



EXECUTIVE CHAMBERS
HONOLULU

LINDA LINGLE
GOVERNOR

May 19, 2010

Dr. Rose Tseng, Chancellor
University of Hawai'i at Hilo
Office of the Chancellor
200 W. Kawili Street
Hilo, Hawai'i 96720-4091

Dear Chancellor Tseng:

With this letter, I hereby accept the Final Environmental Impact Statement for the Thirty Meter Telescope Observatory on Mauna Kea, Island of Hawai'i, as satisfactory fulfillment of the requirements of Chapter 343, Hawai'i Revised Statutes. The economic, social, and environmental impacts which will likely occur should this project be built, are adequately described in the statement. The analysis, together with the comments made by reviewers, provides useful information to policy makers and the public.

My acceptance of the statement is an affirmation of the adequacy of that statement under the applicable laws. I find that the mitigation measures proposed in the environmental impact statement will minimize the negative impacts of the project.

In implementing this project, I direct the University of Hawai'i at Hilo and/or its agent to perform these or comparable mitigation measures at the discretion of the permitting agencies. The mitigation measures identified in the environmental impact statement are listed in the attached document.

Sincerely,


LINDA LINGLE

Attachment

c: Office of Environmental Quality Control

**ATTACHMENT TO THE ACCEPTANCE LETTER OF THE GOVERNOR
TO THE CHANCELLOR, UNIVERSITY OF HAWAI'I AT HILO
REGARDING MITIGATION MEASURES IN THE FINAL ENVIRONMENTAL
IMPACT STATEMENT FOR THE THIRTY METER TELESCOPE OBSERVATORY
ON MAUNA KEA, ISLAND OF HAWAI'I**

The following list of mitigation measures identified in the final environmental impact statement for the Thirty Meter Telescope (TMT) Observatory will minimize the negative impacts of the project. The Chancellor of the University of Hawai'i at Hilo is directed to comply with these or alternative and equally effective mitigation measures at the discretion of the permitting agencies when implementing the Thirty Meter Telescope Observatory Project.

CULTURAL RESOURCES, PRACTICES AND BELIEFS

- As described in Section 3.2.3, of the Final EIS, the Project will implement a Cultural and Natural Resources Training Program that will include training TMT employees to respect and honor cultural and religious practices and practitioners and ways to reduce impact on the cultural resources of the mountain. The training will also include imparting an understanding of the Polynesian perspectives in astronomy and way-finding.
- As outlined in Section 3.1.5, of the Final EIS, an Archaeological Monitoring Plan will be developed in accordance with Section 13-279, Hawai'i Administrative Rules, and cultural and archaeological monitors will be present at construction sites on Mauna Kea and have authority to stop work if cultural finds are made, including historic properties. These monitors will also inform workers of the possibility of inadvertent cultural finds, including human remains.
- A Mitigation Plan will be developed and implemented meeting the requirements of Section 13-284-8(a)(2), Hawai'i Administrative Rules. This Mitigation Plan will be developed in consultation with native Hawaiian organizations, including the Office of Hawaiian Affairs, to seek their views on the proposed forms of mitigation.
- Reduce TMT Observatory operations to minimize daytime activities on up to four days in observance of Native Hawaiian cultural practices. TMT will work with the Office of Mauna Kea Management and Kahu Ku Mauna to determine days for such observances. While the observatory will be operated during these periods, this measure will involve having only a skeleton crew at the observatory, no vehicles will be visible, noise will be reduced, and no visitors will be allowed.
- The Access Way has been designed to reduce the impact to cultural resources by including the steep slopes of Option 2 and modifying Option 3 to a single lane configuration, even though these designs are not desirable from an observatory operation standpoint.
- To mitigate the Access Way's effect on Kukahau'ula, the Access Way pavement will incorporate coloring to blend with the surroundings. In addition, should Access Way Options 2A or 3B be selected, the retaining wall

or embankment facing will be treated to blend with the natural environment to the extent feasible.

