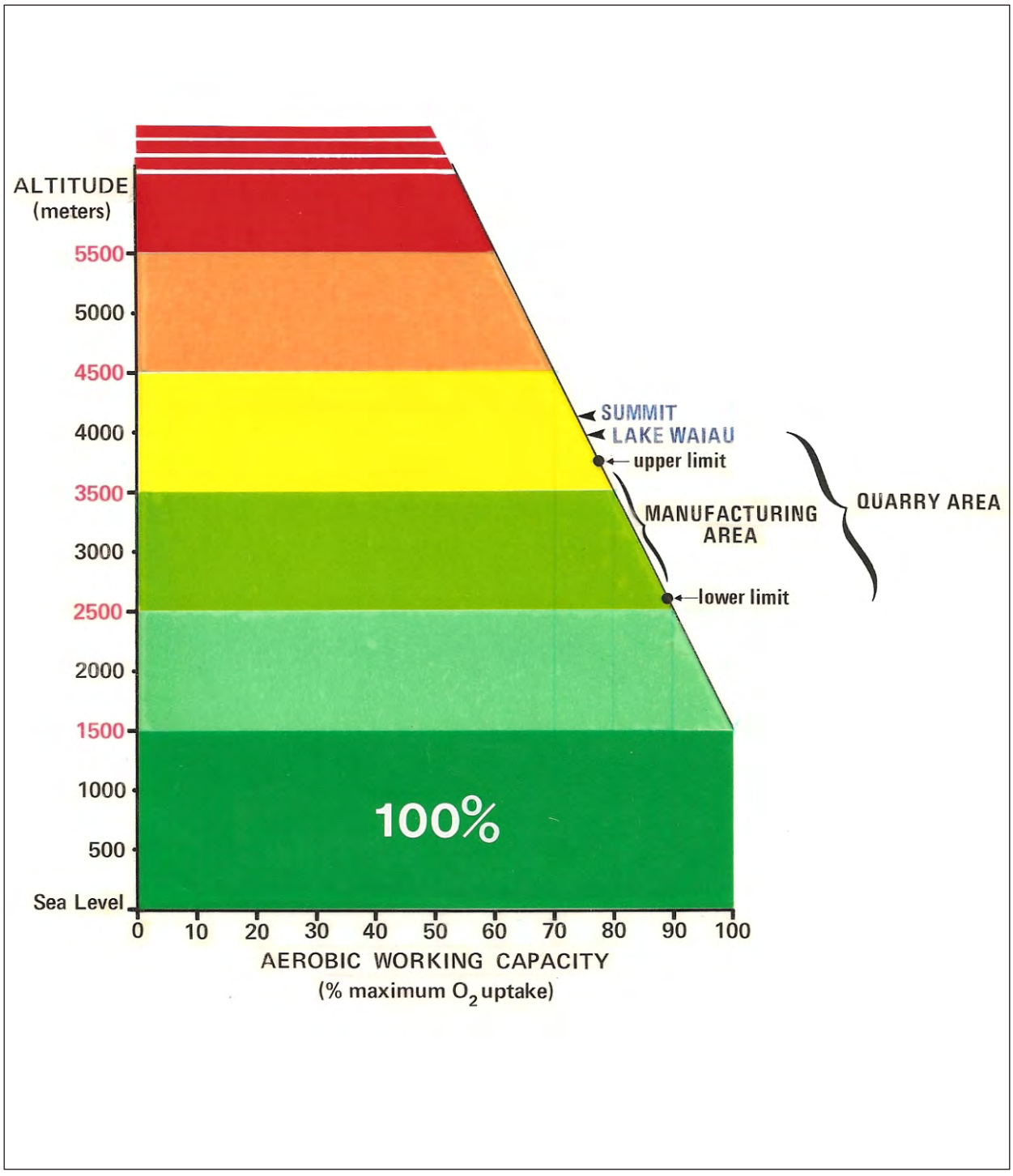

Figure 5.3. Reduction in Aerobic Working Capacity with Increase in Elevation.

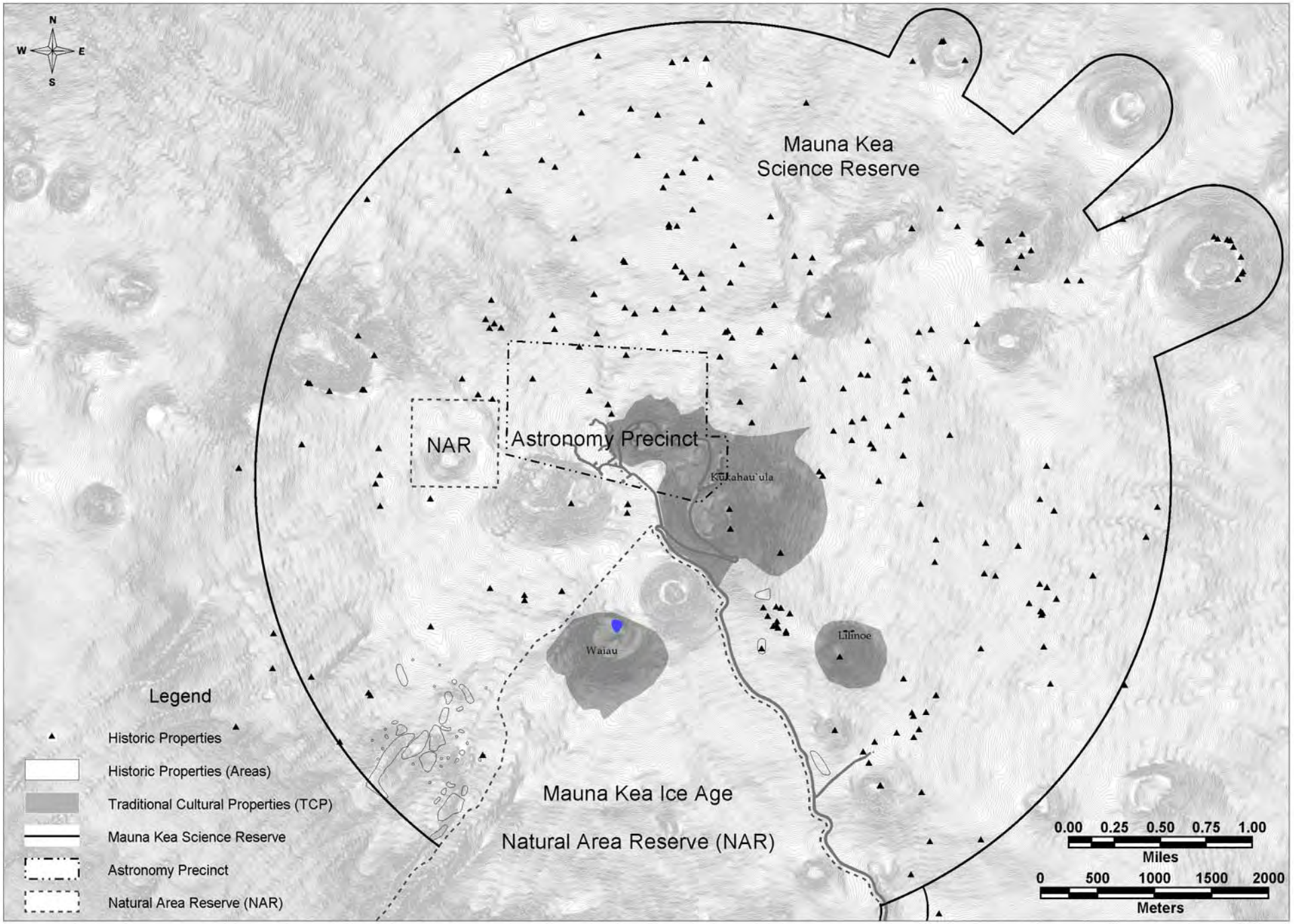

Figure 5.4 Location of Historic Properties Identified in the Mauna Kea Science Reserve.

Note: This Figure is Located in the back pocket of Volume 1

Figure 5.5 Oversized Map Showing Historic Property Locations.

5.4.1 Historic Property Types: Formal and Functional Categories

The convention in Hawaiian archaeology today, due largely to the requirements set forth in Chapter 13-276 of the Hawaii Administrative Rules on archaeological inventory surveys, is to distinguish between formal and functional "types." While sites and features can be easily described in terms of formal attributes, there is in reality no dichotomy between form and function, since function is inferred from form, as argued below for artifacts, but which applies to sites and features as well:

> It must at the same time be recognized that function is an inferential variable... that is, it is an inference made by the archaeologist himself, mostly on the basis of the observable form of the artifact. Consequently, there is no real dichotomy between functional and formal classification …functional classification merely involves the consideration of certain specific attributes of form and not others (Adams and Adams 1991:285).

Functional inferences in this report are based on the environmental and culture-historical context of the project area, formal attributes, locational context, and comparative ethnographic and archaeological data from Hawai`i and other areas of East Polynesia.

Because archaeology is fundamentally an interpretive practice, as argued in Section 4, and because the traces of past practices that archaeologists interpret are often fragmentary and incomplete, there is always an element of ambiguity or uncertainty in the inferences that are made, especially inferences of site function and age. This is especially true of piled and stacked rock features. The problem of determining the age and function of rock features, such as mounds and cairns, is common in Hawaiian archaeology (cf. Reinman and Pantaleo (1998) for a discussion of the problem in the Pohakuloa Training Area).

5.4.1.1 Formal Site and Feature Types in the Project Area

The following list represents the most commonly found formal site and feature types found in the summit region of Mauna Kea. Many of the terms have been used before in earlier reports.

***Ahu*.** According to Pukui and Elbert (1986:8) an *ahu* is a "heap, pile, collection, mass; altar, shrine, cairn; a traplike stone enclosure made by fishermen for fish to enter..." The various meanings, which include cairns and mounds, point to the problem of distinguishing these latter terms.

***Cairn*.** Cairn is a widely used term, which is used to refer to a number of different kinds of stone constructions, however. Linda Hogan, a Native American, has noted that "In its usual, restricted sense, cairn refers only to the (most often) conical pile of stones used to mark boundaries; turning points along routes of travel; caches of food, water, and equipment; areas of danger; sacred sites; and places of private or personal importance" (Hogan 2006:58). In previous archaeological surveys on Mauna Kea cairn has been used to refer to a pile or heap of stones of generally circular to oval shape at the base; there are two varieties in the summit region of Mauna Kea--loosely constructed pyramidal forms with no facings that tend to be of nearly equal in diameter and height, and well-constructed cylindrical piles with facings. The distinction between cairn and mound (see below) is not always easily made, especially in the case of a tumbled cairn which can look like a mound or a simple rock pile.

***Cave, Overhang, and Rockshelter*.** As used in this report and previous reports on the Mauna Kea Adze Quarry Complex, there are no caves utilized by humans in the Science Reserve and NAR. A cave is distinguished from an overhang by a depth (measured from the dripline to the back of the opening) that is greater than the breadth or width of the opening. The areas utilized by Hawaiians for shelter in the summit region are overhangs at the edge of lava flows. These have been called rockshelters, though the term overhang has also been used.

***Lithic Scatter*.** Lithic scatter is a generic term for all of the stone tool residues found at a given locality; these may include tools or implements, unfinished tools, manufacturing waste and hammerstones or some combination of all of these. Lithic scatters represent activity areas where one or more of the following activities may have taken place: tool manufacture, tool use, tool discard.

Prior to the 1980s and an increasing interest in stone tool manufacture, lithic scatter was a rarely used term in Hawaiian archaeology. Indeed, it was not employed in the earlier work in the Mauna Kea Adze Quarry Complex, in 1975-76 (McCoy 1977; Cleghorn 1982) for reasons discussed above. The term lithic scatter does not appear in the literature on the Mauna Kea Adze Quarry Complex until a later date. It was first used and defined in the report on the Pu`u Kalepeamoa Site (McCoy 1991) and later, in a paper on Site 16204 (McCoy 1999b). The lithic debris found at both of these sites differ in important ways from what is typically found in the quarry proper, where manufacture is the only one of the three activities (tool manufacture, tool use, tool discard or some combination of the three) is indicated, with a couple of rare exceptions (e.g. a modified or utilized flake is present, indicating a second function). At the Pu`u Kalepeamoa Site there is evidence of two artifact manufacturing technologies (adzes and octopus lure sinkers), tool use and tool discard (McCoy 1991). At Site 16204, a ritual complex, there are a small number of adze rejects, flakes, and hammerstones. The assemblage was described as a lithic scatter instead of a workshop because:

> This term [*workshop*], though rarely defined in the literature, normally implies in the case of reduction technologies, such as stone tool manufacture, a coherent structure amongst the various by-products of work [cores, waste flakes, rejected tools, etc.] that constitute this category of archaeological remains (McCoy 1999b:25).

Lithic scatter is a more appropriate field designation to use in situations, such as: (1) Site 16204, where the relationship between the various by-products and their behavioral meaning is unclear or ambiguous, and (2) the Pu`u Kalepeamoa Site Complex (16244), where there is evidence of multiple reduction technologies and, thus, different kinds of debitage (McCoy 1991).

In the case of the quarry proper, the alternative would be to describe every single concentration of adze manufacturing debris as a lithic scatter and then explain in every single case why the debris is believed to represent an adze manufacturing workshop. This approach would not only be inefficient, it would also perpetuate the long held, mistaken belief that description and interpretation are separate acts.

Lithic scatter is used in the present report as a blanket term to refer to the isolated artifacts found outside of the quarry proper, where their occurrence and function are ambiguous.

***Flake Scatter*.** The term flake scatter, which occasionally appears in the field notes and site descriptions in Vol. 2, is used interchangeably with lithic scatter. In some contexts it refers to a lithic scatter comprised of just flakes. In other situations it is a more generic term, equivalent in terms of its generality to lithic scatter.

***Chipping Station*.** In the 1975-76 research on the Mauna Kea Adze Quarry Complex, the term "chipping station" was used in reference to small, physically discrete features within a larger workshop (McCoy 1990:96). The term, which appears in some of the site descriptions in Volume 2, refers to a physically discrete workshop area characterized by small flakes that would appear to represent what are often called "finishing flakes."

***Mound*.** A pile or heap of stones that is more irregular in construction and form than a cairn; the linear variety has sloping sides and a generally irregular upper surface.

