RC-0869

Archaeological Monitoring Report: Geotechnical Boring for the Proposed Thirty Meter Telescope (TMT) in the Astronomy Precinct of Mauna Kea

(TMK: 3-4-4-15:009)

Kaʻohe Ahupuaʻa
Hāmākua District
Island of Hawaiʻi

FINAL VERSION

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October 2013

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ARCHAEOLOGICAL, CULTURAL, AND HISTORICAL STUDIES

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MANAGEMENT SUMMARY

At the request of TMT Observatory Corporation, Rechtman Consulting, LLC conducted archaeological monitoring of ground-altering activities associated with the geotechnical boring, and the construction of an associated access road for the proposed Thirty Meter Telescope (TMT) within the astronomy precinct of Mauna Kea. As identified in the monitoring plan, historic archaeological resources are known to exist in the general project vicinity; thus the necessity for archaeological monitoring. The archaeological monitoring adhered to procedures outlined in Hawai‘i Administrative Rules 13§13-279 *Rules Governing Minimal Standards for Archaeological Monitoring Studies and Reports*. This report details the procedures that were followed during monitoring as well as presents the results of the monitoring fieldwork. There were no previously identified archaeological sites impacted by the development activity nor were there any new archaeological resources encountered during monitoring.

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INTRODUCTION

At the request of TMT Observatory Corporation, Rechtman Consulting, LLC has prepared this archaeological monitoring report, which details the procedures that were followed during the monitoring of ground-disturbing activities associated with the geotechnical boring, and the construction of an associated access road for the proposed Thirty Meter Telescope (TMT) within the astronomy precinct of Mauna Kea. The proposed TMT development area is located in Area E of the Astronomy Precinct within the Mauna Kea Science Reserve, in TMK: 3-4-4-15:009, in Kaʻohe Ahupuaʻa, Hāmākua District, Hawaiʻi Island (Figures 1 and 2). Pacific Consulting Services, Inc. prepared a monitoring plan (Collins et al. 2013), which was submitted to and approved by DLNR-SHPD. The archaeological monitoring effort described in the current report adhered to procedures described in the approved monitoring plan and those outlined in Hawaiʻi Administrative Rules 13§13-279 *Rules Governing Minimal Standards for Archaeological Monitoring Studies and Reports*.

ANTICIPATED REMAINS

As noted in the Archaeological Monitoring Plan (Collins et al. 2013), six previously recorded historic sites were located within the boundaries of the Astronomy Precinct, as well as seven "find spots" (modern features), and two Traditional Cultural Properties (TCP). Of the six archaeological sites within the precinct, three are situated relatively close to the access road and the TMT development area (see Figure 2). These include: SHIP Site 50-50-10-16166, eight (possibly nine) uprights arranged in two groups (Figure 3); SHIP Site 50-50-10-16167, an upright set in a crack (Figure 4); and SHIP Site 50-50-10-16172, a single upright (Figure 5). None of these sites were in danger of disturbance during the geotechnical boring. The two traditional cultural properties include the summit cinder cones collectively known as Kukahauʻula (SHIP Site 50-50-10-21438) and Puʻu Līlīnoe (SHIP Site 50-50-10-21439) (see Figure 1). The current access way to the TMT development area intersects with the northwestern edge of Site 21438; a bore hole (B-9) was augured to a depth of 10 feet along this portion of the road.

Mauna Kea and its summit cinder cones to this day still play an important role in religious and cultural practices to many native Hawaiians and non-native Hawaiians alike. Family shrines (consisting mainly of upright boulders set on end) and rock piles are still constructed in and around the summit area, and these more modern features have been labeled as "find-spots." In light of this, there is a possibility that new find spots may be located within the project area. The possibility also exists for the discovery of isolated subsurface artifacts, particularly adzes, flakes, or worked stone, and, although less likely, the discovery of subsurface human remains.

THE MONITORING EFFORT

On August 21, 2013, prior to the commencement of ground-disturbing activities, Robert Rechtman, Ph.D. (Principal Investigator), as well as Genevieve L. Glennon (primary monitor) and Ashton Dirks (secondary monitor) attended the Office of Mauna Kea Management's (OMKM) cultural orientation, held at the Imiloa Astronomy Center. The various environmental, cultural, and safety issues concerning Mauna Kea and the construction of the TMT were presented to the attendees. A preconstruction conference was held on August 27, 2013 at the Hale Pohaku facility; in attendance were the road construction crew (Isemoto Contracting Inc.), the geotechnical contractor representatives (URS, Inc.), and TMT staff. At this preconstruction conference Dr. Rechtman provided an archaeological orientation, explaining the nature of potential cultural resources that might be encountered. It was also explained that the monitoring archaeologist has the authority to halt construction activities in the event that any such resources are encountered. The procedures to be followed in case of an inadvertent discovery of human skeletal remains were also outlined. Also present at this conference was Wally Ishibashi, the cultural monitor working on behalf of the OMKM. Additional on-site archaeological briefings were provided to the drilling crew (Taber Drilling) on an as need basis by the primary archaeological monitor.

