

**FINAL REPORT**

**Historic Preservation Mitigation Plan In  
Support of Construction of the Thirty Meter  
Telescope in the Astronomy Precinct on  
Mauna Kea, Ka'ohē Ahupua'a, Hāmākua  
District, Island of Hawai'i, State of Hawai'i**

TMK: (3) 4-4-015: 09 (por.)

*Prepared for:*

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September 2012

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## INTRODUCTION

On behalf of the Thirty-Meter-Telescope (TMT) Observatory Corporation, the University of Hawai'i has obtained a Conservation District Use Permit from the State of Hawai'i Board of Land and Natural Resources (BLNR) that allows the construction, operation, and eventual decommissioning of the TMT Observatory<sup>1</sup> within an area below the summit of Mauna Kea that is known as "Area E". In addition to the observatory facilities, other uses in the summit region that would occur under the permit include construction of an Access Way and equipment and materials staging in the Batch Plant Staging Area.

This plan presents brief descriptions of the proposed project activities, the historic properties known to be present in or near each area where uses/activities would occur, and the mitigation measures that will be implemented to reduce or eliminate adverse effects on historic properties and cultural practices. It also includes a draft Archaeological Monitoring Plan (AMP). A previous version of this plan was reviewed and approved by the State Historic Preservation Division (SHPD) in 2010 (see Appendix A).

### GENERAL HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

Located within the ahupua'a of Ka'ohe in the Hāmākua District of Hawai'i Island, the summit of Mauna Kea was traditionally described as an abode of the ancestral *akua* (gods, goddesses, deities). Native Hawaiians believed that the *pu'u* (cinder cones) and other features of the summit such as Lake Waiau were the physical manifestations of these deities.

The information on historic properties in the following sections comes from the recently completed archaeological inventory survey (AIS) report by McCoy and Nees (2010) that documents historic properties in the 11,288-acre Mauna Kea Science Reserve (MKSR). The TMT Observatory site, the Access Way, and the existing Batch Plant Staging Area are all within the MKSR and the Mauna Kea Summit Region Historic District -- Statewide Inventory of Historic Places (SIHP) No. 50-10-23-26869 -- as defined in the *Mauna Kea Historic Preservation Plan Management Components* (SHPD 2000). The Mauna Kea Summit Region Historic District includes a concentration of significant historic properties that are linked through their setting, historic use, traditional associations, and ongoing cultural practices. The historic properties recorded during the AIS include shrines, adze quarry complexes and workshops, burials, stone markers/memorials, temporary shelters, historic campsites, traditional cultural properties (TCPs), a historic trail, sites of unknown function, and isolated artifact finds. All of these types of historic sites are contributing properties to the Historic District (McCoy & Nees 2010). The Historic District has been determined by the State Historic Preservation Division (SHPD) to be significant under all five criteria (A, B, C, D and E), as defined in Hawaii Administrative Rules §13-275 -6.

### REGULATORY BACKGROUND AND MITIGATION REQUIREMENTS

Regulatory oversight of historic preservation compliance for construction of the TMT falls under Chapter 6E-8, Hawaii Revised Statutes (HRS), which covers the review of the effects of State projects on historic properties. This historic preservation mitigation plan has also been developed in accordance with the provisions of the implementing

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<sup>1</sup> An observatory includes the telescope(s), the dome(s) that contain the telescope(s), and the instrumentation and support facilities for the telescope(s) that fall under a common ownership.

regulations at Hawai'i Administrative Rules (HAR) 13-275-8 on mitigation and historic preservation review, and HAR 13-279, on archaeological monitoring.

In addition, the *Mauna Kea Comprehensive Management Plan* (CMP) approved by the BLNR in 2009 requires on-site monitors during construction activities on Mauna Kea, as determined by the appropriate agency. CMP Management Action C-1 provides for an overall construction monitor who has oversight and authority to ensure that all aspects of ground-based work comply with protocols and permit requirements. Specifically, the CMP's Management Action C-5 calls for on-site monitors (archaeologist, cultural resources specialist, entomologist) during construction, as determined by the appropriate agencies. Section 3.15 of the *Final Environmental Impact Statement* (FEIS) for the TMT project commits to having on-site cultural and archaeological monitors during construction.

## **DESCRIPTION OF PROJECT AREAS AND ACTIVITIES**

### **TMT OBSERVATORY SITE AND ACCESS WAY**

Approximately five acres would be disturbed during construction of the TMT Observatory. The TMT Observatory would consist of the 30-meter telescope itself, the instruments that are attached to it to record data, the enclosing dome, the attached building housing support and maintenance facilities, and parking. The TMT Observatory would be located on what is referred to as the 13-North (13N) site in Area E within the Astronomy Precinct of the MKSR (Figure 1).