***Pavement*.** A roughly flat to level surface of placed stones that may vary considerably in size, form and compaction; a term commonly applied to the upper surfaces of platforms and terraces; pavements can occur by themselves as either sites or features of sites.

***Platform*.** Commonly defined in Hawaiian archaeology as a free-standing stone structure two or more courses high and with faced sides; the fill can be made up of stone and/or soil; usually rectangular or square in shape; the term has been applied more loosely in previous reports on the archaeology of the Mauna Kea summit region as any kind of constructed foundation on which upright stones were placed; this more generic definition is also used in this report.

***Terrace*.** A structure similar to a platform, except that one side is not free-standing, but rather abuts a slope or rock outcrop; like a platform, the fill can be made up of stone and/or soil.

***Upright*.** An archaeological term for what are inferred to be god stones that the Hawaiians called *`eho* or *pōhaku `eho*; this same term was also used for stone boundary markers and bird cooking stones (cf. Pukui and Elbert 1971; Buck 1957; Emory 1938; McCoy 1991); because they were set on end (the long axis of the stone is vertical) they are called "uprights."

***Structural remains*.** A general term that refers to what is sometimes called the "built environment" and includes shrines, cairns, and the semi-enclosed structures interpreted as temporary shelters.

***Wall*.** A free-standing linear arrangement of stones that is longer than it is wide and at least two stones high; the sides and top are normally level in contrast to linear mounds.

5.4.1.2 Functional Site and Feature Types in the Project Area

Definitions of the functional site and feature types found in the project area are presented below. Functional inferences are based on a number of factors, including morphology, construction style and materials, locational context and comparison with similar remains of known function. The confidence level in assigning functions to many of the sites and component features varies.

***Burial*.** A deliberate or intentional interment of human remains.

***Stone Marker/Memorial*.** A general term applied to cairns, mounds, or piles of rocks believed to have been built by either Hawaiians during the pre-contact period to mark a trail or land boundaries; modern-day surveyors, or visitors to commemorate the ascent of a cinder cone or another destination, such as Lake Waiau.

***Shrine*.** In common usage a place of worship; the distinction, if one existed in the Hawaiian past, between shrines and temples (*heiau*) is not altogether clear. The present study uses shrine as a generic label for all sites with at least one upright stone. The definition departs slightly from the one used by Sir Peter Buck, who defined a shrine as "a convenient term to designate a simple altar without a prepared court. They were made by individuals or small family groups who conducted a short ritual which required no priest" (Buck 1957:527-528). A small number of shrines have prepared courts and some of these are sufficiently complex to infer that a priesthood was involved in their construction and use.

***Temporary Shelters*.** A small number of semi-enclosed walled structures of various shapes are found in the Science Reserve and have been interpreted as temporary shelters based on their size and form and comparison to similar structures in the coastal lowlands.

***Unknown Function*.** This term is used to refer to remains where the function cannot be determined on available evidence.

***Workshop*.** In sites, such as adze quarries the term workshop is the functional equivalent of a lithic scatter that contains material evidence of tool manufacture and/or use; though rarely defined in the literature, this term normally implies in the case of reduction technologies, such as stone tool manufacture, a coherent structure amongst the various by-products of work [cores, waste flakes, rejected tools, etc.] that constitute this category of archaeological remains. Like quarry, this term or one with the same meaning, such as "working areas," is rarely defined in the literature. Torrence, for example, noted that in her work on the island of Melos, "Well-delimited regions on the density maps can be translated into 'working areas' in behavioral terms, with the density of the surface obsidian as a rough quantitative measure of the amount of use of each location…" (Torrence 1984:51-52).

***Quarry* and *Workshop*.** The archaeological literature evinces a considerable amount of confusion surrounding these terms, particularly the word quarry, which to many people is synonymous with the word mine, where material is excavated and removed from beneath the surface. In many instances the meaning of the term is simply taken for granted (for an exception cf. Kahn et al. 2009) and not defined (e.g., Leach and Witter 1990; Weisler 1990; Torrence 1990). Torrence is one of the few archaeologists to distinguish between quarries and mines:

> In Europe, *quarries*-which can be defined as open sites where material was procured directly from outcrops located on the surface or from relatively shallow pits or trenches-have received much less attention that *mines*-sites where impressive shafts up to ten meters deep were sunk into order to obtain high quality surface rocks (Torrence 1986:164-165).

The most common and easiest method of obtaining raw material is to simply collect it from the surface (loose cobbles and boulders) or to extract it from lava flows or embedded boulders (boulder outcrops). The places where such activity has taken place, where there is a raw material source, are defined quarries. The physically discrete areas within quarries are workshops, but workshops are also commonly found some distance from the *quarry proper* (the source) which means that the raw material and/or incipient tools have been purposively transported and the work resumed in a new location.

***Quarry/Workshop*.** This is a term that appears rather frequently in the archaeological literature (e.g., Leach 1984; Torrence 1990:62). In a discussion of the quarry/workshop distinction at the Pu`u Moiwi adze quarry on Kaho`olawe, it was noted that the number of adze manufacturing sites and features identified in the 1976-1980 survey of the island could not be determined because *quarry* and *workshop* were lumped together in a single class of site--*quarry/workshop*--characterized by the presence of boulders or outcrops. At first glance there is nothing wrong with this definition and in fact it is a good definition of a *quarry* as: (1) comprised of *workshops* and (2) coterminous with the raw material source. The problem is that the confounding of quarry and workshop excludes concentrations of adze manufacturing debris where there is no evidence of a raw material source (McCoy, Sinoto, and Makanani 1993).

***Quarry Complex*.** An aggregation or cluster of quarry sites that are physically separated from other sites. The boundaries of such complexes are in some cases arbitrary. The term is used partly as an heuristic device to facilitate comparisons between parts of the Mauna Kea Adze Quarry Complex, which covers a large area and is comprised of both clustered sites and dispersed sites at different elevations.

5.4.2 Summary Description of Individual Classes of Historic Properties

Four classes of sites were recognized in the earlier surveys in the Science Reserve: (1) shrines; (2) adze manufacturing "workshops"; (3) burials; (4) and probable survey markers. The current survey identified several additional site types. Each class of sites is briefly described below in terms of its defining characteristics. Functional inferences are based on formal attributes, locational context, and comparative ethnographic and archaeological data from Hawai`i and other areas of East Polynesia.

Table 5.1 summarizes the number and variety of historic property types found in the Science Reserve. The inventory includes two previously identified traditional cultural properties, and 261 examples of what are commonly called archaeological sites. Shrines are the most common functional site type. The next most common category are sites located in the Mauna Kea Adze Quarry Complex which consists of: (1) the quarry proper, which is defined as the source areas of tool-quality basalt, and (2) diverse activity remains located outside of the quarry proper as just defined, but which are directly linked to the quarry because of the presence of adze manufacturing by-products (e.g., cores, flakes), hammerstones and unfinished adzes in various stages of completion. Burials and possible burials are another fairly common site type. Two possible burial sites have associated lithic scatters comprised of adze manufacturing by-products that suggest the possibility of adze maker interments. They are included in the list of sites that make up the Mauna Kea Adze Quarry Complex. The remainder of the historic property inventory is represented by small numbers of diverse site types.

5.4.2.1 Traditional Cultural Properties

As noted in Section 3, in 1999-2000 SHPD designated three areas on Mauna Kea as traditional cultural properties. Two of the three, Kūkahau`ula and Pu`u Līlīnoe are located in the Science Reserve, the third, Pu`u Waiau, is located in the NAR (Figure 5.6).

Table 5.1 Historic Property Types in the Science Reserve

Functional Site Type	Number	Percent Total (%)
Traditional Cultural Properties	2	0.76
Shrines	141	53.61
Mauna Kea Adze Quarry Complex Sites	67	25.47
Burials and Possible Burials	29	11.03
Stone Markers/Memorials	15	5.70
Temporary Shelters	3	1.14
Historic Campsites	2	0.76
Historic Transportation Route	1	0.38
Unknown Function	3	1.14
TOTAL	**263**	**99.99**

The cultural significance of Kūkahau`ula (Site 21438) was highlighted in a Chapter 6E-8 and Section 106 review of the proposed Keck Outrigger project by SHPD in 1999 (Hibbard to McLaren 1999). Relevant portions of the review letter (which is included in the CRMP as Appendix B) are presented below, in slightly modified form and without the references that appeared in the letter:

> Several lines of evidence lead us to the conclusion that the cluster of cones is an historic property… The first line of evidence indicating the cultural and historical importance of the summit is that, at a minimum, some portion of the summit cluster bore the name Kukahau`ula who appears as a character in recorded Hawaiian traditions and as a figure in legends about Mauna Kea. As a character in traditional histories and genealogies, he is the husband of Lilinoe and is named as an `*aumakua* (family deity) of fishermen. A descendant, Pae, was known as an exceptional fisherman whose bones were coveted for fishhooks by the paramount chief Umi. In one legend, Kukahau`ula is cast in a more fanciful role as the suitor or husband of Poliahu, the deity of snow and, poetically, his name is said to allude to the pink hue that can be seen reflecting from the snow-covered summit. Lilinoe plays a similar role in the mountain's traditions in that she appears both as a traditional character and a mythical figure. She is, however, even more frequently associated with the summit region of Mauna Kea. In addition to being the wife of Kukahau`ula in some traditions, she is said to have been buried near the summit and is called the "woman of the mountain." One tradition has her being an ancestor of the illustrious Mahi family who served as warriors and attendants to the paramount *ali`i* of Hawaii Island. In legends, Lilinoe becomes the embodiment of fine mist, the literal meaning of her name, and as such is the companion or sister of Poliahu.
>
> While the association between the summit and Kukahau`ula is sufficiently clear, it is not as clear which specific topographic features in the summit the name encompasses. The conclusions drawn here that Kukahau`ula, and thus its association with a significant individual and character, probably applied to the entire summit cluster relies on a couple of arguments. First, use of the name Pu`u o Kukahau`ula in the boundary testimonies and in subsequent notes of field surveys indicates that the name was applied, at a minimum, to the cinder cone (i.e., *pu`u*) as a whole and not just to the highest peak or what would generally be considered the summit in English usage. Second, on the early survey maps (i.e., 1884 to 1891 and 1891), the name Kukahau`ula is written to the east of the

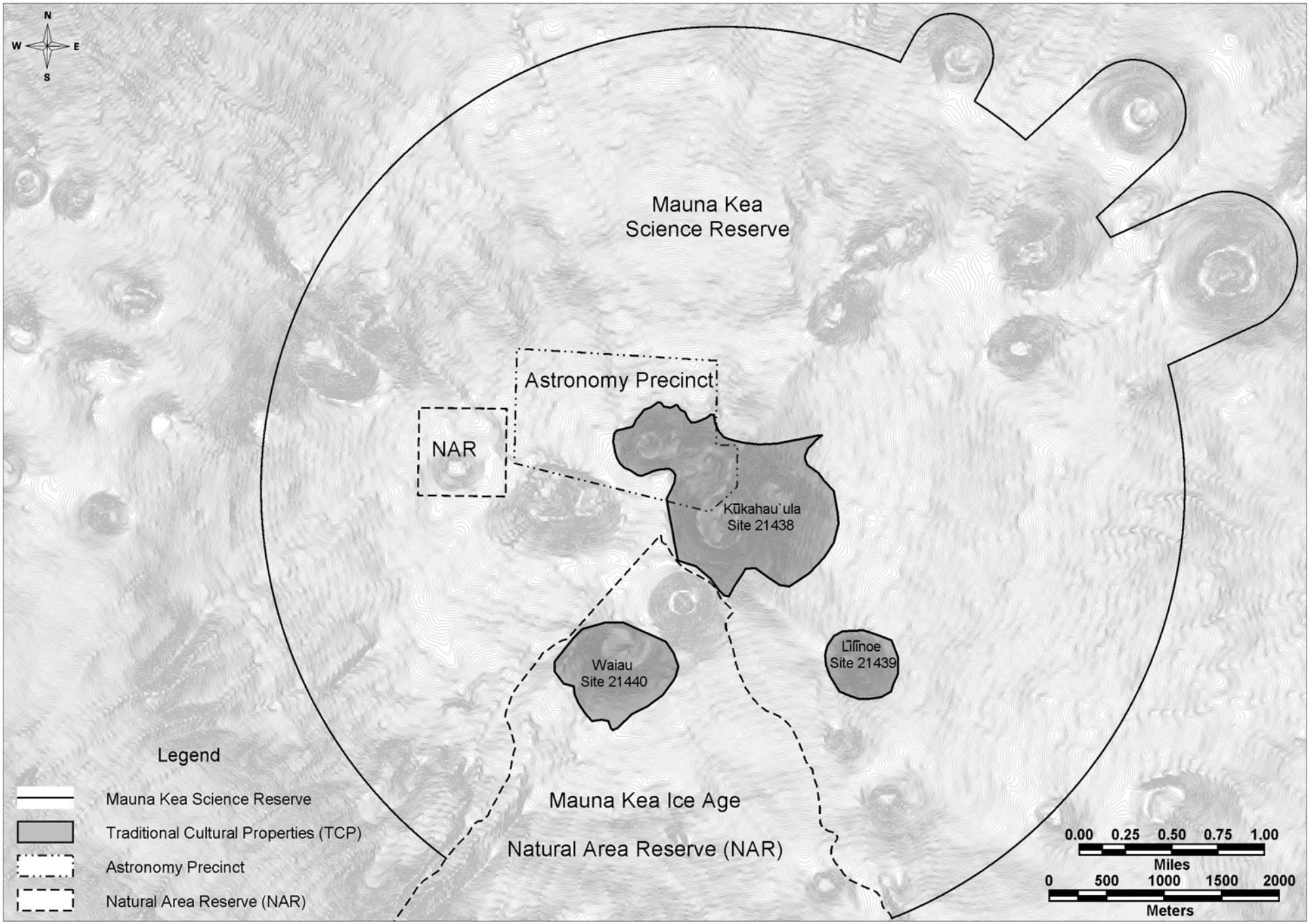

Figure 5.6 Location of SHPD-Designated Traditional Cultural Properties in the Summit Region of Mauna Kea.

cluster of cones and is not immediately associated with a particular point. In contrast, the highest point on the mountain on these maps is labeled the "summit" and "summit cone" and the triangulation marker on the northeastern peak of the cluster is labeled "Mauna Kea."