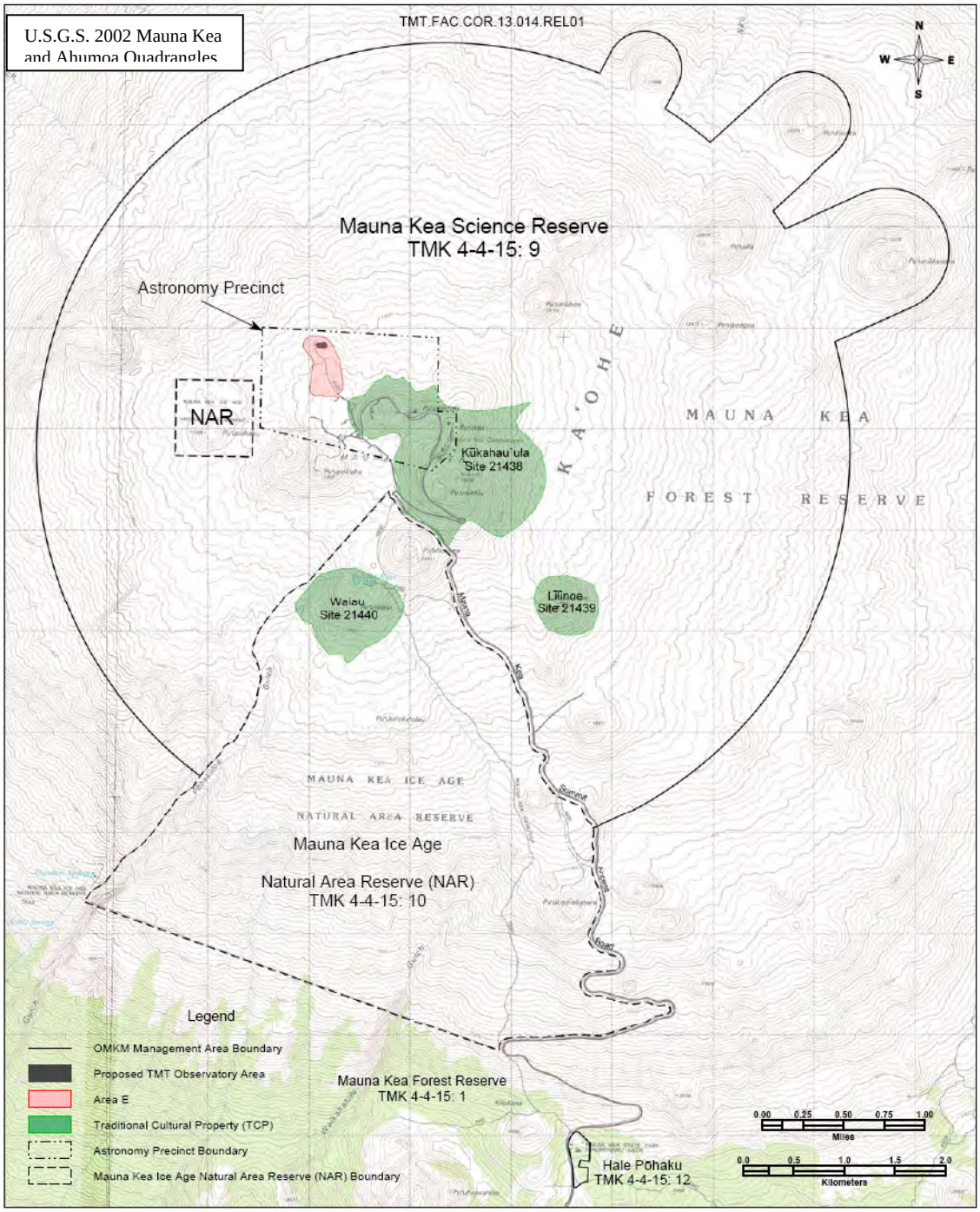

Figure 1. Project Area Location.