- TMT will support, through financial contributions and the utilization of its outreach staff, the translation of chants and mele and the use of their teaching; the focus will include both (a) translation, and (b) the development of programs that can be used in schools to teach Hawaiian science and genealogy.
- Through its outreach office and in coordination with the Office of Mauna Kea Management and 'Imiloa, support the development of exhibits regarding cultural, natural, and historic resources that could be used at the Visitor Information Station, 'Imiloa, TMT facilities, or other appropriate locations. Exhibits will include informational materials that explore the connection between Hawaiian culture and astronomy.
- Contribute to the funding of translating modern astronomy lessons into Hawaiian language for use at Hawaiian language charter schools. This measure was partially developed based on input from participants in the Cultural Impact Assessment for the Project.
- Have an open door policy to enable TMT's outreach management contact by the Native Hawaiian community.
- Conduct annual or as-needed tours of the TMT Observatory to be provided to the Native Hawaiian community.
- TMT quarterly attendance of the Kahu Ku Mauna Council meetings. A TMT representative will be available to review cultural impact issues, should there be any, related to the Project.
- The TMT Observatory, potential TMT Mid-Level Facility, and Headquarters will be furnished with décor, displays and items to provide a sense of place to remind personnel of the cultural sensitivity and spiritual quality of Mauna Kea.
- As detailed in Section 3.11.4, of the Final EIS, TMT will implement a Ride-Sharing Program to reduce the number of vehicle trips between Hale Pohaku and the TMT Observatory and reduce the Project's impact to the spiritual and sacred quality of Mauna Kea by limiting dust, transient noise, and general movements in the summit region.
- TMT's outreach efforts (two full-time staff) will work with 'Imiloa and Native Hawaiian groups to support/fund programs specific to Hawaiian culture and archaeological resources.
- As suggested in the cultural impact assessment for the mauka expansion of University Park, special care will be taken to preserve as much of the natural landscape consisting of 'ohi'a lehua and neneleau at the Headquarters site as possible.
- The Community Benefits Package will be administered by The Hawai'i Island New Knowledge (THINK) Fund Board of Advisors. As discussed in Section 3.9.4, of the Final EIS, it is envisioned that THINK Fund purposes could include grants, scholarships, programs, internships, and summer jobs for students at Hawaiian charter schools.
- In addition to those long-term and ongoing measures, the Project will continue to consult with State Historic Preservation Division and Kahu Ku Mauna Council to assess the modern shrine in the vicinity of the TMT Observatory site and determine appropriate protocols for its relocation. The Project will also

- perform archaeological data recovery for the shrine.
- Mitigation measures related to construction are discussed in Section 3.15, of the Final EIS, and include actions such as cultural and archaeological monitoring.

ARCHAEOLOGICAL/HISTORIC RESOURCES

In compliance with the Comprehensive Management Plan (CMP) and to mitigate potential effects on cultural practices and Historic Properties, among other things, a Cultural and Natural Resources Training Program will be developed and implemented. The Cultural and Natural Resources Training Program will include educational instruction and materials designed to: impart an understanding of Mauna Kea's cultural landscape, including cultural practices, historic properties and their sensitivity to damage, and the rules and regulations regarding the protection of historic properties; make it clear that any disturbance of an historic property is a violation of Chapter 6E-11, Hawai'i Revised Statutes and provide guidance and information as to what constitutes respectful and sensitive behavior while in the summit area. The training program will incorporate University of Hawai'i Management Area-wide updates by the Office of Mauna Kea Management. All persons involved in TMT Observatory operation and maintenance activities, including but not limited to scientists and support staff, will receive the training on an annual basis.

To mitigate the TMT Observatory's visual impact within the Historic District the following will be undertaken: The TMT Observatory has selection of the 13N site within Area E, which, as selected in the 2000 Master Plan details, to minimize the Project's visual effect; and, reduction of the TMT Observatory's visual impact as described in Section 3.5.3 and 3.5.4 of the Final EIS. Steps include design effects to reduce its size, finish the support building and fixed structure exterior with a lava color, and finish the dome with a reflective finish similar to the Subaru Observatory.

To mitigate the Access Way's effect on Kukahau'ula and the Historic District, the following will be undertaken: Reduce disturbance by including the steep slopes of Option 2 and modifying Option 3 to a single lane configuration. The Access Way Options will have pavement with a reddish color to blend with the surroundings (it will be paved for a length of approximately 750 feet, of which roughly 600 feet are within the Kukahau'ula Historic Property. In addition, should Access Way Options 2A or 3B be selected, the retaining wall or embankment facing will be treated so as to blend into the natural environment to the extent feasible.

To mitigate the generation of wastewater in the summit region. The Project will implement a zero discharge wastewater system and remove all wastewater from the mountain for treatment, as detailed in Section 3.7 of the Final EIS.

To mitigate against accidental release of a hazardous substance, the Project will comply with applicable rules, regulations, and requirements, and adopt measures to reduce the potential for accidental spills of hazardous substances and the potential impact as detailed in Section 3.8 of the Final EIS.

To mitigate effects related to noise and dust, the Project will implement a Ride-Sharing Program to reduce the number of vehicle trips between Hale Pohaku and the TMT Observatory, which is discussed in Section 3.11.4 of the Final EIS. Additional control measures discussed in Sections 3.13 and 3.14 will also be implemented.