At this time, it cannot be known with certainly how Hawaiians during the early historic period and their predecessors would have viewed the cluster or what purposes they may have had to make and name particular distinctions within the cluster. Given the unified appearance of the cluster and the prominence of the name Kukahau`ula, however, it seems reasonable, if not probable, that this name applied to this entire landscape feature, including that which is now called Pu`u Hau Oki.

Pu`u Līlīnoe (Site 21439), as noted above, is from the Hawaiian point of view intimately related to Pu`u Kūkahau`ula since the two personages of the same name were, according to some traditions, husband and wife. Most of what we know about Līlīnoe comes from Kamakau, who called her “the woman of the mountains” and also said that she was an ancestress of Pae, a *kahuna* of `Umi’s time (Kamakau 1961:215; McEldowney 1982:A-7). As mentioned above Līlīnoe is also regarded in some traditions as the sister of Poli`ahu. On the summit of Pu`u Līlīnoe is a possible burial site (16195).

Traditional cultural properties, like all historic properties, must have boundaries. As Parker notes, however, “Many, if not most, traditional cultural properties, were and are simply not meant to have lines drawn around them marking where they begin and where they end. Trying to do so can lead to some fairly bizarre and artificial constructs” (Parker 1993:4). Parker goes on to give a hypothetical example of a Native American vision quest site on a mountain top in terms of how the boundaries can be narrowly defined from one point of view and encompass a vast area from the perspective of potential effects on the property. She writes, “The boundaries of a mountain top on which religious practitioners seek visions could be drawn around the toes of a person sitting on it, but the area of potential effect could include everything within that person’s viewshed” (Parker 1993:4).

The boundaries of the three TCP’s on Mauna Kea were drawn based on geological boundaries of the cinder cones (Wolfe et al. 1997: Plate 2) and in the case of the summit a series of overlapping, contiguous cinder cones which include Pu`u Wekiu, Pu`u Kea, Pu`u Hau Oki and at least one other unnamed cone (see Figure 5.6). In the case of Kūkahau`ula, the boundaries are also based in part on the near total absence of archaeological sites on the summit. The summit thus stands out from the rest of the cultural landscape which is dotted with shrines and other cultural remains as summarized above.

5.4.2.2 Shrines and Possible Shrines

Shrines are by far the most common site type in the UH management areas (see Table 5.1). A total of 141 or 53.62% of the 263 historic properties are shrines that on present evidence are non-occupational religious structures unrelated to the adze quarry. This number includes possible shrines, where some doubt exists about the presence of uprights because none were found in a standing position. It is possible that the construction of some shrines was never completed or the uprights were removed at a later date. There are three sites where there is a confirmed shrine and a second possible shrine. As described below and noted in Table 5.2 and Table 5.3, an additional

12 shrines were found in association with isolated lithic scatters comprised of adze manufacturing by-products transported from the adze quarry. The survey identified another 20 shrines in the quarry, so the total number of shrines in the Science Reserve is 173 (141 non-quarry, 12 shrines with associated lithics outside of the quarry proper and 20 shrines in the Pōhakuloa Gulch area of the quarry).

The quintessential characteristic of all of the sites on Mauna Kea that have been interpreted as shrines is the presence of one or more upright stones that the Hawaiians called *`eho* or *pohaku `eho*, which translates as "god-stone" (cf. Andrews 2003; Pukui and Elbert 1971; Buck 1957; Emory 1938). The conventional view of these and other kinds of Polynesian "god-stones" is that they were "places for the gods to inhabit," or "abodes of the gods," as opposed to icons or actual representations of the gods (Best 1976; Buck 1957; Handy 1927).

The uprights can be regarded as either a special kind of *sign* or *symbol* in the way these terms were defined by Langer:

> Symbols are not proxy for their objects, but are *vehicles for the conception of objects*. To conceive a thing or a situation is not the same thing as to "react toward it" overtly, or to be aware of its presence. In talking *about* things we have conceptions of them, not the things themselves; and *it is the conceptions, not the things, that symbols directly "mean."* Behavior toward conceptions is what words normally evoke; this is the typical process of thinking (Langer 1957:60-61).
>
> In short, images have all the characteristics of symbols. If they were weak sense-experiences, they would confuse the order of nature for us. Our salvation lies in that we do not normally take them for bona fide sensations, but attend to them only in their capacity of *meaning* things, being *images* of things--symbols whereby those things are conceived, remembered, considered, but not encountered (Langer 1957:144-145).

A number of shrines consist of just a single upright, while others are characterized by multiple uprights arranged in different patterns on a variety of different kinds of foundations (Figure 5.7). Kenneth Emory, who was the first one to describe the shrines on Mauna Kea and note their East Polynesian affinities, was of the opinion that the uprights represented or symbolized separate gods. Emory made the following comments about the shrines he saw in the adze quarry, during a brief reconnaissance of the main quarry area in 1937:

> The adze makers, clinging to the ancient form of shrine at which to approach their patron gods, have preserved a most important link with their ancestral home. Each upright stone at a shrine probably stood for a separate god. The Hawaiian dictionary describes *'eho* as "a collection of stone gods" and this is the term which the Tuamotuans, the neighbors of the Tahitians, used to designate the alignment of upright stones on the low and narrow platform at their maraes, or sacred places (Emory 1938:22).

On current evidence there are at the minimum two functional classes of shrines in the Science Reserve: (1) occupational specialist shrines related to adze manufacture, and (2) all the others, which on current evidence appear to be "non-occupational." Morphologically, there is nothing to distinguish these two classes, each of which exhibits considerable variability in groundplan, number of uprights, etc. The Mauna Kea shrines

Figure 5.7. Photographs Showing Examples of Multi-upright Shrines.

are in this regard no different from Hawaiian shrines in general. According to Buck, “Shrines varied considerably in construction, and similar forms were distinguished merely by their function” (Buck 1957:528).

For the so-called occupational shrines Buck added:

> Malo (1951, p. 81) writes that “each man worshipped the *akua* that presided over the occupation or profession he followed...” Thus what may be termed occupational shrines were built to the presiding gods in convenient places, and cultivators, woodsmen, fowlers, and others recited their rituals and laid their offerings upon their particular shrine before engaging in their work. There was nothing to distinguish this form of shrine from others, except, perhaps, the locations of the sites, which were away from the beaches and could not be readily confounded with the shrines of fishermen (Buck 1957:529).

The only thing that distinguishes the occupational shrines from all the others in the Science Reserve are lithic scatters found either on the shrine itself or in close enough proximity to be considered part of a single site. The artifacts found on shrines are interpreted as offerings, while those some distance may denote some other kind of ritual practice (McCoy 1999a).

The report on the 1982 archaeological survey of roughly 1,000 acres of land on the north flank of the mountain (McCoy 1982) followed Buck in referring to the architecturally simpler and generally smaller structures as shrines (*kuahu*), which Buck (1957:527) considered "a convenient term to designate a simple altar without a prepared court." Some of the larger, more complex structures, including those with courts, were called *marae*, following Emory, who had used this term to describe structures on the island of Necker that he believed bore close resemblances to the so-called “inland” type of Tahitian *marae* (Emory 1921, 1928, 1933, 1943, and 1970). Though some of the stone remains in the Hawaiian Islands, including those on Necker and Mauna Kea, do in fact appear to more closely resemble some of the simpler forms of *marae* in Tahiti and the Tuamotus than any known form of Hawaiian *heiau* (see discussion in Section 7) it is probably best to discontinue using the term *marae*, which has no cognate in the Hawaiian language.

The shrines in the Mauna Kea summit region have been previously described as including one or more of the following elements or “parts”: (1) uprights, (2) pavements, and (3) courts. The idea of describing shrines as comprised of parts, instead of features, follows Emory (e.g., Emory 1947:10) who used this terminology in describing East Polynesian *marae* and the structures on Necker Island that he called marae (Emory 1928).

Significant variability exists in the presence/absence of pavements, courts, and artifacts, and in attributes such as, the number of uprights and manner in which they were set and arranged. Whether or not all of the observed variability can or should be subsumed by the term “shrine,” as it is commonly understood, is a thorny issue that needs to be briefly addressed. If one accepts the distinction that Buck (1957) made between shrines and temples, then the sites with prepared courts should be called temples. This report uses the generic term “shrine” to describe all of the religious structures that exist in the summit region of Mauna Kea.

Some may object and argue that they should instead be called *heiau*, but a review of the literature indicates that there is no agreement on what that term included in the past and how it should be used today. According to Buck, “All shrines came under the general term of *kuahu*, except the fishermen’s shrine which received the specific

term of *ko`a"* (Buck 1957:528). As noted in Section 2, the term *kuahu* appears to be a more obscure and presumably older term that in modern times has been shortened to *ahu*.

The fact that there were names for different kinds of shrines suggests that shrines and heiau were different. Kamakau (1964:33) said that the *Pohaku o Kane* were family shrines and not a kind of *heiau*, whereas some archaeologists, such as Kirch (1985:260), hold to the view that the *Pohaku o Kane* was a *heiau*. Kolb presented an even broader definition of *heiau* based on the earlier definitions used by McAllister (1933:20) for sites on Oahu, and Bennett (1931:31) for sites on Kauai. They included natural rock outcrops, boulders and other unmodified places as examples of *heiau*. Kolb used this information to define sacred places: "Sacred places thus represent *heiau* possessing little, if any, structural modification" (Kolb 1991:109).

5.4.2.3 Mauna Kea Adze Quarry Complex

The Mauna Kea Adze Quarry Complex consists of two physically discrete but functionally interrelated parts: (1) the quarry proper, which is defined as the source areas of tool-quality basalt, and (2) diverse activity remains located outside of the quarry proper as just defined. The largest number of new sites found in the survey is in the Pōhakuloa Gulch area, which is part of the quarry proper, as is one isolated quarry/workshop. All of the other sites (Table 5.2) are located outside of the quarry proper. These include isolated adze manufacturing by-products (e.g., cores, flakes), hammerstones and unfinished adzes in various stages of completion found by themselves and also found with shrines and possible burials. One of the most important sites is a ritual complex that consists of multiple shrines, enclosures, and a lithic scatter.

Table 5.2 Historic Properties in the Mauna Kea Adze Quarry Complex

Functional Site Type	Number	Percent Total
Pōhakuloa Gulch Adze Quarry/Workshop Complex**	41	61.19
Isolated Quarry/Workshop	1	1.49
Isolated Lithic Scatters and Artifacts of Uncertain Function	12	17.91
Isolated Shrines with lithic offerings and/or associated lithic scatters of uncertain function	12	14.92
Isolated Ritual Complex	1	1.49
Possible Burials with Associated Lithic Scatters	2	2.98
TOTAL	**69**	**99.98%**

5.4.2.3.1 The Pōhakuloa Gulch Quarry/Workshop Complex

Though several adze manufacturing sites had been found on the eastern edge of Pohakuloa Gulch in a 1976 reconnaissance survey (see Section 3), it was not until the end of the 2007 field season that the extent of quarrying and adze manufacture in this area of the Science Reserve was known. Fieldwork conducted in 2008-2009 identified a total of 41 sites (Figure 5.8; see Table 5.2) of varying size and complexity in terms of the number of functional components (workshops, rockshelter habitations, shrines, and burials). The number and variety of components in each of the 41 sites is summarized in Table 5.3.

5.4.2.3.2 Site Components or Activity Remains

As described elsewhere (McCoy 1990), the structure of the quarry industry on Mauna Kea is inferred to have been more complex than any other known Hawaiian adze quarry based on a consideration of the number, diversity, spatial distribution and formal-functional variability within different classes of activity remains which have been called site components. This reflects the view, summarized earlier, that there is a functional relationship between the various activity remains or components. On present evidence the Mauna Kea Adze Quarry Complex is unique amongst Hawaiian adze quarries in the presence of raw material procurement localities (quarries), workshops of various kinds, shrines, temporary habitations (primarily rockshelters), and possible burials. In short, there are site components representing life, work and death as these are normally conceived by anthropologists and archaeologists. The Pōhakuloa Gulch site complex includes the following components:

1) Extraction Areas

A total of 33 extraction areas were identified in the quarry area (see Table 5.3). As defined above (see terminology) there are two kinds of extraction areas: (1) lava flow margins with more or less vertical faces; and (2) bedrock outcrops that may or may not be located on a flow margin. The first type of extraction area is characterized by more or less vertical rock faces exhibiting signs of battering and large negative flake scars, associated with large chunks of broken bedrock. The second type, which are “pits” or depressions that resemble what some archaeologists would call mines, although most mines are characterized by vertical shafts. Nine pits were found in the survey, all of them at Site 27605.