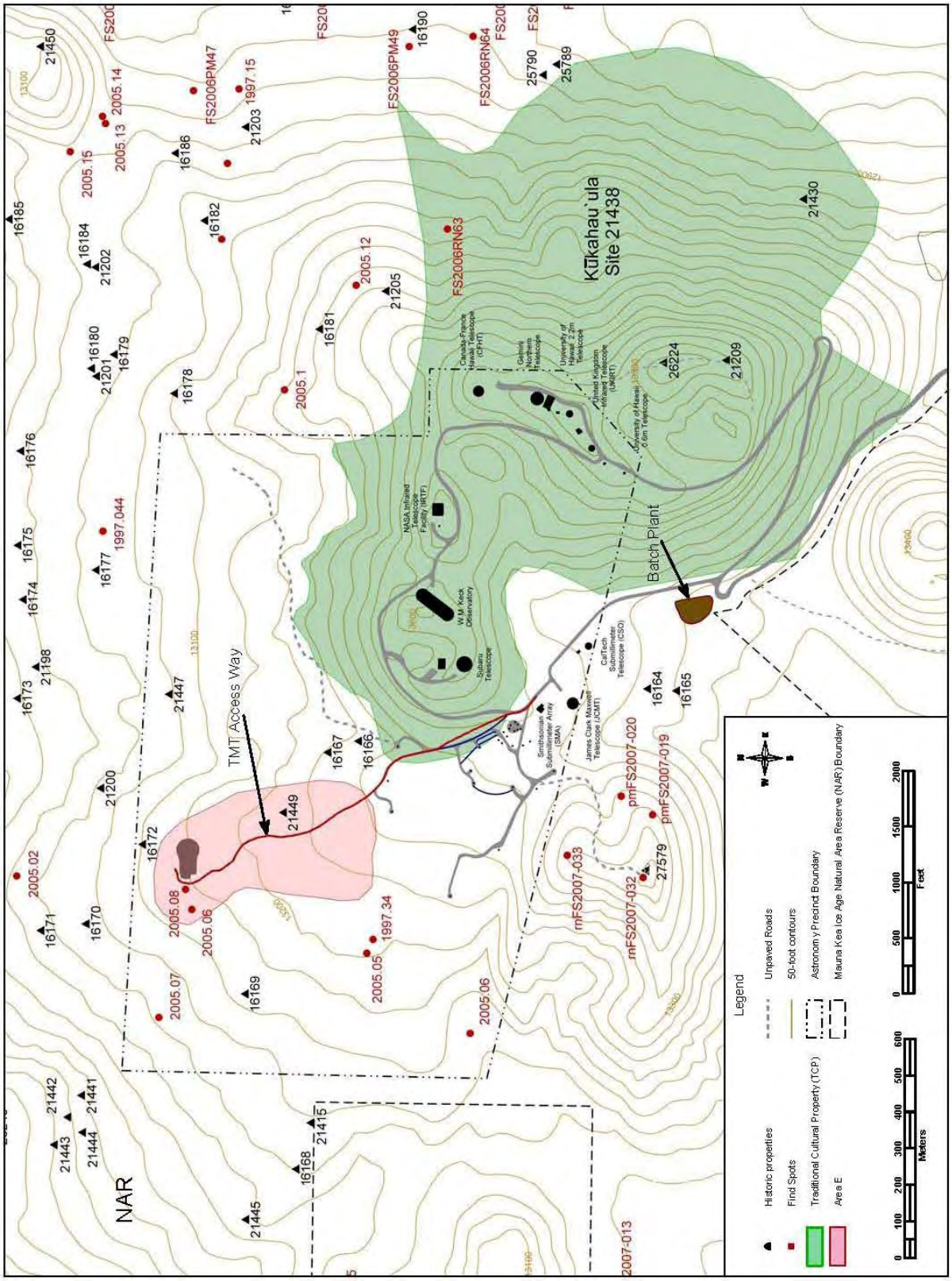

Figure 2. Historic properties in the Astronomy Precinct and vicinity of the proposed TMT Location.