The Access Way consists of the road and underground utility (power and telecommunications) improvements that would be constructed to connect the TMT Observatory with existing roads and utilities. Currently, utility services exist along the Mauna Kea Loop Road to a point near the intersection of the Mauna Kea Loop Road and the Submillimeter Array (SMA) building. The proposed Access Way would start at that point and extend to the TMT Observatory; it would follow either existing 4-wheel drive roads or the wider roads that currently serve the SMA facility (see Figure 1).

### **BATCH PLANT STAGING AREA**

The Batch Plant Staging Area is a roughly 4-acre area northwest of where the Mauna Kea Access Road forks to form the Loop Road near the summit (see Figure 1). It is just outside the boundaries of the Astronomy Precinct. This area would be used only during construction primarily for storing bulk materials and for a concrete batch plant, as it has been during past construction. At the completion of TMT construction, excess excavated material will be used to partially re-naturalize the batch plant staging area.

### **ELECTRICAL PLANT AND UTILITIES UPGRADES**

The Hawaii Electric Light Company (HELCO) would upgrade the two transformers within its Hale Pōhaku Substation, which is located approximately 2,000 feet southwest of the main headquarters building at Hale Pōhaku and about 1,000 feet from Mauna Kea Access Road.

The new transformers would replace the existing transformers on a one-for-one basis, and the existing fenced compound would not be expanded. In addition to the work within the substation, HELCO plans to re-conductor the existing 12 kV electrical power line from the transformer compound near Hale Pōhaku to the existing utility boxes

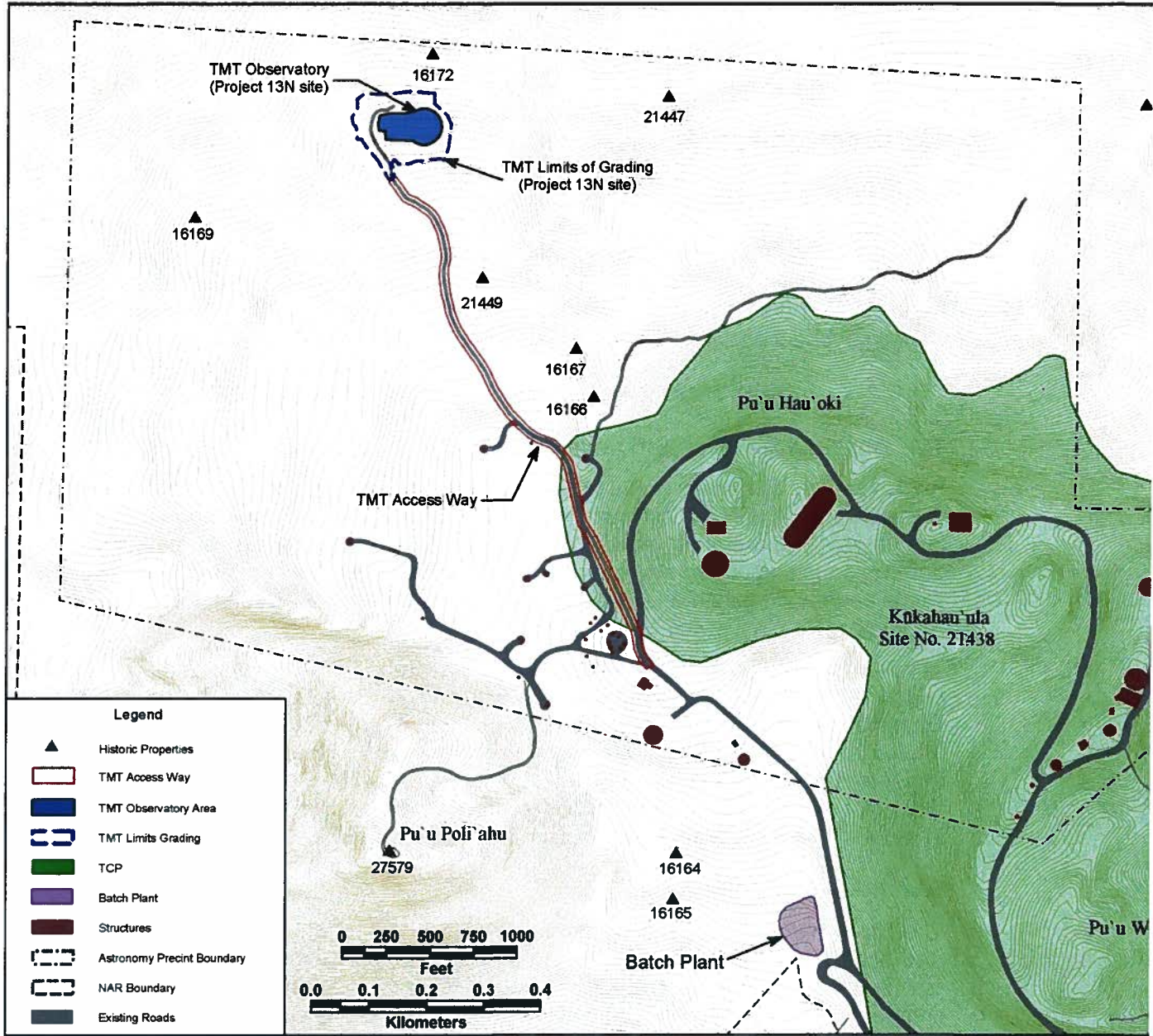


Figure 1. Illustrates the Planned Location of the TMT Observatory and Access Way.