2) Adze Manufacturing Workshops

Investigations in 1984-85 in the Hopukani, Waihu, and Liloe Springs area, which is part of the Pōhakuloa Gulch region of the quarry (McCoy 1986) indicate a number well in excess of the 264 workshops and 1566 constituent features [physically discrete "chipping stations"] identified in the 1975-76 fieldwork (McCoy 1978; Cleghorn 1982). The 2005-2009 survey identified another 459 plus workshops in an area that had never been surveyed (see Table 5.3)

There is considerable variability in the size of individual workshops defined in terms of the area and volume of debitage and the presence/absence of internal features, such as windbreak walls (Figure 5.9). There are two varieties of walled "enclosures" in the quarry that have been classified as open-air shelters. The simplest form is a low windbreak wall. The second variety is a full enclosure. Both varieties are found singly

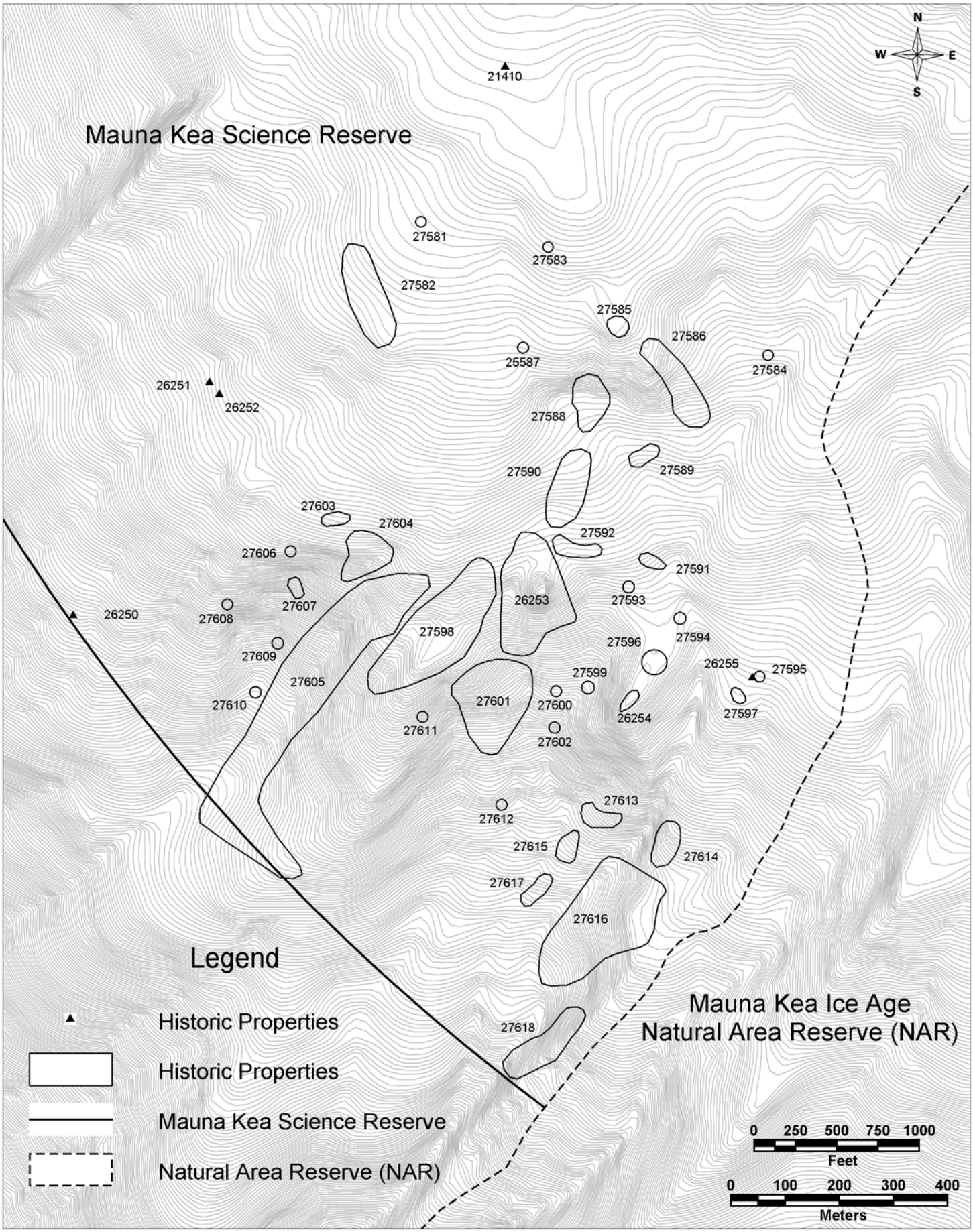

Figure 5.8 Map of the Pōhakuloa Gulch Area of the Mauna Kea Adze Quarry Complex.

Table 5.3. Number and Variety of Components/Features in the Pōhakuloa Gulch Quarry/Workshop Complex.

State Site Number 50-10-23-	Burial/ Possible burial	Shrine	Adze workshop	Flake scatter	Hammerstone workshop	Extraction Area	Temporary habitation	Unknown	Isolated artifacts	Total Number of Components
26253		1	65	6		1	2		4	79
26254		2						2		4
26255		1								1
27581			1							1
27582		1	2					1		4
27583			3							3
27584					1					1
27585			4							4
27586		1	11	1		1				14
27587			1							1
27588		2	4	3		1*				10
27589			5	1						6
27590			9	2					2	13
27591					1	1				2
27592			1	1	1				1	4
27593			1							1
27594					1					1
27595			1		1					2
27596			2		1					3
27597			2		1					3
27598			69	5	1	4			2	81
27599				1						1
27600			1							1
27601			68		2	2	3		3	78
27602									1	1
27603				2						2
27604			14	1						15
27605			74			10		2		86
27606	1		1				1	1		4
27607			2		4					6
27608			1							1
27609					1					1
27610			1							1

Table 5.3. Number and Variety of Components/Features in the Pōhakuloa Gulch Quarry/Workshop Complex.

State Site Number 50-10-23-	Burial/ Possible burial	Shrine	Adze workshop	Flake scatter	Hammerstone workshop	Extraction Area	Temporary habitation	Unknown	Isolated artifacts	Total Number of Components
27611				1						1
27612			1							1
27613			3							3
27614			5			1				6
27615					3	3				6
27616	1	5	97			9		6		118
27617		5	1	1						7
27618		2	10						4	16
Total	2	20	459	25	18	33	6	12	17	587

on workshops and aggregated into clusters where they are associated with shrines in what appear to be religious compounds. Nearly 200 of these structural remains had been recorded in the quarry prior to the start of the current survey (McCoy 1990).

The survey of the new quarry area identified three walls that probably functioned as windbreaks.

3) Hammerstone Quarries-Workshops

On present evidence all of the hammerstones found in the Mauna Kea Adze Quarry Complex are of local origin. A total of 18 hammerstone quarries were found in the Pōhakuloa Gulch area. At each locality there is evidence of extraction and the initial reduction and shaping process. This appears to be one of the largest concentrations of such activity areas in the Mauna Kea Adze Quarry Complex.

4) Flake Scatters

The Pōhakuloa Gulch area, like all areas of the larger quarry complex, are characterized by diffuse scatters of debitage which have been called “flake scatters” though other artifact types are oftentimes found. They are in almost all cases the result of slope movement. A total of 25 such areas were identified, which were undoubtedly originally a part of one or more workshops (see Figure 5.8).

5) Isolated Artifacts

In an area as large as the quarry complex it is not unusual to find isolated artifacts. The earlier surveys in the Mauna Kea Adze Quarry did not record isolated finds as sites, in part because of the difficulty of plotting such small finds on the USGS quadrangle maps due to the lack of technological tools like GPS units.

Figure 5.9. Photoghraphs Showing Examples of Adze Manufacturing Workshops.

The survey found 17 isolated artifacts, mostly adze preforms, in the general area of the quarry, but beyond the boundaries of both workshops and the flake scatters. It is difficult to determine what such isolated objects mean in a quarry context, but the meaning is probably different from the isolated artifacts found outside of the quarry proper (see discussion above).

6) Temporary Habitations

What are believed to have temporary habitations were found at six sites. These include four open-air shelters and two rockshelters with cultural deposits.

In an earlier classification of activity remains in the quarry complex a distinction was made between rockshelters and what were called "overhang shelters" based on differences in surface characteristics of the interior floor area. Rockshelters were noted as containing a variety of residues indicating their use as camps. The "overhang shelters" were described as lacking midden deposits and containing only small quantities of adze manufacturing debitage (McCoy 1977:229). Most of these were presumed to have been used for the storage of food, firewood and other bulky items. A test excavation of one of these "overhang shelters" at Hopukani Spring in 1985 revealed a buried occupation layer with a fire hearth, faunal remains and flake debitage (McCoy 1986). As a result, all natural shelters were combined into one category and the site was renamed Hopukani Rockshelter No. 2 (McCoy 1990).

Two rockshelters were identified in the new quarry complex. Rockshelter 1 of Site 26253 was excavated in 2008. An analysis of the recovered materials is presented in Section 6. The full excavation report is presented in Volume 2.

7) Shrines

A total of 20 shrines were found in the Pōhakuloa Gulch quarry area. This number includes two shrines on top of what was called the “Crag” (Site 26254) in the 1892 mapping of the summit area by Alexander and his assistant, J.M. Muir (Alexander 1892). There is no debitage associated with these shrines. One site (26255) is an isolated shrine, which like the two shrines on the “crag” may have had a special purpose. Debitage was found on all of the other shrines in the quarry area.

8) Possible Burials

Two possible burial locales were found in the survey. One is a platform at Site 27616. The other is a crevice at the back of the rockshelter at Site 27606. Their location in the quarry is unusual, but not totally unexpected based on findings elsewhere in the Science Reserve and the NAR.

9) Unknown Function

There are 12 site components in the quarry of unknown function. They include mounds, walls, and terraces. Further analysis of the data might provide some clues to function, as might excavations in the future.

5.4.2.4 Isolated Quarry/Workshop Site

Site 21437, located outside of the Science Reserve boundary (see Figure 5.5), is a small and apparently isolated quarry and workshop. The raw material source is the edge of a flow of fine-grained, dense basalt at the lower end of a scree deposit. The site, which was found in the SHPD reconnaissance survey in 1997, was not mapped. It covers an area of approximately 8.0-10.0 square meters and consists of six or more

cobble-size cores and an estimated 300 to 400 flakes. The flakes are of varying sizes, indicating primary and secondary reduction. One adze preform, made on an angular blocky core, measures 38.0 cm long, 16.0 cm wide, and 14.0 cm thick. The artifact inventory also includes a couple of hammerstones.

Based on the limited time spent at this site, it would appear to be short term, possibly single event workshop. This site may be related to Site 26249 which is an isolated lithic scatter located upslope several hundred meters east-southeast, just inside the Science Reserve boundary. There is more evidence of adze manufacture on this side of the mountain, on the glacial moraines and in the gulches below the Science Reserve.

5.4.2.5 Isolated Lithic Scatters and Artifacts of Uncertain Function

A number of different kinds of isolated lithic artifacts, oftentimes referred to as *find spots* (e.g., McCoy 1984a), as opposed to the admittedly more idiosyncractic use of the term in the current survey, were found in different areas of the Science Reserve and given site designations. A total of 12 sites comprised of isolated lithic scatters or single lithic artifacts were found in the project area outside of the Pōhakuloa Gulch quarry/ workshop complex (Table 5.4; Figure 5.10).

Some of these isolated finds, most of which cover a small area and contain a small number of artifacts, have been previously discussed as a specialized kind of adze manufacturing "workshop" based on the presence of one or more of the following kinds of manufacturing byproducts---flakes, cores, adze preforms, and hammerstones (McCoy 1999a; McCoy and Nees 2009). Others may represent locations where an unfinished adze or several adzes and hammerstones, were lost in transport. In other instances, there is reason to suspect that additional artifacts are located in the immediate vicinity, but were not identified because of factors such as small size, poor lighting conditions, or because they are buried.

Table 5.4. Summary of Isolated Lithic Scatters and Artifacts of Uncertain Function.

State Site Number 50-10-23-	Feature Number	Elevation (feet amsl)	Site Area L x W (in meters)	Description
21204	4	12,800	23.0 x 9.0	Site consists of four (4) features: 1 terrace, 2 mounds, and a lithic scatter
25760	1	11,448	2.0 x 1.0	Approximately 15 flakes and 1 adze preform observed, three (3) flakes collected
25761	1	11,639	1.0 x 1.0	One and possibly two flakes
25762	1	11,829	25.0 x 4.0	Basalt flakes associated with three enclosures; two (2) flakes collected
25767	1	12,240	2.0 x 2.0	Two (2) preforms, both collected
25768	1	12,192	1.0 x 1.0	Single basalt flake
25769	1	12,160	1.0 x 1.0	Basalt flakes two (2) collected
25779	1	11,996	5.0 x 5.0	Three adze preforms, hammerstone and basalt flakes; three (3) preforms collected

Table 5.4. Summary of Isolated Lithic Scatters and Artifacts of Uncertain Function.

State Site Number 50-10-23-	Feature Number	Elevation (feet amsl)	Site Area L x W (in meters)	Description
25796	1	12,627	10.0 x 10.0	Over 15 basalt flakes, several adze preforms, one hammerstone; two (2) preforms collected
25801	1	11,353	1.0 x 1.0	Four (4) basalt flakes, all collected
25828	1	12,712	1.0 x 1.0	Single basalt flake
26249	1	12,077	10.0 x 10.0	Basalt flake scatter

There appears to be a considerable amount of inter-site variability in the number or frequency of different artifact classes found on these sites, unlike the usual workshop. In some cases there seems to be a disproportionate number of unfinished adzes compared to the number of flakes, thus pointing to the high probability that some of the adzes were flaked elsewhere and/or transported to these localities at a later stage in the manufacturing process. At other sites the predominant artifact type is flakes. These characteristics, combined with the small size of most of the artifact assemblages, indicate that these were not ordinary "workshops." Indeed, the evidence for *in situ* manufacture, as opposed to a place where offerings were made, is in many instances ambiguous.

Four isolated flake scatters were found at Lake Waiau in 2007. A brief analysis of these scatters considered three possible interpretations:

1) the flake scatters mark the locations of small workshops where only one or perhaps two stages of adze manufacture took place;

2) the flake scatters are specialized "workshops" where a small number of flakes were removed as a symbolic act as part of a ritual practice; and

3) the flake scatters represent selected pieces of debitage that were carried from the quarry and offered to the gods of the lake, thus representing a different kind of ritual than what occurred at other places in the summit region.

The first two interpretations are similar in that both involve symbolic acts with similar intentions. They are virtually impossible to test, however. The first theory would require a technological analysis of each assemblage to reconstruct the reduction sequence and determine how many stages of manufacture are represented. On current evidence it is a highly unlikely scenario because of the assemblage characteristics. These characteristics, considered singly and as a whole, are unusual compared to the debitage found on chipping stations in the quarry, where regardless of the size of the blank (either a core or flake) the number and types of flakes removed in the reduction process are more varied. Cleghorn's replicative experiments, using raw material from the quarry, confirmed this (Cleghorn 1982). For example, the manufacturing process typically produces large and small flakes and shatter throughout the reduction sequence.