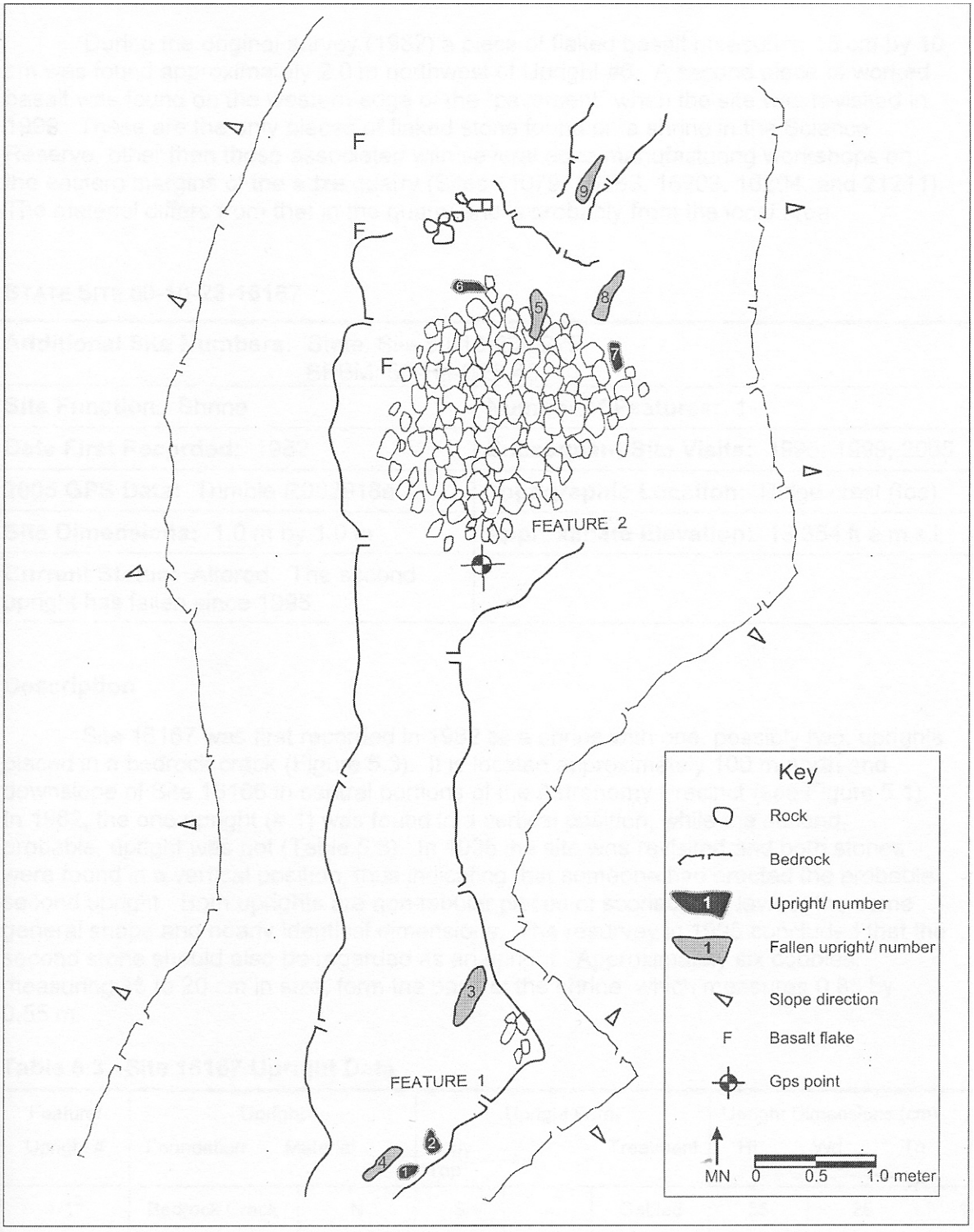

Figure 3. Site 16166 plan view (from McCoy et. al 2010).