across the road from the SMA building (see Figure 1-8 in the CDUA). The new wires would be pulled through the existing underground conduits. The conduits are located approximately 50 feet west of the Mauna Kea Access Road for most of the distance to the summit area; one portion of the power line alignment follows a former access road alignment that is now within the Mauna Kea Ice Age Natural Area Reserve (Ice Age NAR). HELCO would need to access the pull boxes to install the new cable in the existing conduit. Because the pull boxes are located along the conduit and, in places, the former access road, there would be no new ground disturbance during the cable upgrade process.

## **DESCRIPTION OF KNOWN HISTORIC PROPERTIES IN PROJECT AREA**

### **HISTORIC PROPERTIES IN THE VICINITY OF THE TMT OBSERVATORY SITE AND THE ACCESS WAY**

Figure 1 shows the location of all historic properties in the project area. The site proposed for the TMT Observatory is nearly one-half mile northwest of the TCP named Kūkahau'ula, and the Access Way leading to the observatory would intersect the northwestern edge of the TCP for approximately 800 feet. Kūkahau'ula has been described and referred to as a traditional cultural property (TCP) by the SHPD DLNR.<sup>2</sup>

Kūkahau'ula includes the summit cinder cones (referred to separately as Pu'u Wēkiu, Pu'u Kea, and Pu'u Hau'oki) and covers roughly 463 acres, of which nearly one third is within the Astronomy Precinct. The Kūkahau'ula TCP is associated with the activities of Native Hawaiian deities as identified in numerous legends and oral histories, and plays an important role in ongoing traditional and religious practices carried out by modern-day Native Hawaiians. Kūkahau'ula is a contributing property to the Mauna Kea Summit Region Historic District.

There are several archaeological sites near the location of the proposed Access Way and TMT Observatory. Three historic shrines, first identified during a 1982 survey (McCoy 1982), are in the vicinity:

- SIHP No. -16172 is located about 225 feet north of the proposed TMT Observatory site and consists of a single upright with several support stones.
- SIHP No. -16167 is located approximately 500 feet east of the Access Way and about 1,300 feet southeast of the proposed TMT Observatory site and consists of one, possibly two, uprights placed in a bedrock crack. In 1995, the site was revisited and both stones were found in a vertical position.
- SIHP No. -16166 is approximately 350 feet east of the Access Way and 1,600 feet southeast of the proposed TMT Observatory site and is a multi-feature shrine with a total of eight, possibly nine uprights arranged in two groups. When the site was revisited in 1999 it was noted that several of the uprights had been reset in a vertical position along the edge of the outcrop.

In addition to the shrines, a terrace of unknown function (SIHP No. -21449) was documented in 2005; it is located in Area E approximately 200 feet east of the Access Way and 700 feet south of the proposed TMT Observatory site. This site was excavated

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<sup>2</sup> In conformance with SHPD's practice, Kūkahau'ula is referred to as the Kūkahau'ula TCP.

and determined to be a natural gelifluction terrace (McCoy and Nees 2010) during AIS work in the Astronomy Precinct.

#### **HISTORIC PROPERTIES IN THE VICINITY OF THE BATCH PLANT STAGING AREA**

The Batch Plant Staging Area is adjacent to the southwestern boundary of the Kūkahau'ula TCP, across the Mauna Kea Loop Road. Figure 1 shows the Batch Plant and surrounding historic properties. The Batch Plant Staging Area has undergone considerable ground disturbance over the years due to a series of construction-related activities. No historic properties are known to be present in this area and none has been recorded during previous surveys. The locations of two traditional shrines – SIHP Nos. -16164 and -16165 – were originally recorded in 1982 at some distance from the disturbed area; their locations were verified during the survey for the TMT Project. Both shrines are more than 500 feet west of the Batch Plant Staging Area.