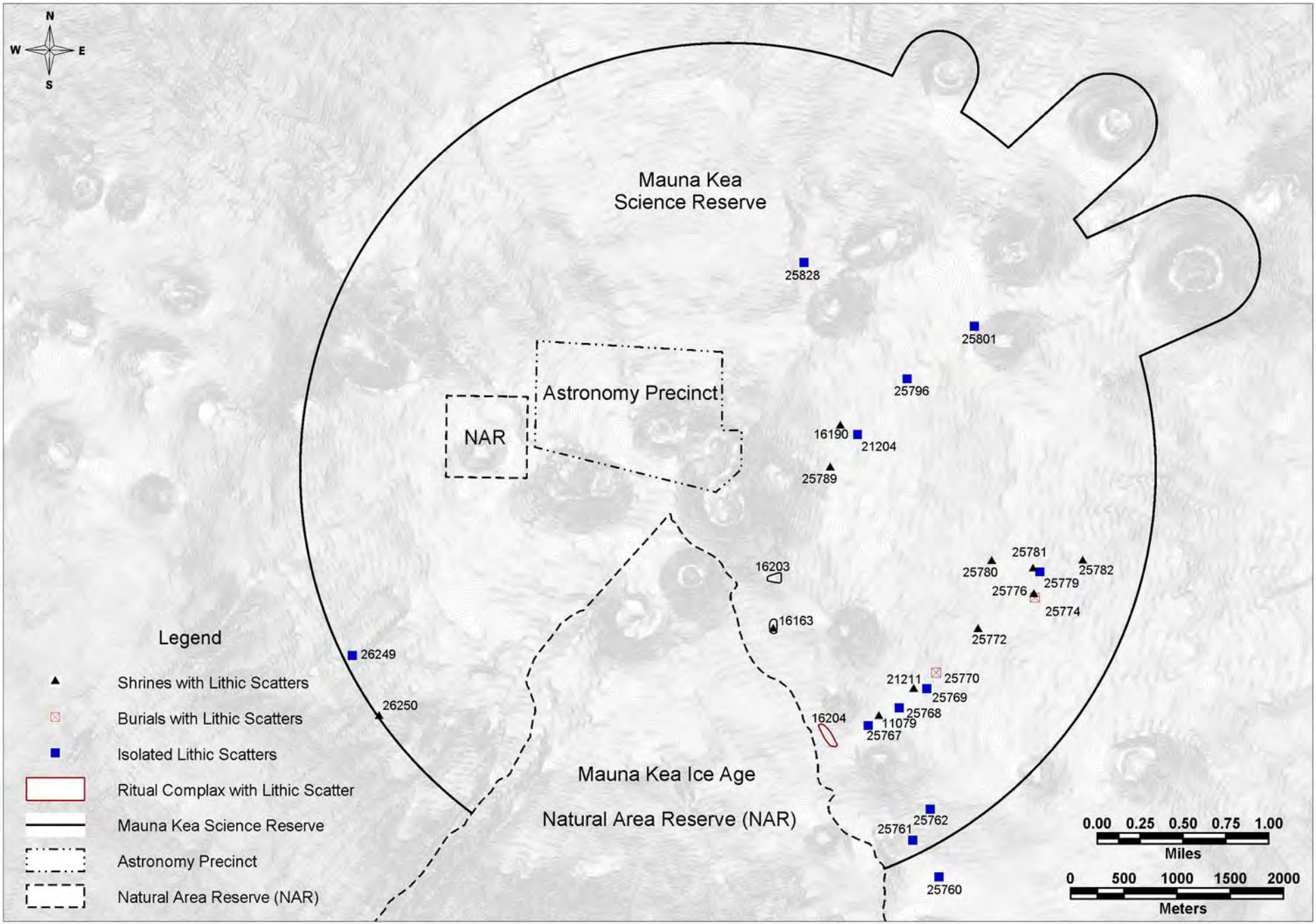

Figure 5.10 Locations of Isolated Sites with Lithic Scatters and Artifacts in the Mauna Kea Science Reserve.

The number of flakes produced in making an adze preform varies enormously (Cleghorn 1982), but a workshop with only 25 or so flakes, all or the majority of them without cortex and of fairly uniform size, is not something that has been observed in the quarry or in replicative experiments (McCoy and Nees 2009).

If adze manufacture did take place at Lake Waiau and the other isolated sites, it would appear to have been an essentially symbolic act as argued in the case of Site 16204, the ritual complex that is part of the quarry complex (McCoy 1999a). It is important to note that symbolic acts can be both expressive and instrumental:

> But as well as expressing something, symbolic activity often (though not always) has an instrumental aspect. People who carry out institutionalized symbolic procedures or rites usually believe that by doing so they are either producing some desired state of affairs or preventing some undesired one (Beattie 1964:202).

Though not common, the location of isolated lithic scatters and artifacts, some associated with shrines, are potentially one of the most important findings of the 2005-2009 survey. Their possible significance is discussed in Section 7.

5.4.2.6 Isolated Shrines with Lithic Scatters

Unfinished adze preforms, flakes and occasionally other manufacturing by-products were found on or near shrines at 12 sites outside of the quarry proper (see Figure 5.10). The intention underlying the presence of lithic artifacts on or near a shrine is less ambiguous than sites consisting of nothing but lithic artifacts because of their locational and functional context. These assemblages, like those found on many shrines in the quarry, are interpreted as offerings to the tutelary gods of adze making (Malo 1951; McCoy 1990, 1999b). The characteristics of the 12 sites are summarized in Table 5.5.

5.4.2.7 Isolated Ritual Complex

Site 50-10-23-16204, first recorded in 1975 during research on the Mauna Kea Adze Quarry (McCoy 1977, 1999b), is one of the most complex and significant sites in the Science Reserve. The site, which is located on a prominent whale-back ridge on the east side of the summit road between the roughly 12,250 and 12,332 ft elevations (full description in Volume 2), consists of 5 shrines, 26 open-air enclosures and a diffuse scatter of adze manufacturing by-products (see Figures 5.5 and 5.10).

There is no other known site like 16204 in either the Science Reserve or the NAR. It has been interpreted as the locus of initiation rites for apprentice adze makers (McCoy 1999b).

5.4.2.8 Possible Burials with Associated Lithic Scatters

As described below, a new form of burial was found in the survey. They are pavements consisting of boulders and cobbles which in some places have a little elevation. The middle tends to be lower than the sides. The two examples found in the survey both have an associated with a lithic scatter (see Figure 5.10). In addition, a

small basalt preform was found on one of features at Site 25744. The presence of lithic materials suggests a direct association with the adze quarry (Table 5.6). If these are indeed burial sites, they may contain the remains of adze makers.

Table 5.5. Summary of Isolated Shrines with Associated Lithic Scatters.

State Site Number 50-10-23-	Feature Number	Elevation (feet amsl)	Site area L x W (in meters)	Description
11079	Fe1 (preform) Fe3 (flakes)	12,227	~20.0 x 20.0	Basalt flakes and adze preforms observed with and around Feature 1;Feautre 3 is a lithic scatter
16163	Fe 2	12,755	30.0 x 4.0	Flake scatter
16190	Fe 2	12,856	8.0 x 6.0	Basalt flakes observed (five (5) flakes collected) below shrine
16203	Fe 1, Fe 2, and Fe 3	13,046	150.0 x 100.0	Preforms, cores, and flakes observed at the site
21211	Fe 1 and Fe 2	12,194	10.0 x 10.0	Preform (Fe 1) and basalt flakes (Fe 2) observed
25772	Fe 1 and Fe 4	12,072	50.0 x 50.0	Basalt flakes associated with crude enclosure (Fe 2) and single basalt flakes associated with Fe 3, 4, and 7. Several flakes collected
25776	Fe 2 and Fe 3	11,979	16.0 x 13.0	Associated with both Feature 2 (crude enclosure) and Feature 3 (terrace)
25780	Single upright	12,159	1.0 x 1.0	Single basalt flake
25781	Fe 4	12,032	15.0 x 6.0	Basalt flakes (Fe 4) associated with shrine (Fe 1)
25782	Fe 1	11,834	15.0 x 10.0	Basalt flakes associated with pavement and upright; three (3) flakes collected
25789	Fe 2	12,822	8.0 x 6.0	3-4 flakes
26250	Fe 1	12,053	10.0 x 10.0	Single basalt flake, observed at Feature 1 (shrine)

Table 5.6. Summary of Possible Burials with Associated Lithic Scatters.

State Site Number 50-10-23-	Number of Features	Elevation (feet amsl)	Feature Type	Location	Possible or Confirmed Burial (Number)
25770	2	12,164	pavement	Gelifluction Lobe	Possible (2)
25774	4	11,971	pavement	Gelifluction terrace	Possible (4)

5.4.2.9 Burials and Possible Burials

Prior to the 2005-2009 survey the only positively identified human remains in the Science Reserve were located on the summit of Pu`u Mākanaka (see Figure 2-13). Jerome Kilmartin, a surveyor with the United States Geological Survey, noted the presence of human remains on this prominent cinder cone in 1925. The presence of human remains on the pu`u was confirmed in 1991, as noted in Section 3. In a popular account of his experiences on the mountain, written many years later, Kilmartin noted that the name Pu`u Mākanaka means “Hill crowded with many people” and the grave must have been ancient (Kilmartin 1974:15). The name is indeed accurate; a number of

other human remains were found on the rim of the *pu`u* in the survey as noted in Table 5.7.

The survey identified 29 sites with a total of 48 features in the Science Reserve that have been interpreted as burials or possible burials (see Table 5.7). Of the 48 features, five are confirmed burials and 43 are possible burials. For the sites classified as possible burials there are compelling reasons, such as the topographic location and morphological characteristics of the structures, to believe that these sites are indeed burials, but because human remains were not seen at the time they were recorded they are classified as possible burials.

5.4.2.10 Historic Transportation Route

The only direct and in our view unambiguous evidence of the Umi Koa Trail is a single horseshoe that was assigned SIHP number 25800. The horseshoe was found in close proximity to the route shown on the USGS Mauna Kea Quadrangle maps (see Figure 2.13). We believe that this is not a case of mere coincidence. How long the trail was used to transport visitors from the Hāmākua Coast is unknown.

5.4.2.11 Stone Markers/Memorials

One of the more ambiguous classes of sites are piles or stacks of rocks believed to be a marker of some kind or a memorial to some person or event. In all but a couple of cases the actual function is unclear. There are 15 sites that may have been survey markers, piles of stones left by unknown visitors as memorials of their visit to the top of a cinder cone or way-markers along an unmarked trail (Table 5.8). The cairns are quite unlike those which have been interpreted as burials. One of the 13 sites (26244) is the USGS survey marker on Pu`u Wekiu. Another USGS marker was found on Pu`u Poli`ahu and assigned SIHP number 27579. Site 26246 is an example of a cairn interpreted as a marker, perhaps a trail marker in this case (Figure 5.11). The locations of the 15 sites are shown in Figure 5.12).

While there are no dates for any of the cairns, we know from historic accounts that the Rev. Goodrich saw a cairn on the “summit” in 1823 (Goodrich 1826) and that later visitors also observed and built cairns (see Section 2). Jarves (1844:228) described the construction of a cairn to memorialize the ascent of the summit by his companions. It is possible that some of the simple stacked-stone constructions that have been interpreted as modern (see Section 2.4), may be memorials of the kind described by Thomas Thrum in Haleakalā:

> It was a recognized custom of Hawaiians to erect stone piles--pile is one meaning of the word ahu--as way marks, memorials of parties traveling or resting, division points of survey, and also guides to most accessible routes of travel. One such marks the safest of three ridges leading from the rim of the crater to the district of Nuu. That some ahu mark burial places is in accord with the present practice in certain districts of Maui and of Hawaii, and perhaps elsewhere. Most, if not all, of the ahus of three stones, one upon the other, are tributes to the deity of the locality and are designed by travelers to assure safety in their journey (Thrum 1921:259).

The number of markers could thus change with a closer analysis of the survey data.

Table 5.7. Summary of Burial and Possible Burial Sites.

State Site No. (50-10-23-)	Number of Burial Features	Elevation (Ft. amsl)	Burial Feature Types	Location	Confirmed and Possible Burials
16195	2	12,964	Platform, mound	Rim of Pu`u Līlīnoe	Possible (3)
16248	3	12,292	Three mounds	Rim of Pu`u Mākanaka	Confirmed (1); Possible (2)
21209	2	13,714	Mound, alignment	Rim of Pu`u Wekiu	Possible (2)
21413	1	12,626	Platform	Rim of unnamed cinder cone	Possible (1)
21414	1	12,804	Mound	Rim of unnamed cinder cone	Possible (1)
21416	1	12,688	Mound	Rim of unnamed cinder cone	Possible (1)
21452	2	12,541	Platform, mound	Cinder cone	Possible (2)
25765	1	12,416	Platform	Rim of unnamed cinder cone	Possible (1)
25802	2	12,266	Terrace, mound	Rim of Pu`u Mākanaka	Confirmed (1); Possible (1)
25803	1	12,253	Mound	Rim of Pu`u Mākanaka	Possible (1)
25804	1	12,251	Mound	Rim of Pu`u Mākanaka	Possible (1)
25805	1	12,320	Mound	Rim of Pu`u Mākanaka	Possible (1)
25806	3	12,324	Three mounds	Rim of Pu`u Mākanaka	Possible (3)
25807	3	12,349	Three mounds	Rim of Pu`u Mākanaka	Confirmed (1); Possible (2)
25808	7	12,372	Cinder areas, platform, mound, terrace	Rim of Pu`u Mākanaka	Confirmed (1); Possible (6)
25809	1	12,359	Cinder area	Slope of Pu`u Mākanaka	Confirmed (1)
25812	1	12,402	Overhang shelter	Slope of Pu`u Ala	Possible (1)
25813	1	12,560	Mound	Rim of Pu`u Ala	Possible (1)
25814	3	12,544	Three mounds	Rim of Pu`u Ala	Possible (3)
25815	1	12,603	Mound	Rim of Pu`u Ala	Possible (1)
25816	1	12,561	Mound	Rim of Pu`u Ala	Possible (1)
25822	1	11,917	Terrace	Rim of Pu`u Ala	Possible (1)
25823	1	11,882	Mound	Rim of unnamed cinder cone	Possible (1)
25824	1	11,893	Mound	Rim of unnamed cinder cone	Possible (1)

Table 5.7. Summary of Burial and Possible Burial Sites.

State Site No. (50-10-23-)	Number of Burial Features	Elevation (Ft. amsl)	Burial Feature Types	Location	Confirmed and Possible Burials
25829	1	12,780	Mound	Rim of unnamed cinder cone	Possible (1)
25830	1	12,729	Platform	Rim of unnamed cinder cone	Possible (1)
25831	1	12,638	Mound	Rim of unnamed cinder cone	Possible (1)
25832	1	12,510	Mound	Rim of unnamed cinder cone	Possible (1)
26237	1	12,062	Mound	Gelifluction terrace	Possible (1)

Table 5.8. Summary of Markers and Memorial Sites.