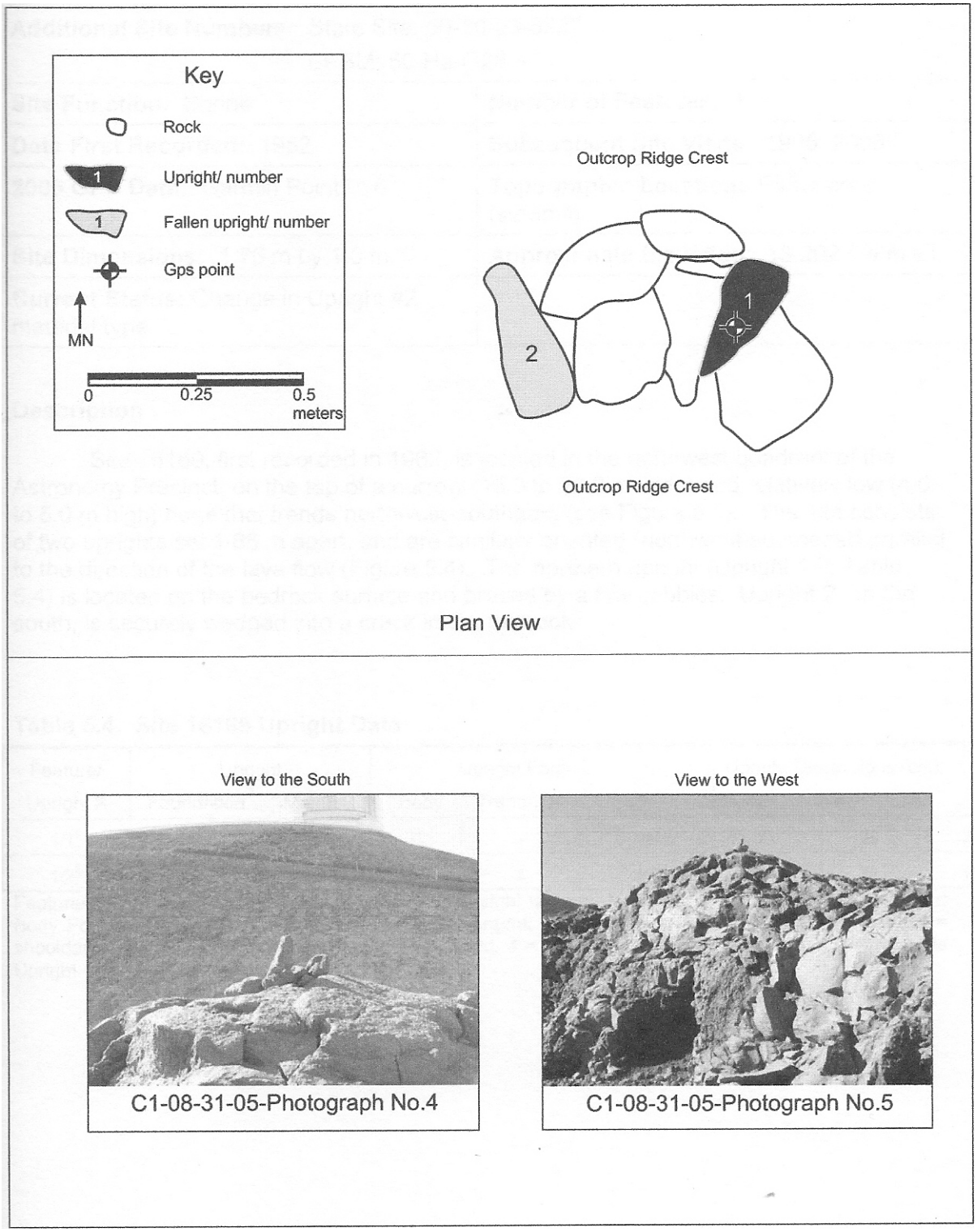

Figure 4. Site 16167 plan view and photos (McCoy et al. 2010).

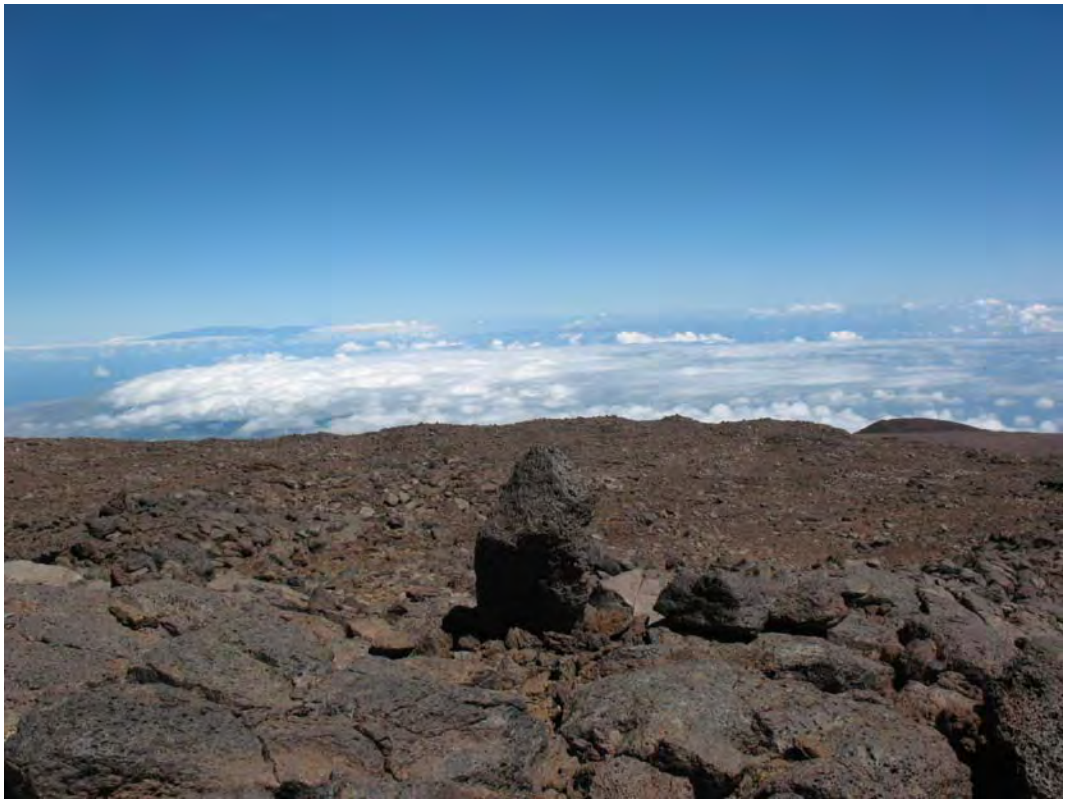

Figure 5. Site 16172, view to the north.