#### **HISTORIC PROPERTIES IN THE VICINITY OF THE HELCO ELECTRICAL UPGRADES**

Figure 2 shows the HELCO Hale Pōhaku substation and surrounding historic properties. In 1985, two lithic scatters were identified in the Hale Pōhaku area and determined to be part of the Pu'u Kalepeamoia Site Complex, which includes two shrines and a stone tool quarry and workshop complex (McCoy 1985). Two workshop areas – designated as SIHP Nos. 50-10-23-10310 and 50-10-23-10311 -- subsequently underwent archaeological data recovery after increased erosion in the site area made preservation of the sites difficult (Hammatt and Shideler 2002). The data recovery field work demonstrated the presence of both lithic workshops and manufacturing areas for octopus lure sinkers. The two shrines (SIHP Nos. 50-10-23-10313 and 50-10-23-10315) are located across the four-wheel drive access road and to the south about 190 feet away from Hale Pōhaku.<sup>3</sup> The sites are over 1,200 feet from the HELCO substation and from the nearest electrical pull box that will be accessed when HELCO upgrades the conductors in the existing conduits. None of the actions required to implement the proposed project would affect these historic properties. Only one known historic site is present near HELCO's Hale Pōhaku Substation, where transformer swaps would occur. SIHP No. 50-10-23-10320 (also part of the Pu'u Kalepeamoia Site Complex) is a lithic scatter that lies about 200 feet west of the existing substation. None of the potential activities in this area would be carried out near this site.

In addition to these archaeological sites, the original buildings of Hale Pōhaku – the “stone cabins” – are historic in age (Walden and Park 2010). Two rest houses date to the 1930s and were constructed by participants in the Civilian Conservation Corps; one comfort station dates to 1950. They are over a thousand feet from the work that would be done within the existing HELCO Hale Pōhaku Substation, and would not be used or otherwise affected by the TMT Project.