To mitigate the presence of the TMT Observatory during cultural events that take place within the Historic District. TMT Observatory daytime operations will be reduced to minimize activities to allow observance of Native Hawaiian cultural practices. TMT will work with the Office of Mauna Kea Management and Kahu Ku Mauna to determine days for such observances. During these periods, the observatory will operate with only a skeleton crew, vehicles will not be visible, noise will be reduced, and no visitors will be allowed.

To mitigate the general development of TMT Observatory, the following additional mitigation measures will be implemented: the Project will work with the Office of Mauna Kea Management and Imiloa to develop exhibits for the Visitor Information Station and Imiloa regarding cultural and archaeological resources; and, TMT's outreach efforts (two full time staff) will work with Imiloa and Native Hawaiian groups to support/fund programs specific to Hawaiian culture and archaeological resources.

The modern shrine at 13N site is not categorized as a Historic Property. Notwithstanding this fact, the Project will continue consultation with the State Historic Preservation Division and Kahu Ku Mauna Council to establish appropriate protocols to integrate it within the Comprehensive Management Plan Action CR-9. The Project will perform archaeological data recovery for the two find spots – the modern shrine and the site that initially appeared to be a temporary habitation.

BIOLOGIC RESOURCES

The Project will comply with existing regulations and requirements, which will mitigate many of the potential impacts as discussed above. The Project's policies to comply with applicable rules and regulations will include the following Comprehensive Management Plan Management Actions:

- **Management Action NR-6: Implementation of a Cultural and Natural Resources Training Program.** This program, detailed in Section 3.4.3 of the Final EIS, will require that TMT personnel receive an annual orientation regarding natural resources.
- **Management Action NR-2: Implementation of an Invasive Species Prevention and Control Program.** This program, detailed in Section 3.4.3 of the Final EIS, will outline steps to be taken to avoid the potential impacts associate with invasive species.
- **Management Action FLU-6: The Access Way** has been designed to limit disturbance and displacement of sensitive habitat and will be paved where adjacent to sensitive habitat to reduce dust-related impacts. Construction-phase measures will be implemented to reduce impacts to sensitive habitat

(Section 3.15 of the Final EIS), and arthropods will be monitored in the area of the Access Way prior to, during, and for two years after construction on the alpine cinder cone habitat.

Mitigation measures that complement the Comprehensive Management Plan and other applicable requirements related to biological resources include the following:

- Undertake the Access Way Options to reduce the impact to Wekiu bug habitat by including the steep slopes of Option 2 and modifying Option 3 to a single lane configuration, even though these designs are not desirable from an observatory option standpoint.
- Work with the Office of Mauna Kea Management and Imiloa to develop exhibits for the Visitor Information Station and Imiloa regarding natural resources.
- TMT will plant two new mamane trees for each mamane tree directly impacted (i.e., removed or pruned to reduce canopy by more than half) by possible Project activities at the potential TMT Mid-Level Facility. This effort, if necessary, will include monitoring and care for new plantings for a period of two years to ensure the new trees become established.
- TMT will implement a Ride-Sharing Program, described in Section 3.11.4 of the Final EIS. This program will reduce the number of vehicle trips a day to the summit, including pickup and deliveries to about nine trips. Dust generated along the unpaved section of the Mauna Kea Access Road and the Access Way will be reduced relative to the number of trips reduced by the program.

VISUAL AND AESTHETIC RESOURCES

The location of the TMT Observatory is the primary mitigation for the Project's potential visual impact. Because the location proposed for the TMT Observatory is north of and below the summit of Mauna Kea it will be substantially less visible than if it were to be placed in a more visible location, such as the summit ridge or pu'u.

The visual impacts of the TMT Observatory, which will house a telescope with a primary mirror ninety-eight feet in diameter, are also due to the size of the dome enclosure. The diameter of the dome is 216 feet. Because the center of the dome will be placed only thirty-six feet above grade, the observatory will have a height of approximately one-hundred and eighty feet above grade level. While this will be the tallest observatory on Mauna Kea, it has been designed to minimize the height of the structure. The telescope itself has been designed to be much shorter with a focal ratio of f/1.0, to allow for the smallest dome possible. The enclosure has been designed to fit very tightly around the telescope, leaving twenty-inches, between the telescope and the enclosure (see, Figure 3.25 in the Final EIS). For comparison purposes, the Keck Observatory consists of two telescopes each with mirrors thirty-three feet in diameter with a focal ratio of f/1.75; the diameter of each Keck dome is 121 feet; the height of the Keck dome and other observatories on Mauna Kea is listed in Table 3-6 of the Final EIS.