FIELD METHODS AND FINDINGS

Archaeological monitoring for the current project commenced on August 26, 2013 and was completed on October 18, 2013. Robert B. Rechtman, Ph.D. served as Principal Investigator and Genevieve L. Glennon, B.A. was the primary archaeological monitor. All of the field records generated during this project are archived with Rechtman Consulting, LLC.

The project area is located within the Mauna Kea Science Reserve, in Area E of the Astronomy Precinct (see Figure 2). The Geotechnical Boring for this phase of construction for the TMT consisted of grading and improving an existing access road, as well as creating a new road extension, and drilling/auguring for the extraction of core samples and percolation testing. Sixteen holes were drilled/augured along the access road and within the footprint of the proposed TMT development area (Figure 6). Twelve of these holes (B-1, B-2, B-2b, B-3, B-3b, B-4, B-5, B-6, B-7, B-8, B-9, and B-10) were drilled in order to retrieve core samples, and four (P-1, P-2, P-3, and P-4) were augured for percolation testing. Additional testing that took place during this process included thermal resistivity and conductivity, and seismic refraction. The proposed TMT observatory location is at the northern end of an existing 4WD road. This road runs roughly north/south and provides access from the summit loop road to the proposed development area. The southern section of this access road runs along a portion of the northwestern edge of the defined Kukuhau‘ula TCP site (SIHP Site 21438). A Komatsu WA500 Loader and a Komatsu 275AX bulldozer were used to cut, grade, fill and generally improve the existing road in some areas (Figure 7 and 8). This was done to provide safe and easier access for the drill rig, water trucks, and other vehicular traffic to the site area. An extension to the road was also created in order to secure access to the boring locations within the proposed TMT observatory development area. This new road was cut roughly six meters wide with the Komatsu 275AX bulldozer, and formed a loop through the proposed TMT observatory area. No surface or subsurface cultural material was observed during this activity.