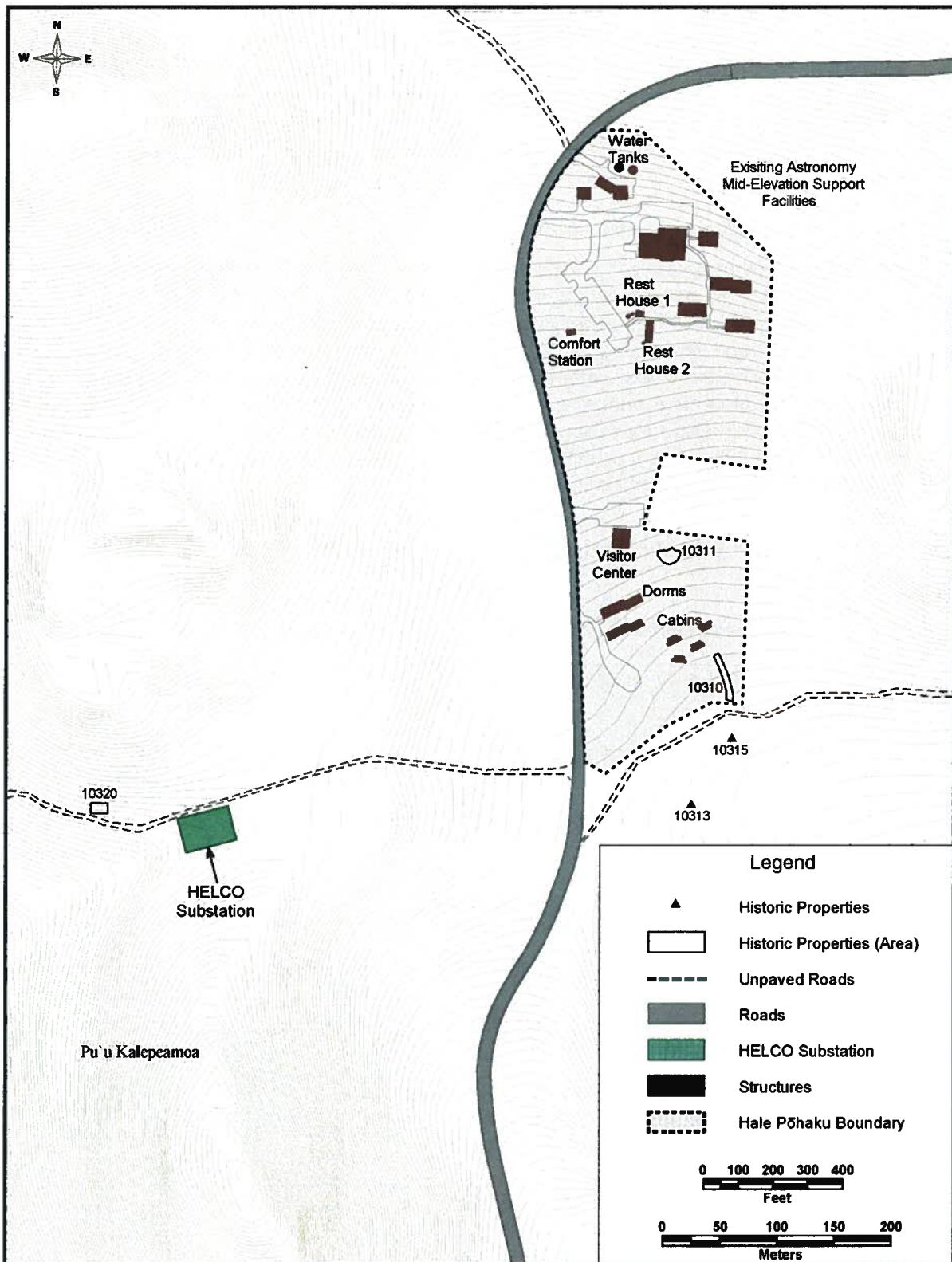
#### **ARCHAEOLOGICAL MONITORING PLAN (AMP) COMPONENTS**

This section describes the components of the AMP that will be prepared and submitted to SHPD for review and approval prior to commencing uses/activities with a potential to impact historic properties on Mauna Kea (Collins et al. 2012).

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<sup>3</sup> Note that the work within Hale Pōhaku itself that was discussed as a possibility in the *Final EIS* for the TMT has been determined to be unnecessary and is not a part of the Conservation District Use Application.





**Figure 2. Historic Properties in the Vicinity of the HELCO Substation.**

### Anticipated Finds

In view of the prior archaeological findings within the MKSR, pre-Contact and/or historic properties that have not been identified in past studies may be present within one or more portions of the project area. Such properties may include the following: isolated artifacts such as adzes or worked stone fragments; archaeological sites such as shrines, workshops, or camp sites; buried archaeological deposits; and buried human skeletal remains.

### Extent of Archaeological Monitoring

A qualified archaeologist will conduct **on-site full time monitoring** of all ground-disturbing activities potentially extending into previously undisturbed ground during construction of the TMT and the Mauna Kea Access Way. Table 1, derived in part from the Conservation District Use Application (CDUA- U.H. Hilo 2010) provides a list of ground disturbing activities, estimated depths of these activities, and whether or not they require archaeological monitoring. It should be noted that archaeological monitoring of excavations that are deeper than 10.0 feet (ft), or 3.0 meters (m) will not be necessary since the probability of encountering subsurface archaeological materials and features at this depth is considered to be minimal.

**Table 1. List of Specific Activities that Require Archaeological Monitoring.**

Ground Disturbing Activity	Estimated Excavation Depths in Meters (m) and Feet (Ft)	Monitoring Necessary?
Drilling exploratory borings at the TMT Observatory site	3.1-50.3 m (10.0-165.0 ft)	Yes
Cutting new access roads for boring locales	0.9-3.1 m (3.1 – 10.0 ft)	Yes
Performing excavation activities and grading at the TMT Observatory site	0.9-10.7 m (3.0 to 35.0 ft)	Yes
Performing fill activities in areas at the TMT Observatory site that require ground disturbing activities before they are filled (beyond where excavation activities took place)	0.9-3.1 m (3.0 – 10.0 ft)	Yes
Performing excavation activities for the Access Way	2.1 m (7.0 ft)	Yes
Excavation of utility trenches along the Access Way	0.8-1.5 m (2.5-5.0 ft)	Yes
Performing fill activities in areas along the Access Way that require ground disturbing activities before they are filled (beyond where excavation activities took place)	0.9-3.1 m (3.0 – 10.0 ft)	Yes
Ground disturbance in areas that have been previously disturbed through construction and/or use (e.g., existing facilities or parking areas)	NA	No
Replacing transformers at existing HELCO facility	NA	No
Replacing conductors in existing conduits	NA	No

The design plans for the TMT project are incorporated in the Archaeological Monitoring Plan (AMP) and provides the locations of areas where ground disturbing activities will be occurring along the Mauna Kea Access Way and within the TMT observatory site. Activities to be monitored include excavation and grading activities, cutting access roads, excavation of utility trenches that are scheduled to occur in previously undisturbed areas, and some fill activities where ground disturbing is expected to occur (see Table 1).

### **Treatment of Cultural Materials**

If any archaeological materials are encountered during the monitoring of ground-disturbing activities, work will be stopped immediately in that area, and the monitoring archaeologist will investigate the nature of the discovery. If an intact cultural layer, living surface, structural components (e.g., foundations), archaeological sub-surface features (e.g., hearths, pits, postholes, etc.), artifacts, charcoal, or midden deposits/trash pits are encountered, then the following actions will be taken:

1. Selected, sorted charcoal samples from discrete fire features will be collected for radiocarbon analysis where appropriate (particularly if the charcoal appears in a prehistoric context).
2. Bulk samples of midden material will be collected, such as shell, bones, etc.
3. All prehistoric artifacts will be collected.
4. All historic artifacts will be collected unless large trash or refuse pits are encountered, in which case only diagnostic samples will be taken, such as bottle and ceramic bases containing maker's marks.
5. Standard documentation will be carried out, including scale maps, profiles, photographs, detailed soil and provenience descriptions, and interpretation.
6. Photographs of excavations will be included in the monitoring report even if no historically significant sites are documented during the monitoring field work.