The color, or coating of the dome enclosure has substantial visual implications. The coating of the dome enclosure will be an aluminum-like coating, similar to that used on the Subaru Observatory. In general, an aluminum-like coating reflects the morning sunrise and evening sunset light and stands out during this period, however, during most of the day the coating reflects the sky, and reduces the visibility of the observatory.

The support building attached to the observatory dome has been reduced in size since the Draft EIS. This reduces its visibility and the design continues to incorporate items to reduce its visibility from Kukahau'ula, the summit cinder cone complex that is a State Historic Property. The building will be lava-colored and the parking areas will not be visible from Kukahau'ula, except the visitor parking area.

The Access Way incorporates design components to mitigate its visual impact. These measures include coloring the pavement a reddish color pavement to better blend with the surroundings, using a wire type guardrail to reduce its visibility, and should Access Way Options 2A or 3B be selected, the retaining wall or embankment facing will be treated so as to blend into the natural environment to the extent feasible.

GEOLOGY, SOILS, AND SLOPE STABILITY

Through compliance with existing regulations and requirements, Project impacts on geologic resources, soils, and slope stability will be less than significant and no additional mitigation is required. The Project's design features to comply with applicable rules and regulations will include:

- Grading in compliance with applicable standards; and,
- The Project will comply with applicable seismic safety regulations and standards in the design of structures to meet applicable codes to ensure life and safety of personnel and visitors.

In addition to these compliance measures, the Project will implement the following mitigation measures:

- Interpretive signage will be placed along the Access Way identifying these noteworthy examples of glacial features to enhance public interpretation/education efforts. The number and placement of signs will be determined through consultation and coordination with the Office of Mauna Kea Management. Installation of interpretive signs is consistent with the Comprehensive Management Plan Management Action EO-4, which calls for improvements to interpretive, safety and regulatory signage through the University of Hawai'i management areas.
- The Project will work with the Office of Mauna Kea Management and Imiloa to develop exhibits that reflect the nationally-recognized natural resources of the Mauna Kea Science Reserve, which is within the Mauna Kea National Natural Landmark. These exhibits will be utilized by the Visitor Information Station and Imiloa, as appropriate.

- The design of the Observatory will incorporate techniques to minimize the seismic risk of potential damage to the telescope and associated equipment. With these measures, the likelihood of damage will be lessened.

WATER RESOURCES AND WASTEWATER

Through compliance with existing regulations and requirements, Project impacts on water resources will be less than significant and no additional mitigation is required. The Project's design features and policies to comply with applicable rules and regulations will include:

- The use of Stormwater dry wells and grading to maximize groundwater recharge;
- The installation of water efficient fixtures and the implementation of water saving practices to reduce the demand for freshwater resources;
- In compliance with Comprehensive Management Plan Management Action FLU-7, a zero-discharge waste system will be installed at the TMT Observatory so there will be no discharge of any wastewater at the summit;
- Facility engineering measures to provide proper chemical and fuel storage enclosures to protect against the release of chemicals or fuel to the environment, including double-walled piping and tanks for fuel and mirror washing wastewater; and,
- The development and implementation of a Spill Prevention and Response Plan that will outline measures to appropriately use and store chemicals and require inspections to ensure that systems are working properly and any necessary maintenance measures are taken.

In addition to these compliance measures, the Project will include in its Waste Minimization Plan (described in Section 3.8.3 of the Final EIS), an annual audit of water use by the Project with an evaluation of measures that could be implemented to reduce Project water use. The annual audit will be submitted to the Office of Mauna Kea Management.

SOLID AND HAZARDOUS WASTER AND MATERIAL MANAGEMENT

Implementation of the design and engineering features, techniques, and management procedures to comply with existing regulations and requirements will ensure that Project impact will be less than significant, and no additional mitigation is required. The Project's design features and policies to comply with applicable rules and regulations include:

- Collecting all solid waste in secured and covered storage containers and trucking these containers down the mountain for proper disposal at an off-site disposal facility.
- Instituting a Waste Management Plan, that will include an annual audit to identify waste produced by the Project and how that waste could be reduced, reused, or recycled. Implementation of waste minimization practices during

design has eliminated the use of mercury Project-wide, and the use of acetone and methyl ethyl ketone at the TMT Observatory.

- Storing a minimal amount of hazardous materials on site.
- Implementation of a Materials Storage/Waste Management Plan and component Spill Prevention and Response Plan.
- Recycling sold and non-hazardous waste material and reusing such materials to the extent possible.
- Designs that include specialized space and contained system to collect chemical waste from the mirror stripping, coating, and washing area floor drain and laboratory.
- Leak detection systems and daily inspection of equipment handling hazardous materials.
- Mandatory training of all personnel handling hazardous materials and waste.
- Regular inspections by a Safety and Health Officer.