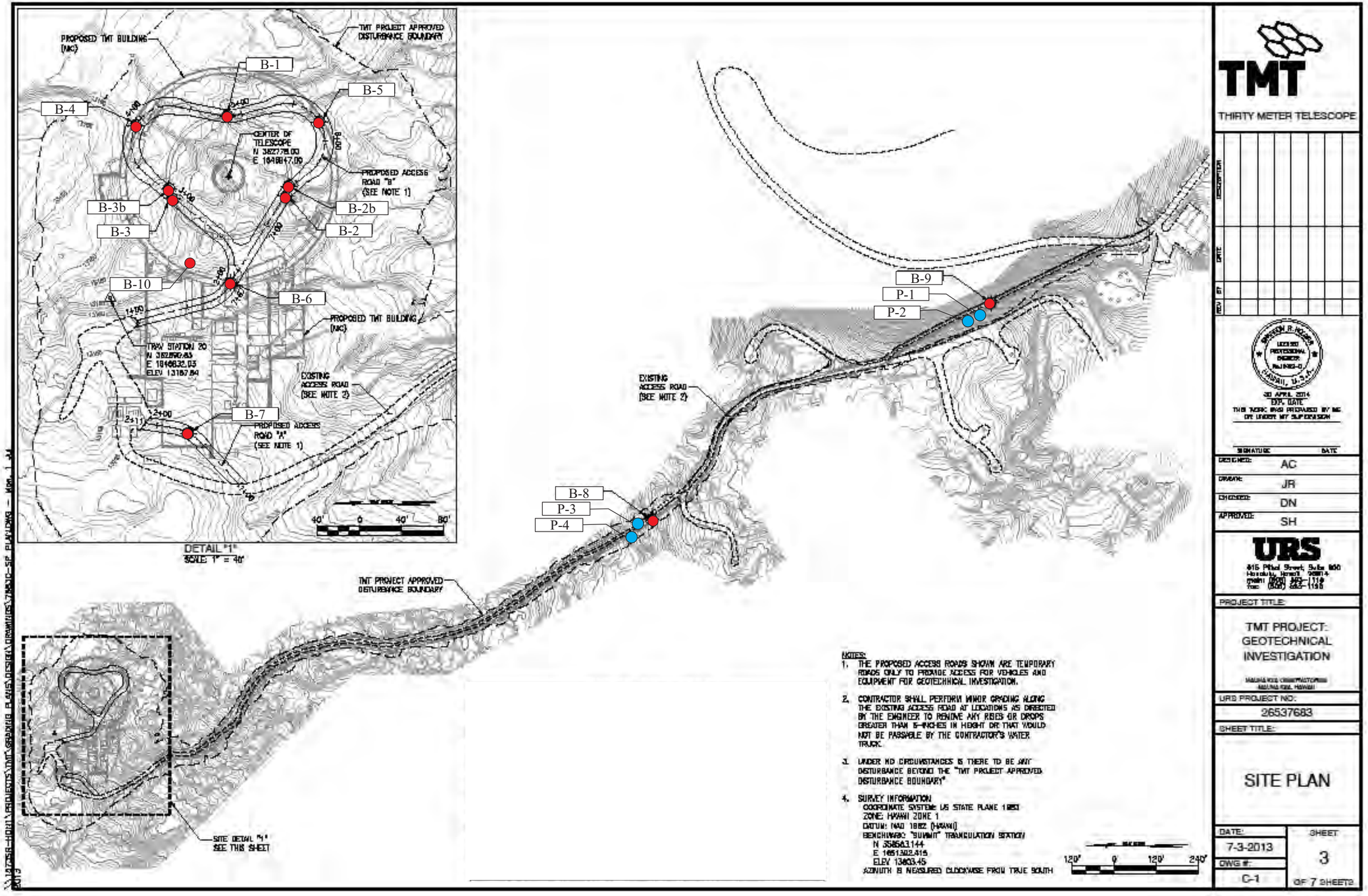

Figure 6. Map of Boring Locations and Road Work.

Figure 7. Komatsu 275AX bulldozer and Komatsu WA500 loader grading the existing 4WD road, note observatories in background.

Figure 8. Komatsu 275AX bulldozer ripping existing 4WD road, Pu‘u Pohaku in background.

Boring activities began on September 4, 2013 and continued intermittently until October 18, 2013. Taber Drilling (working as a subcontractor under URS) used a limited access CME 55 HD crawler drill rig mounted on rubber tracks (Figure 9) to drill and auger the holes. The drilling depths for the core sampling ranged from 10 feet to 80 feet. Two samples (B-8, and B-9) were taken along the access road, while the remaining samples (B-1 to B-7 and B-10) were located within the footprint of the proposed TMT observatory development area (see Figure 6). The individual depths of B-1 to B-10 are listed in Table 1. During the drilling process an auger (Figure 10) was used in areas of looser material (mainly consisting of clinkers and cinder); and in areas of more compact rock, a standard diamond bit core barrel was utilized. The core samples were extracted and packaged in roughly 5 foot sections (Figure 11). Five of the bore holes (B-6, B-2, B-2b, B-3, and B-3b) had grouted PVC casings inserted for the seismic refraction testing. The four percolation test holes were each augured to a depth of 2.5 feet (Figure 12). No cultural material was observed during the drilling/auguring activities.

Table 1. Individual bore hole depths.

Hole #	*Depth (ft.)*
B-1	50
B-2	70
B-2b	70
B-3	60
B-3b	60
B-4	36.5
B-5	50
B-6	80
B-7	30
B-8	10
B-9	10
B-10	50

Figure 9. CME 55 HD crawler drill rig.

Figure 10. Auger being used at B-9.

Figure 11. Core sample box from B-3.


Figure 12. Percolation testing.

Although no historic properties were observed during the monitoring of the geotechnical test activities described in this report, there were a few instances of "new" construction (Find Spots) and modern cultural items placed in the work area. These included the erection of two small upright boulders and placement of a ti leaf bracelet at the northern outlying boundary of the TMT observatory development area (Figure 13), the placement of a second braided ti leaf bracelet by the drill rig while located at B-3b (Figure 14), and a the placement of a bouquet of *ʻōhelo* at the northern end of the access roadway. The two uprights were later dislodged by OMKM staff.

Figure 13. Newly placed upright boulders and ti leaf bracelet at the northern boundary of the TMT area.

Figure 14. Ti leaf bracelet placed at B-3b.