### **Treatment of Human Remains**

If human remains are identified, work will immediately stop in the area that the archaeologist determines could contain the remains and related materials such as grave goods, and the SHPD/DLNR and the OMKM will be notified immediately of the find. OMKM will immediately notify the Hawaii County Medical Examiner, via the Hawai'i County Police Department, if the discovery of human remains is verified by the monitoring archaeologist. No further work will take place in that locale—including screening of back dirt, cleaning and/or excavation of the burial area, or exploratory work of any kind—unless explicitly requested by the SHPD.

### **Halting of Excavation Activity**

The archaeological monitor has the authority to halt construction in the vicinity of the find, so that the provisions of the AMP can be carried out. The archaeological monitor and the TMT Site Superintendent will make it clear to the construction personnel that the archaeologist is authorized to halt work when it is deemed appropriate.

## **PRE-CONSTRUCTION CONFERENCE**

Before works begins on the project, the on-site archaeological monitor will, with the cultural resource specialist (described below in Section VI), participate in a pre-construction conference. At that conference, the archaeological monitor will explain to the entire construction crew what materials may be encountered and the procedures to follow if archaeological materials are found, as well as the role of the archaeological monitor. At this time the TMT Site Superintendent will make it clear to construction supervisors and all other members of the construction team that the archaeological monitor has the authority to stop work *immediately*, if necessary. Before supervisors, subcontractors, or other construction workers not present at the pre-construction conference are assigned to work on ground disturbing activities, they will meet with/be briefed by the on-site archaeological monitor so that they receive the same guidance as those who were present at the pre-construction conference. Additional steps during the pre-construction phase may also include having a land surveyor flag the limits of ground disturbance prior to the start of work in order to indicate clearly the areas that are off-limits to construction equipment and personnel.

## **LABORATORY WORK**

Artifacts will be cataloged and analyzed, along with any samples of midden materials that were collected. Charcoal and other datable materials will be submitted for dating analysis, provided samples were collected in-situ from prehistoric contexts that show no signs of intermixing with historic materials; e.g., charcoal obtained from distinct fire features in solely pre-contact deposits. In the event human remains are encountered, as noted above, all work will stop in the vicinity until SHPD/DLNR authorizes resumption of activity. SHPD/DLNR, in consultation with the OMKM, the Kahu Kū Mauna, the Office of Hawaiian Affairs, and the Hawai'i Island Burial Council, will determine if it is appropriate to remove and relocate any human remains encountered. If SHPD/DLNR authorizes removal of the human remains, the archaeological monitor will remove and inventory the remains in accordance with Hawaii Administrative Rules 13-300, and the remains will be stored temporarily at the SHPD/DLNR Hawai'i Island office until re-interment plans are finalized.

## **REPORT PREPARATION**

The archaeological monitor will compile daily monitoring logs. These logs will minimally include a description of daily activities, sites or features cleared and recorded, personnel on-site, problems encountered, and corrective action taken. Reports will be filed as appropriate with the SHPD detailing any new sites or features identified within the project area boundaries, if necessary and appropriate.

Following completion of monitoring fieldwork and any required laboratory analyses, a draft archaeological monitoring report will be prepared and submitted to SHPD/DLNR for review. The archaeological monitor will submit a final archaeological monitoring report after receiving any comments on the draft report.

## **COLLECTIONS ARCHIVING**

All burial remains and associated materials will be given to the SHPD/DLNR Hawai'i Island office for curation until re-interment plans are finalized. Non-burial materials will be stored temporarily at OMKM's facilities until an appropriate curation facility is available on Hawai'i Island.

## **CULTURAL MONITORING**

In accordance with the CMP and with the commitments described in the FEIS for the TMT, TMT Observatory Corporation will hire a cultural resource specialist to work in conjunction with the archaeological monitor at all times and in all places or situations where on-site archaeological monitoring is required. Currently, there are no statutory or regulatory mandates for cultural resource specialist or monitors, nor are there any recognized policies or guidelines that set out standards for cultural monitoring. However, preliminary consultations with Kahu Kū Mauna have led to the following basic recommendations for the cultural resource specialist and monitoring during TMT construction work:

- A cultural monitor will be present on-site at all times whenever the archaeological monitor is present.
- Individuals selected to be cultural monitors will have the appropriate background in order to serve as a cultural monitor and as a cultural resource specialist for cultural matters. Such individuals are to serve as mediators among the various stakeholders.
- Cultural monitors will not be affiliated with the archaeological firm that is hired to provide archaeological monitoring support.
- Cultural monitors will participate in any pre-construction briefings with the archaeological monitors.
- Cultural monitors will maintain regular records of attendance and activity on the job site.
- Cultural monitors will provide the Kahu Kū Mauna and OMKM with a report of activities and findings, if any, on a regular basis.