State Site Number 50-10-23-	Number of Features	Elevation (ft. amsl)	Location	Feature Type (Feature Number)
21411	1	12,682	Gelifluction terrace	Rock mound (Feature 1)
21412	1	12,511	Glacial moraine	Rock pile (Feature 1)
21415	1	13,050	Ridge crest	Cairn (Feature 1)
21423	1	12,046	Ridge crest	Rock pile on boulder (Feature 1)
21434	1	12,466	Ridge crest	Rock pile on boulder (Feature 1)
21436	1	11,520	Ridge crest	Cairn (Feature 1)
21450	3	13,091	Cinder cone	Two cairns (Features 1-2) and a possible cairn (Feature 3)
25777	1	12,029	Ridge flank	Cairn (Feature 1)
25785	1	12,281	Ridge crest	Cairn (Feature 1)
26224	1	13,796	Pu`u Wekiu	USGS Marker (Feature 1)
26245	1	12,801	Ridge flank	Rock mound (Feature 1)
26246	1	12,805	Ridge crest	Rock mound (Feature 1)
26247	1	12,970	Ridge flank	Rock mound (Feature 1)
26256	1	12,949	Gelifluction terrace	Rock pile (Feature 1)
27579	1	13,610	Pu`u Poli`ahu	USGS Marker (Feature 1)

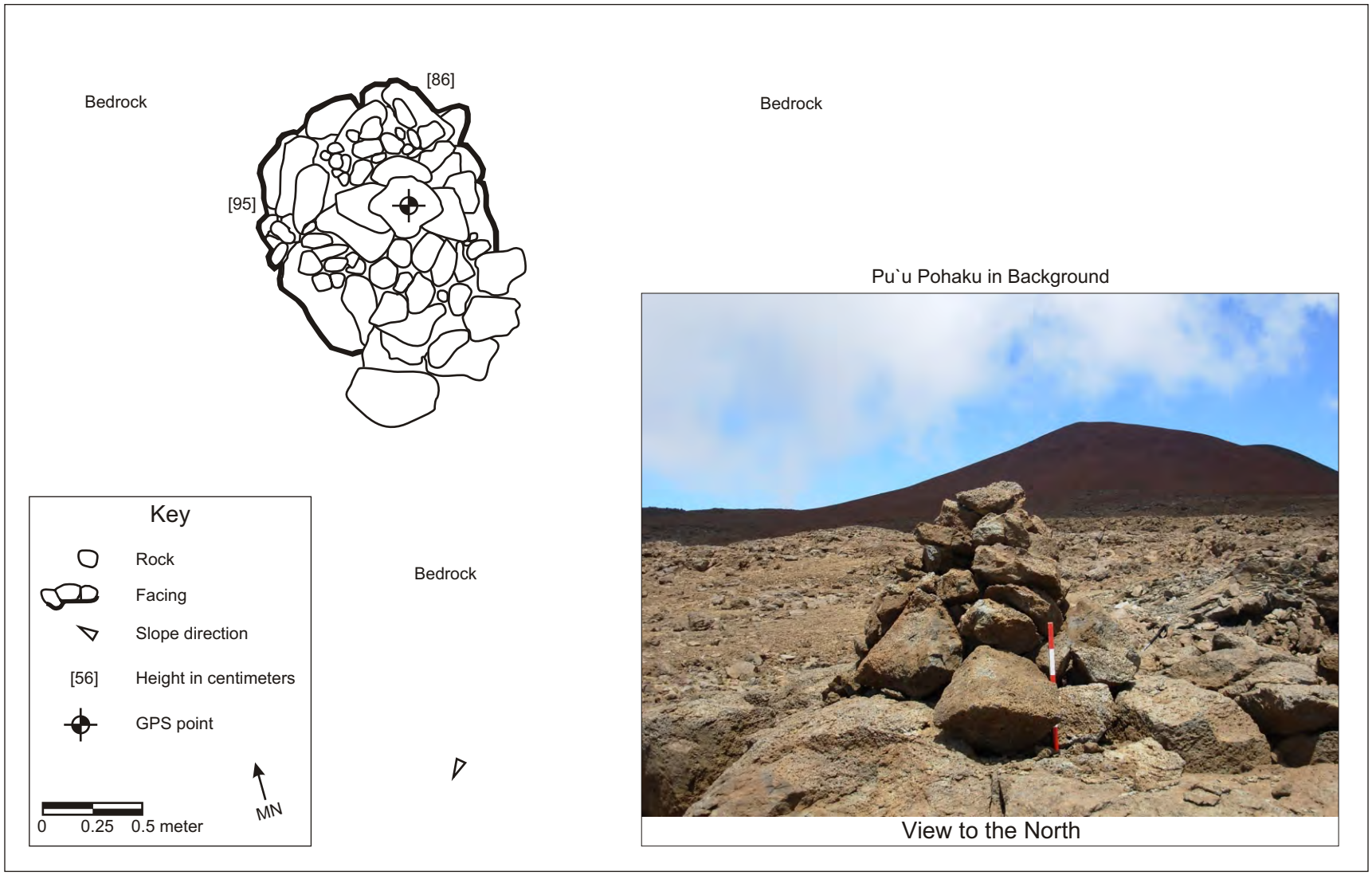

Figure 5.11. Example of a Cairn (Site 26246) Interpreted as a Marker, Plan View and Photograph.

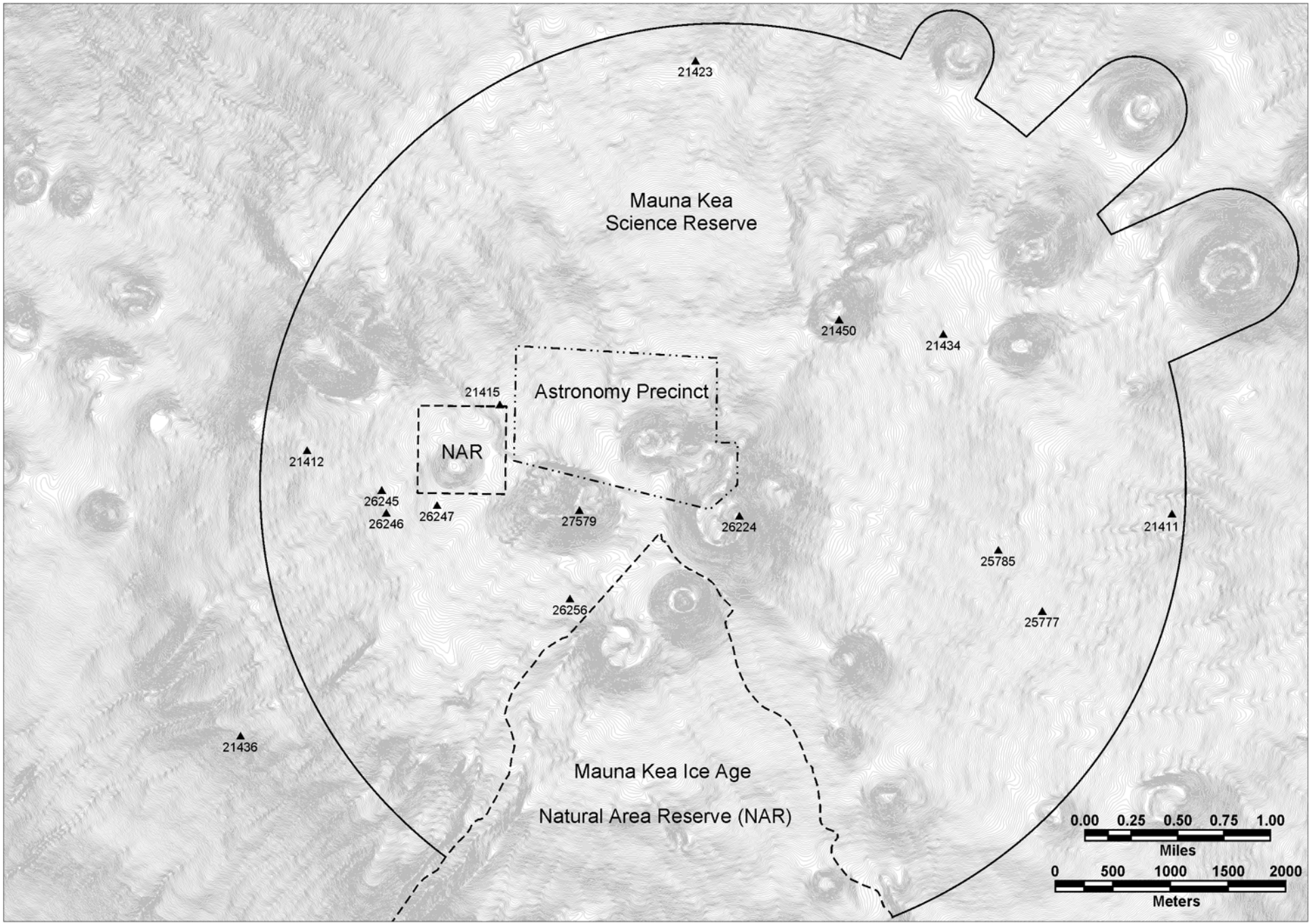

Figure 5.12 Locations of Sites Interpreted as Markers or Memorials.

5.4.2.12 Temporary Shelters

The evidence for "habitation" in the most general sense of the word in the Science Reserve is sketchy. Crude stone walls were found at various localities in the Science Reserve, usually in association with other features, such as lithic scatters. Three sites consist of walls without associated artifacts. Two to a maximum of four walls were found at three sites. Some are linear, while others are roughly C-shape in planview (Figure 5.13). A walled overhang shelter was found directly below a ridge-top shrine at Site 25781. All of these remains are interpreted as temporary shelters based on their morphology and environmental setting.

With the possible exception of the walled rockshelter at Site 25781 there is no evidence that any of the shelters were occupied over night. At least there is no evidence of a fire pit, although the evidence could be buried beneath the surface. With the possible exception of the walled overhang shelter there is no means of dating any of these sites, which are probably either late prehistoric or historic in age.

5.4.2.13 Historic Camp Sites

One and possibly two of the camps occupied by the United States Geological Survey (USGS) survey team in 1925 were found on the northern and northeastern slope of the mountain near Pu`u Māhoe and Pu`u Mākanaka (see Figure 5.5 in back pocket). Site 26218, which corresponds to the location of Camp 3 on a map (MA-1720) of the USGS survey team's camp sites (Figure 5.14), consists of five features, including a boulder concentration with a small constructed cairn (Feature 1), a trash dump (Feature 2), and three alignments (Features 3, 4, and 5). Feature 1 is a boulder concentration with a small constructed cairn located on the northeast side marking an inscription scratched into a flat lying slab. The inscription reads (from top to bottom): "Dec, 6 1925, HIM, USGS." An "arrow" is also present (Figure 5.15). A second inscription is located approximately 4.0 m south of the first, also on a flat lying slab. This inscription is scratched twice in cursive handwriting, and is very difficult to read; it appears to read "Ah Chiung." Upon further investigation it appears that Ah Chiung was the cook for the survey party (Kilmartin 1974:15). Artifacts associated with Feature 4 include a medicine bottle, an aluminum medicine tube, and an aluminum lid with the date of "1921" on it.

What might be Camp 4 was found near Pu`u Mākanaka, just outside of the Science Reserve. Kilmartin noted that "To set up Camp Four at 12,400 feet near Pu`u Mākanaka, we had difficulty finding a small flat area for the tents" (Kilmartin 1974:15). Site 27580 consists of an enclosure located on a small knoll between three pu`u (Pu`u Mākanaka, Pu`u Hoaka, and Pu`u Ala). Originally the enclosure was believed to be outside of the Science Reserve boundary and was only noted as a find spot related to possibly hunters. The enclosure is relatively square in shape with walls constructed of piled cobbles and small boulders and large boulders. It has a relatively level soil interior. No cultural material was observed in the enclosure or immediate vicinity. Whether this is indeed the remains of Camp 4 is an open question.

There is some confusion between the dates on the map and the date inscribed on the boulder at Site 26218. The inscription, as noted, reads Dec. 6, 1925 instead of Nov. 13, which is the date on the map. The Dec. 6 date is on the map but it is next to Camp 4. We suspect that the camp number and dates got switched.