Worthy of note and a brief discussion are a series of natural geological features that number in the hundreds if not thousands within the general TMT development area. These features have variously been called “gelifluction terraces,” “solifluction terraces,” “stone-banked gelifluction lobes,” and “stone nets or polygonbodens” (Davies 1972; Embleton and King 1975; Washburn 1956, 1979, Gregory and Wentworth 1937). One such natural feature was recorded in 2005 as a possible archaeological site and designated SIHP Site 21449, but was later subject to subsurface testing that indicated the feature was completely natural (McCoy et al. 2010). As McCoy et al. reported, “[e]xcavation of Site 21449 (a terrace) in 2008 did not recover any cultural remains and the terrace is now thought to be a natural gelifluction terrace” (2010:6-1). These terraces have the appearance of constructed features (Figure 15) in various shapes and sizes, and can be observed widely throughout the area. Gregory and Wentworth (1937) described a process whereby terraced features (“stone nets”) form in a periglacial environment through the slow downslope movement of water-saturated sediment as part of a recurrent freezing and thawing cycle (a phenomenon that still occurs daily on the summit terrain of Mauna Kea). This process (gelifluction) involves the transport and sorting of localized ground material, creating a pattern of banks/retaining walls of larger rock material with associated leveled interiors consisting of trickled down sediment and smaller rock and gravel material (Huddart and Stott 2010).

During construction of the loop road extension, one such terrace was bisected by bulldozing (Figure 16) exposing an interior profile of fine silt (weathered rock and cinder) and small to medium clinker pebbles and cobbles. The sorted nature of the material was clearly visible in the profile.

Figure 15. Example of natural stone-banked gelifluction terrace.

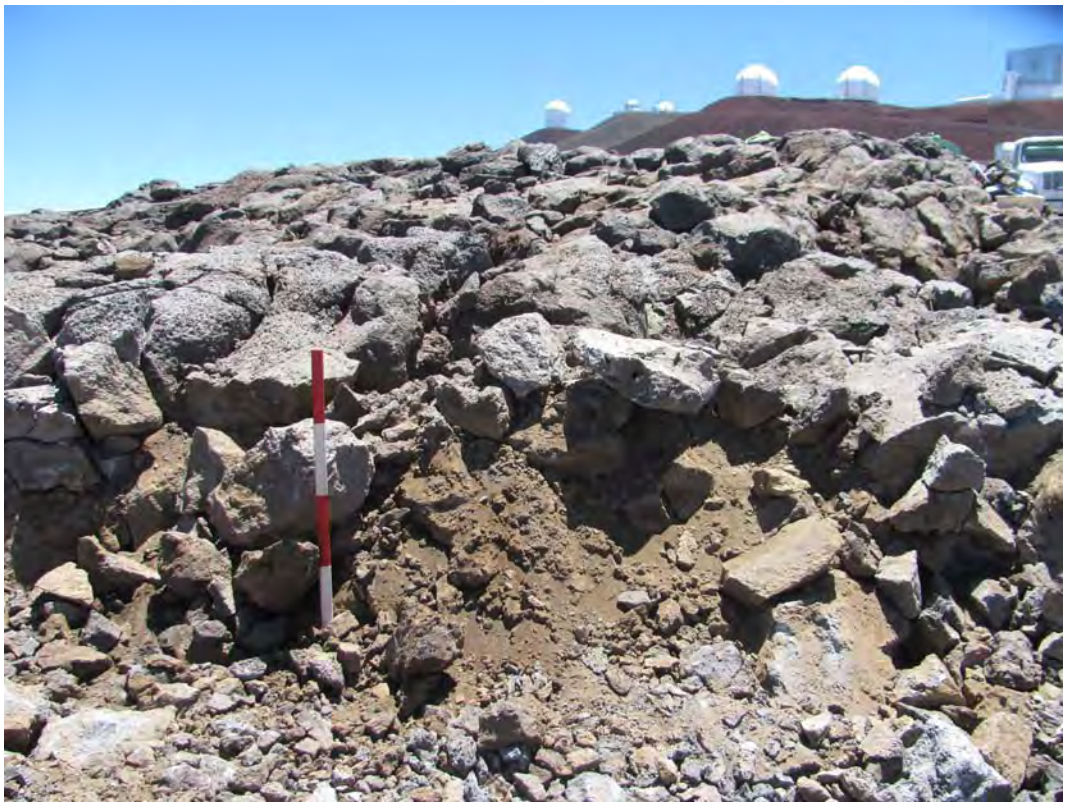

Figure 16. Natural terrace bisected by bulldozing.

SUMMARY

Rechtman Consulting, LLC conducted archaeological monitoring of geotechnical testing associated with the proposed TMT observatory development area within the Astronomy Precinct on Mauna Kea. The current work included grading and cutting of an already existing 4WD access road, cutting of a new extension loop for the access road, as well as the drilling/auguring of sixteen bore holes ranging in depth from 2.5 to 80 feet. During the course of the monitoring all exposed soil was inspected and core samples were examined for cultural material. No surface archaeological features were observed; nor were there any cultural deposits, artifacts, or human skeletal remains encountered during this project.

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