A detailed protocol and plan for cultural monitoring during TMT construction will be developed in consultation with the Kahu Kū Mauna and will be adopted prior to the beginning of work.

## **ADDITIONAL DIRECT MITIGATION MEASURES TO BE TAKEN IN PROJECT AREA**

This section describes the direct mitigation measures that will be taken to lessen the impacts of the project on cultural resources. Direct mitigation measures refer to actions that occur at the location of the project activity that will avoid or minimize effects to cultural resources and that would compensate for any unavoidable effects.

### **DIRECT MITIGATION MEASURES TO BE TAKEN AT THE TMT OBSERVATORY SITE AND ACCESS WAY**

The TMT Observatory project and Access Way have been designed to minimize their potential impacts on cultural resources. The observatory structure is sited in a portion of the Northern Plateau that is more than 200 feet from known historic properties. In addition, the visual effect of the observatory, including its visual impact from areas of cultural importance such as the summit of Kūkahau'ula, has been minimized through design steps such as reducing its size, finishing the support building and fixed structure exterior with a lava color, and finishing the dome with a reflective aluminum-like surface similar to that on the Subaru Observatory. Finally, to avoid the disposal of wastewater in the summit region (the discharge of wastewater within the summit region has been

identified as an impact on cultural resources), the Project will implement a zero discharge wastewater system at the TMT Observatory and will remove all wastewater generated from the mountain for treatment elsewhere in an approved treatment facility.

Minimization measures are proposed for the Access Way that reduce the potential for both physical and visual impacts to the historic properties known to be in the vicinity. The Access Way that TMT has proposed is limited to a single-lane road (from a previous design of two-lanes) and follows an existing single-lane, 4-wheel drive road that was previously disturbed for access and testing of the 13N site in the 1960s. This proposed design omits the retaining wall that was required for the similar "Option 3" route described in the Draft EIS. The portion of the Access Way within the boundaries of Kūkahau'ula will be paved in order to reduce dust. Additionally, the pavement and guardrail will be a reddish color that blends with the surrounding area. Finally, utilities and electrical and communication lines, will be placed beneath the paved roadway instead of on a different or parallel alignment that would cause more ground disturbance, even though this design is not desirable from a utility agency service standpoint.

The Project will meet with OMKM and Kahu Kū Mauna to identify cultural events that would be sensitive to construction noise in the vicinity of the TMT Observatory site. On up to four days per year, to be identified by Kahu Kū Mauna, the Project will endeavor to reduce construction noise and activities in the vicinity of cultural practices. During the operational phase, TMT Observatory operations will be reduced to minimize daytime activities on up to four days in observance of Native Hawaiian cultural practices. TMT will work with OMKM and Kahu Kū Mauna to determine days on which TMT activities will be reduced. While the observatory will be operated during these periods, this measure will involve having only a skeleton crew at the observatory, minimizing vehicle traffic, reducing noise and prohibiting visitors to the TMT Observatory.

TMT will provide initial and then annual or as-needed tours of the TMT Observatory, with the Native Hawaiian community invited at least two weeks prior to the tour. Insofar as practicable, these tours will be scheduled on the days (up to four each year) on which cultural events are scheduled.

The Project will comply with the Decommissioning Plan, a sub plan of the CMP. This provides a detailed methodology for planning the removal of the TMT Observatory and the Access Way exclusively used to access the TMT Observatory at the appropriate time.

Measures proposed for the summit area where the TMT Observatory and Access Way will be located that are designed to mitigate unavoidable effects include funding the restoration of the closed access road on Pu'u Poliahu to its natural state. Existing HELCO pull-boxes and other utility boxes that are visually distracting or intrusive at the summit and other key locations visible from other portions of Kūkahau'ula will be camouflaged by treating them so as to blend into the natural environment to the extent feasible. The method of treatment will be determined through consultation with Kahu Kū Mauna and may include one of the following options: painting the concrete and metal lid to match the surrounding natural colors; or affixing stones and cinders from near the utility box to the concrete using epoxy.

Construction best management practices (BMPs) will also be implemented to avoid potential disturbance of land beyond the planned limits of disturbance. Examples of BMPs that will be implemented include:

- Flagging the limits disturbance prior to the start of work to clearly indicate equipment and personnel should not move beyond those limits.
- Implementing a Materials Storage/Waste Management Plan with specific BMPs such as the use of water-tight trash receptacles that are secured to the ground and have attached lids that are secured to the receptacles.
- Conducting noise-emitting activities during normal work hours to the extent possible.