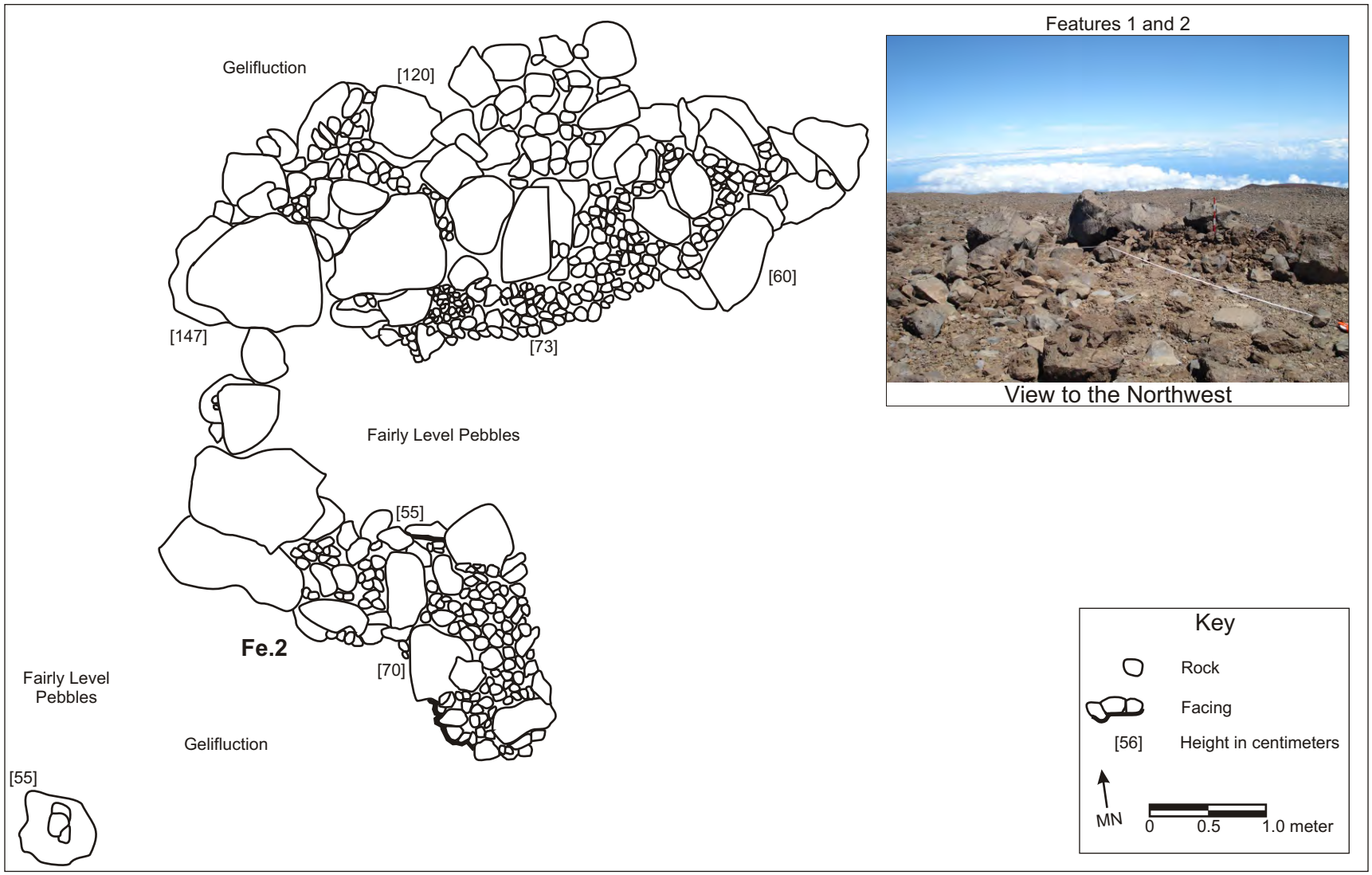

Figure 5.13. Example of a Temporary Shelter at Site 26232, Plan View and Photograph.

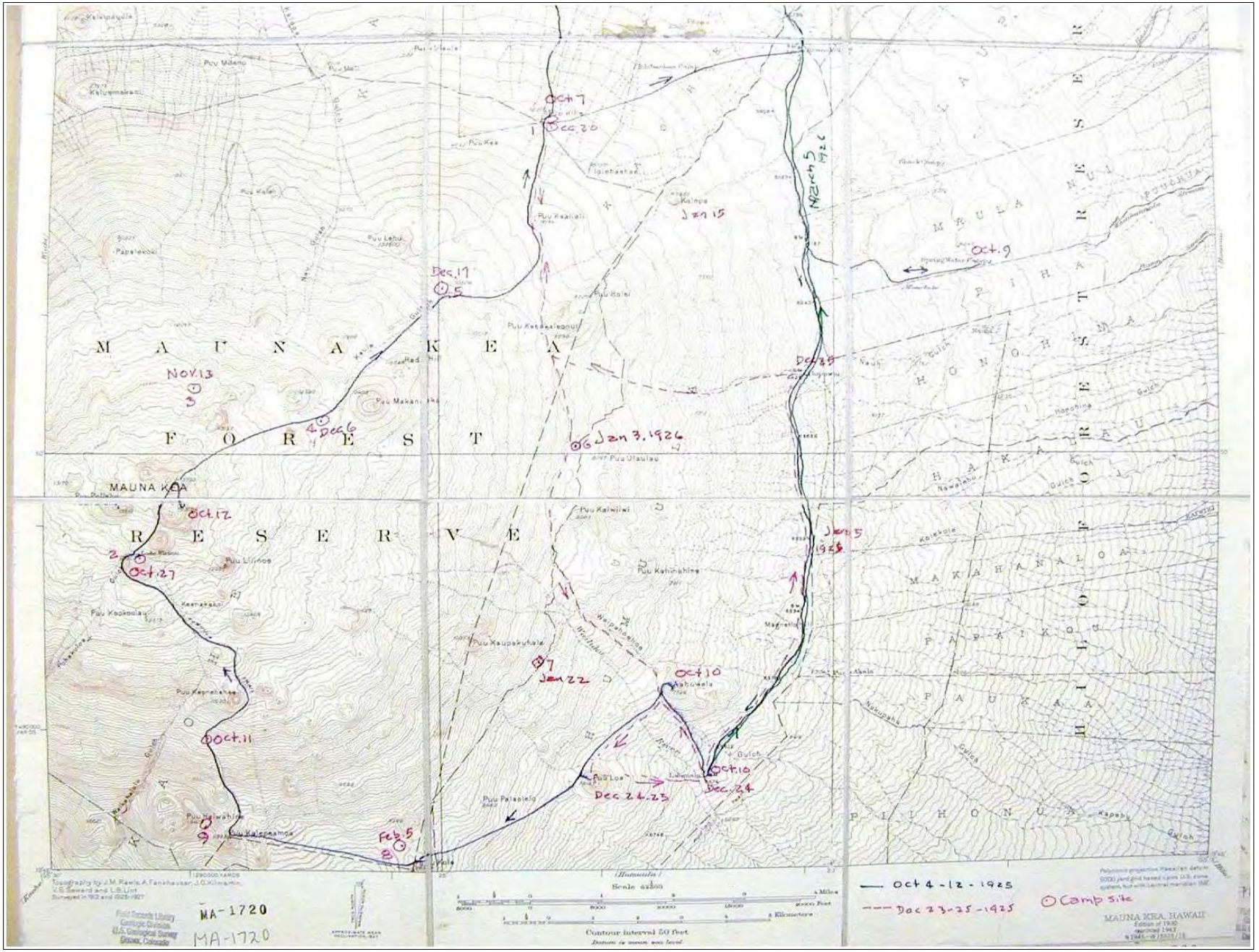

Figure 5.14. Map Showing the Location of the 1925 USGS Survey Party's Camps.

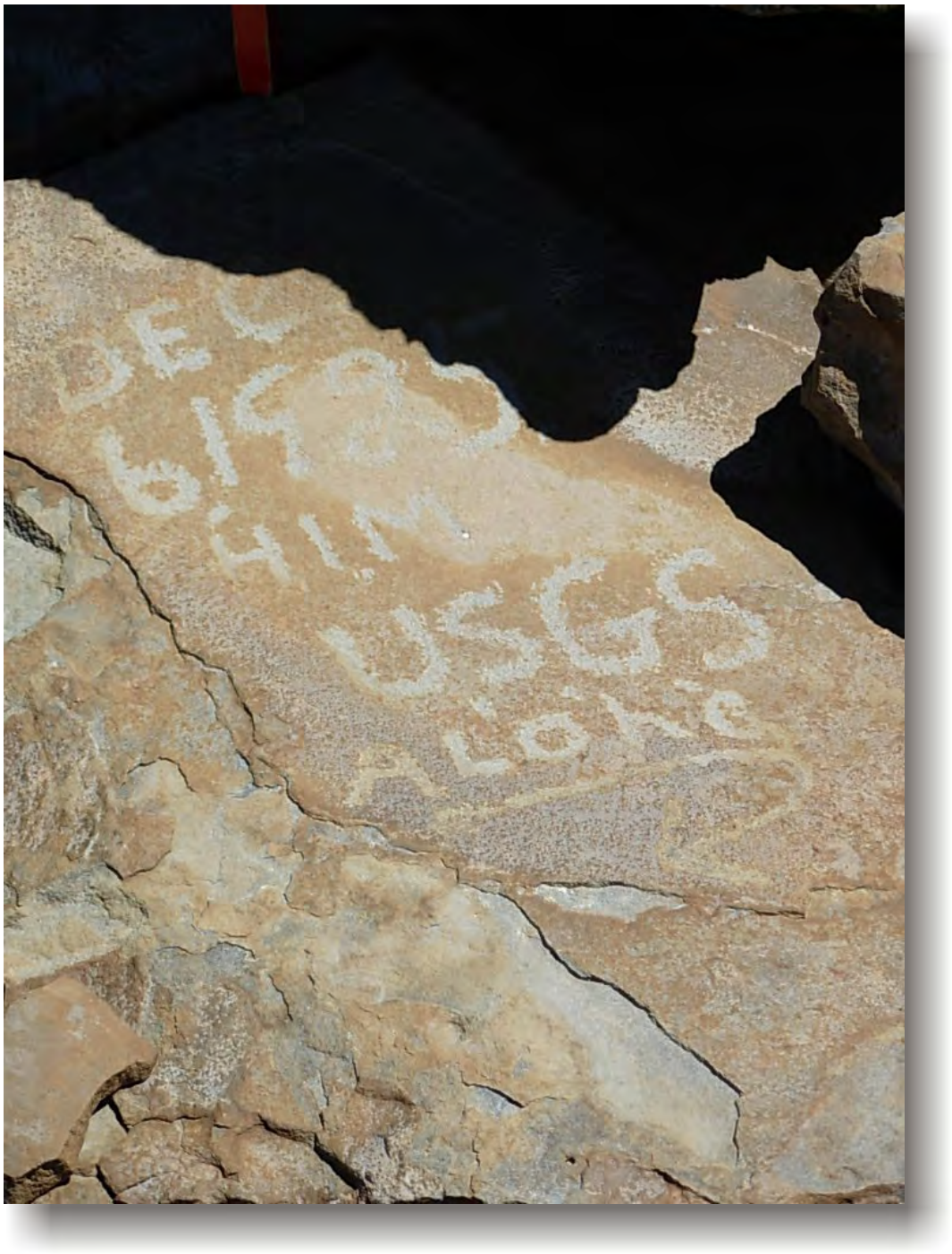

Figure 5.15. Date Inscribed on Boulder at Site 26218 (USGS Camp 3).

5.4.2.14 Unknown Function

There are three sites with a total six features whose function could not be determined (Table 5.9). A large number of these features are stone mounds and rock piles, which is one of the most common formal feature types found in the project area. It illustrates the difficulty in determining the use and meaning of one of the simplest kinds of features, in part because such features continue to be made today.

Table 5.9. Summary of Sites of Unknown Function.

State Site Number 50-10-23-	Number of Features	Elevation (ft. amsl)	Location	Feature Type (Feature Number)
21449	1	13,228	Ridge flank	Terrace (Feature 1)
25776	4	11,979	Rim of unnamed cinder cone	Four stone mounds (Features 1-4)
26230	1	12,199	Gelifluction terrace	Cobble and boulder mound between 2 large boulders (Feature 1)

5.4.3 Other Cultural Resources

Cultural resources in the Science Reserve include a large number of remains that at present cannot be classified as historic properties or sites, as normally defined in State and Federal laws, but which nevertheless need to be considered in developing appropriate management strategies which, according to Tom King (1998:235), need to consider all cultural resources. As noted above in the summary of previous archaeological work in the Science Reserve (Section 3.1), in 1997 SHPD instituted a process of recording what were initially referred to as “locations” but are now being termed “find spots,” although this term generally refers to isolated artifacts (cf. McCoy 1984a). “Find spots” are cultural resources that are either obviously modern features (e.g., camp sites with tin cans, pieces of glass and other modern material culture items), or features that cannot be classified with any level of confidence as historic sites because of their uncertain age and function (e.g., a pile of stones on a boulder).

A total of 339 find spots were found in the 2005-2009 survey (see Appendix E for descriptions). Their general locations are shown in Figure 5.16.

It is highly likely that some of the simple piles or stacks of rocks are either trail markers, boundary markers, or a simple kind of shrine made to propitiate the gods. Ed Stevens (personal communication) mentioned that when he was little and his family decided to hike a forest trail they would erect a pile of three stones with *ti* leaves between. The purpose was to petition the gods to avoid rain during the hike. It is reasonable to think that this kind of practice, which continues even today, would explain the large number of small stacks of rocks widely dispersed throughout the Science Reserve. It is hard to imagine that such features of the most minimalist kind would necessarily mark trails. They would hardly be visible or not at all during misty or foggy weather, for example. It is easy to see how a simple ritual performed to avoid bad weather could have evolved from earlier practices that were aimed at avoiding danger and insuring safe passage.

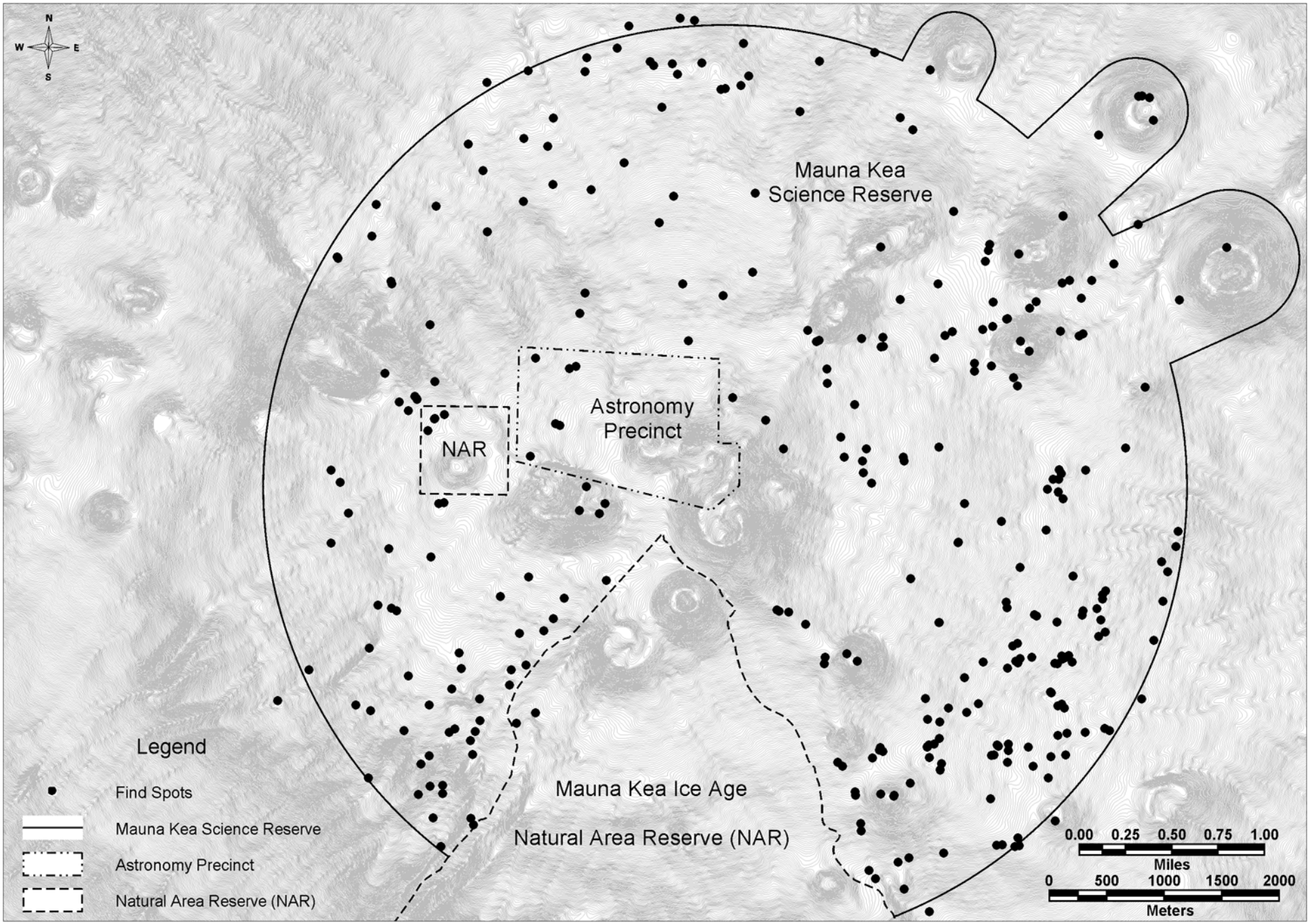

Figure 5.16 General Location of Other Cultural Resources (Find Spots) Identified in the 2005 - 2009 Survey.

McEldowney (1982: A-13) noted that “Such propitiation or petition made to local deities or to those who were personified in natural phenomena (i.e., clouds, mist, rains, winds, falling rocks, stands of trees, etc.) could be made with offerings to “upright stones,” “small platforms,” simple stones and natural landscape features” (Buck 1957:259).

There are numerous historic accounts that describe such propitiation practices. McEldowney (1982:A-9 to A-10) included two first-hand accounts from Menzies which date to 1793:

> So bigoted are these people to their religion that here and there on the sides of the path they have little maraes or spots consecrated to their deity, which none of them ever pass without leaving something, let it be ever so trifling, to obtain his good will, and they were highly delighted indeed when we followed their example in throwing a nail, a few beads, or a piece of tapa before their deity, which the women were not allowed to pass without uncovering their breasts and shoulders (Menzies 1920:85).

> We observed here and there on the path little maraes, pointed out by taboo sticks stuck in the ground round a bush or under a tree. In passing these places the natives always uttered a prayer or hymn, and made some offerings as they said, to their akua, by leaving a piece of fruit, vegetable or something of other at these consecrated spots (Menzies 1920:156-157).

McAllister (1933:19-20) included a quote from a passage in Tyerman and Bennett (1831: 432) that describes in more detail:

> As we proceeded towards an adjacent village, we had to cross, with great difficulty and some peril, a range of black rocks which overhung the dashing surges with precipices of giddy elevation. The path being exceeding rough, there were placed, at intervals small heaps of stones with a large block set upright in the centre of each. The latter, in fact, was a local divinity, tufts of grass and wreaths of leaves being devoutly laid around these sanctuaries by passengers, who thus propitiated his favour that they might be protected from slips and falls by the way…On the summit of this stupendous range, we found a perfect pandemonium, consisting of multitudes of these dumb, shapeless fragments of the rock on which we were treading, set up to receive the honours due to God alone. These seemed to be of a superior order, entitled to inhabit a higher region, than those on the declivities; for, in addition to the grass and leaves that strewed their respective shrines, their tops were wrapped round with native cloth. The savage aspect of nature in this scene of utter loneliness and desolation—where not a tree or plant grew among the innumerable crags, loose or fixed, that lay like the ruins of a mountain shattered to pieces around and below where we stood—was well calculated to affect with superstitious awe an ignorant people.

The Rev. William Ellis observed similar practices aimed at ensuring safe passage at dangerous places along paths or trails, especially those that went up and over cliffs. His account, dating to his travels through the islands in 1823, mentions stone gods at such dangerous places.

> Within a few yards of the upper edge of the pass, under the shade of the surrounding bushes and trees, two rude and shapeless stone idols are fixed, one on each side of the path, which the natives call *Akua no ka Pari*, gods of the precipice; they are usually covered with pieces of white tapa, native cloth; and every native who passes by to the precipice, if he intends to descend, lays a green bough before these idols, encircles them with a garland of flowers, or

> wraps a piece of tapa round them, to render them propitious to his descent; all who ascend from the opposite side make a similar acknowledgment for the supposed protection of the deities, whom they imagine to preside over the fearful pass. This practice appears universal, for in our travels among the islands, we have seldom passed any steep or dangerous paths, as the commencement or termination of which we have not seen these images, with heaps of offerings lying before them. Until very recently, it is evident the influence of superstition was strong in the minds of the great mass of the people; for although the natives who accompanied us in our excursions, either from a conviction of the absurdity of the notions of their countrymen, or from mere wantoness, usually overturned the idols, battered them with stones, or rolled them down the precipice or passage which they were supposed to defend; yet on passing the same path only a very short time afterwards, we have invariably found them replaced, or, if broken, their places supplied by fresh ones. The conduct of our native companions was never the consequence of our directions, and seldom received our approbation, for we were not ambitious to become Iconoclasts....(Ellis 1979:15-16).

Eduard Arning, who was collecting ethnographic specimens in the Hawaiian Islands in the 1880s witnessed a variation of same practice as that described earlier by Ellis, on Molokai and Oahu, indicating that what many people today would call superstitious beliefs, continued well after European contact. Instead of tapa and flowers, Arning describes the offerings as stones:

> Stone Offerings: In crossing the pali between Kalawao and Waikolo (Molokai) the natives deposited oval lava stones on the dangerous hills. This custom was, during my stay, still rigidly observed. I took such a lava piece (1,20) from one of the rocks; it measures 9 cm. long and 7 cm. wide. Also at the end of a narrow gorge famous for its picturesque waterfall near Punaluu on Oahu (photo 1, 232 and 1, 233) behind the temple of the fish god is Kalaupoko the natives deposited stone offerings. They hoped that these offerings would protect them from falling stones, and they deposited these every four or five steps in little heaps and covered them with leaves of dracaena or Eugenia. They hoped by these tokens of attention to propitiate the gods. They always entered the valley only timidly and with shyness. Here, I was told, the god Kameepua fled from the angry Pele and in sliding down the mountain caused the stripes of erosion beside the waterfall (Arning 1931:79).

5.4.4 Summary of Work and Findings in the Astronomy Precinct

The 525-acre Astronomy Precinct, which was established in 2000 with the approval of the Mauna Kea Science Reserve Master Plan (Group 70 International, Inc.) by the UH Board of Regents, is an area of special concern since this is the only area within the Science Reserve where developments, such as new observatories, will be allowed in the future. A summary of archaeological investigations in the precinct is presented below. Figure 5.17 shows the locations of all known archaeological sites and find spots.

The Astronomy Precinct is one of most intensively surveyed areas in the Science Reserve. Three archaeological surveys have been conducted in the Astronomy Precinct. The first survey, in 1982, identified four sites (Table 5.10; McCoy 1982a). In 1995, SHPD resurveyed a portion of the precinct in the process of relocating previously identified sites which for the first time were accurately located using GPS technology. No new sites were found in that project, which did not cover the whole area, however.

Table 5.10. List of Historic Properties Located in the Astronomy Precinct.

State Site No. 50-10-23-	Site Type	Site Function
Previously Recorded Archaeological Sites		
16166	2 rows of uprights, 8 to possibly 9 total	Shrine
16167	Single row of 2 uprights	Shrine
16169	Single row of 2 uprights	Shrine
16172	Single Upright	Shrine
Newly Recorded Archaeological Sites		
21447	Single Upright	Shrine
21449	Terrace	Unknown

The archaeological inventory survey of the precinct in 2005 found one new shrine (Site 21447) and a small terrace of unknown function (Site 21449; McCoy et al. 2005). Excavation of Site 21449 in 2008 failed to produce any evidence that would aid in the determination of site function (see Volume 2 site descriptions for excavation results). There was no evidence of buried cultural deposits and the only clue of human activity are several large slabs on the surface that are difficult to explain as a natural occurrence. The function of this site thus remains unknown.

In summary, there are six known archaeological sites in the Astronomy Precinct. As shown on Figure 5.17 a portion of Pu`u Kūkahau`ula, a TCP (Site 21438) is also included within the Astronomy Precinct. There are thus seven identified historic properties in the precinct.

The 2005 survey also identified a couple of new find spots in the Astronomy Precinct near the terminus of the “13 North Road.” Two single uprights (Find-spots 2005-9 and 2005-9) were found in close proximity to the road and to recently installed test telescope and other equipment (see Figure 5.17). No archaeological sites had ever been found at this location in past surveys or during field inspections by SHPD staff archaeologists in 2004 as part of the compliance process for the installation of the new equipment. The appearance of find-spots 2005-8 and 2005-9 in the short interval between 2004 and 2005 is a good example of why these new cultural features need to be tracked and distinguished from the shrines and other features associated with Mauna Kea’s ancient cultural landscape.

Seven find-spots were identified in the Astronomy Precinct in 2005 (Table 5.11; see Figure 5.17), including a previously identified find-spot found during the 1997 SHPD survey (McCoy 1999a).

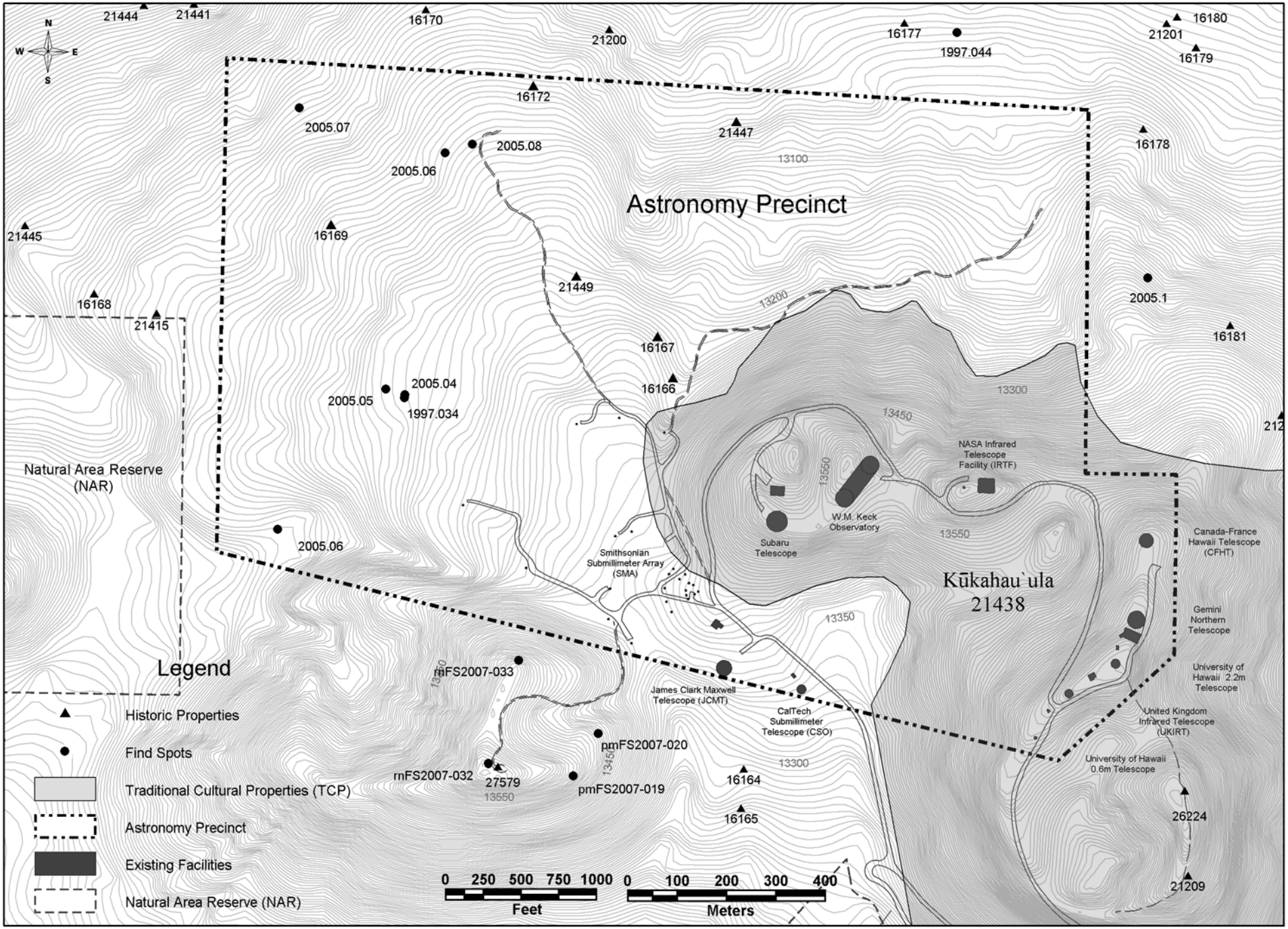

Figure 5.17 Location of Historic Properties and Find Spots in the Astronomy Precinct and Surrounding Area.

Table 5.11. List of Find Spots Located in the Astronomy Precinct.

Year. No.	Approximate Elevation (ft. asl)	Description	Function
Previously Recorded Find-Spots			
1997.07	13,308	Stacked (2) rocks on a boulder	Marker
Newly Recorded Find-Spots			
2005.03	13,271	Stacked (3) rocks	Marker
2005.05	13,220	Stacked rocks	Marker
2005.06	13,202	Possible upright	Unknown
2005.07	13,000	Possible uprights	Unknown
2005.08	13,140	Two uprights near weather station	Shrine
2005.09	13,016	Stacked rocks	Shrine