#### **DIRECT MITIGATION MEASURES TO BE TAKEN IN THE BATCH PLANT STAGING AREA**

A portion of the Batch Plant Staging Area will be restored to a more natural condition upon the completion of its use during TMT construction. The area to be restored will depend on how much excess cut material is available at the end of TMT construction and how much of that material OMKM needs to reserve for its use for maintenance and other projects. Generally the restoration will involve placing available excess material within a portion of the Batch Plant Staging Area to form a more uneven terrain, resembling natural conditions to the degree possible, and producing a surface that cannot be driven over.

As in the case of the Observatory and Access Way, the Project will meet with OMKM and Kahu Kū Mauna to identify cultural events that would be sensitive to construction noise in the vicinity of the Batch Plant Staging Area. On up to four days per year, identified by Kahu Kū Mauna, the Project will endeavor to reduce construction noise and activities in the vicinity of cultural practices.

#### **DIRECT MITIGATION MEASURES TO BE TAKEN IN THE VICINITY OF THE HELCO ELECTRICAL UPGRADES**

Since no ground disturbance is required, and since the only work planned for this area will be the replacement and upgrading of existing electrical components, no direct mitigation measures are needed in this portion of the project area.

#### **INDIRECT MITIGATION**

Several forms of indirect mitigation will be carried out in conjunction with the construction of the TMT project. Most importantly, the Project will implement a Cultural and Natural Resources Training Program that will require all construction managers, contractors, supervisors, construction workers and TMT staff to be trained annually regarding the potential impact to cultural and archaeological resources and the measures to prevent such impact. The content of the training program will be determined by OMKM. Both the archaeological and cultural monitors will have the authority to enforce the tenets of this training. The training program will include but not be limited to the following objectives:

- Impart an understanding of Mauna Kea's cultural landscape, including cultural practices, historic properties, and their vulnerability to damage.
- Provide guidance and information on respectful and sensitive behavior and activities while in the summit region.
- Make clear that any disturbance of a historic property is a violation of Chapter 6E11, HRS, and punishable by fine and/or confiscation of equipment. All other applicable statutes and regulations pertaining to the protection of historic

properties, including isolated artifacts and human burials, will also be explained during such training.

The training program will be updated regularly to incorporate any changes made by OMKM in any portion of the UH Management Area. All people involved in TMT Observatory operations and maintenance activities, including but not limited to scientists and support staff, will receive the training on an annual basis.

The TMT Observatory Corporation will fund a Community Benefits Package (CBP) of \$1 million per year, to be administered via The Hawai'i Island New Knowledge (THINK) Fund Board of Advisors. THINK Fund purposes could include scholarships and mini-grants, educational programs, college awards, educational programs specific to: Hawaiian Culture, astronomy, math, and science, and community outreach activities.

TMT will support, through financial contributions and utilization of its outreach office, the following measures related to cultural resources:

- Hosting an annual cultural event or training. Examples of how this measure will be implemented include activities such as a star-gazing program at the annual Makahiki festival, workshops on stone adze-making, and workshops on how to recognize archaeological sites and to determine their importance.
- The translation of chants and mele and the use of their teachings; the focus will include both (a) translation, and (b) developing programs that can be used in schools to spread what is learned about Hawaiian science and genealogy.
- The translation of modern astronomy lessons into Hawaiian language for use at Hawaiian language charter schools.
- Development of exhibits regarding cultural, natural, and historic resources in coordination with OMKM and 'Imiloa that could be used at the VIS, 'Imiloa, TMT facilities, or other appropriate locations. Exhibits will include informational materials that explore the connection between Hawaiian culture and astronomy. TMT will have an open door policy so that TMT's outreach management can be contacted by the Native Hawaiian community to discuss various issues.

TMT will request permission to attend meetings of the Kahu Kū Mauna council upon a quarterly basis. A TMT representative will be available on an ongoing basis to review cultural impact issues, should there be any related to the Project. By attending the meetings the TMT representative would become aware of other cultural resource issues on the mountain and then implement any necessary changes in TMT policies to address potential similar issues at the TMT Observatory.

The TMT Observatory will be furnished with items to provide a sense of place and encourage and remind personnel and visitors of the cultural sensitivity and spiritual quality of Maunakea. This will be done to serve as a constant reminder of the lessons learned during the required annual cultural training to respect, honor, and not restrict or interfere with cultural or religious practices.

TMT will implement a Ride-Sharing Program to reduce the number of vehicle trips between Hale Pōhaku and the TMT Observatory. This step could further reduce the Project's impact to the spiritual and sacred quality of Mauna Kea by reducing dust, transient noise, and general movements in the summit region.



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