SOCIOECONOMIC CONDITIONS AND PUBLIC SERVICES AND FACILITIES

Mitigation measures that include a Community Benefits Package and Workforce Pipeline Program. These socioeconomic mitigation measures will ensure that as many local people as possible are trained and equipped to fill TMT jobs at most levels.

- **Community Benefits Package:** The Community Benefits Package will be funded by the TMT Observatory Corporation and will be administered via The Hawai'i Island New Knowledge (THINK) Fund Board of Advisors. The THINK Fund Board of Advisors will consist of local Hawai'i Island community representatives. The Community Benefits Package funding will commence upon the start of the Project construction and continue throughout the TMT Observatory's presence. As a part of the Community Benefits Package, the TMT Observatory Corporation will provide \$1 million annually during such period to the THINK Fund; the dollar amount will be adjusted annually using an appropriate inflation index (the baseline from when inflation index will be applied will be the date of the start of construction). THINK Fund support will include:
 - Scholarships and mini-grants
 - Education programs
 - College awards
 - Educational programs specific to Hawaiian culture
 - Educational programs specific to astronomy
 - Educational programs specific to mathematics and science, and
 - Community outreach
 - Educational initiatives will focus on K-5, 6-8, 9-12, and college. The program could include support for students to visit Imloa, TMT and other observatories.
- **Workforce Pipeline Program (WPP):** TMT will work with the University of

Hawai'i at Hilo, Hawai'i Community College and the Department of Education to help develop, implement, and sustain a comprehensive, results-oriented WPP that will lead to a highly qualified pool of local workers who could be considered for hiring into most job classes and salary levels. Special emphasis will be given to those programs aimed at preparing local residents for science, engineering, and technical positions commanding higher wages. Therefore, there will be a significant component in the WPP for higher education on the Island of Hawai'i.

- TMT will continue to work with organizations such as the University of Hawai'i at Hilo, including its science, technology, engineering and mathematics (STEM) programs; Hawai'i Community College workforce programs that train, retrain, and place trainees in jobs; current observatories; the Department of Education; and charter schools. A dedicated TMT WPP manager will coordinate the program.
- In addition, TMT will participate in a County of Hawai'i Workforce Investment Board initiative with the Mauna Kea Observatories to explore opportunities for marshaling existing community resources to introduce focused programs within the Hawai'i Island community to provide the observatories with a broader and stronger qualified local labor pool, as candidates for careers in the local astronomy enterprise. Key elements of the planned pipeline program include:
 - Initiation of a TMT workforce committee including members from the University of Hawai'i at Hilo, Hawai'i Community College, the Department of Education, and Hawai'i Island workforce development groups.
 - Identification of specific TMT job requirements that the University of Hawai'i at Hilo, Hawai'i Community College, and the Department of Education can use to create education and training programs, and ongoing support for the identified programs.
 - TMT earmark of funds in its annual operations budget which can be used to support workforce development programs at suitable educational institutions.
 - TMT support of the development and implementation of education and training programs, including at least four internships per semester, apprenticeships, and at least ten summer jobs for students.
 - Creation of a partnership between the University of Hawai'i at Hilo and TMT partner organizations, such as Caltech, the University of California system, and Canadian universities to attract and develop top talent. This will include internships, degree programs, and student exchanges.
 - Support of, and active participation in, on-going efforts to strengthen science, technology, engineering and mathematics (STEM) education in Hawai'i Island K-12 schools and informal learning organizations. Examples include the Science and Engineering Fair, FIRST robotics competitions, and Imiloa Astronomy Center of Hawai'i.
 - The program will be focused on long term investments to strengthen the current STEM skills infrastructure, programs, and curricula at the

University of Hawai'i at Hilo, Hawai'i Community College, and Big Island K-12 education organizations, especially those serving lower income and first-generation college attending populations in the development or support of astronomy, other sciences, and engineering education at the University of Hawai'i at Hilo, as well as programs at Hawai'i Community College to provide well-qualified mechanical and electrical technicians. The scope of these investments will include strengthening language and cultural programs and their integration with science and engineering to broaden the appeal of STEM disciplines to Hawai'i Island college students while earning and retaining community support.

- The project will start the WPP during the early construction phase so that local youth have the qualifications and could be considered for hiring into most job classes and salary levels with the Project the operational phase begins.

In addition to the Community Benefits Package and Workforce Pipeline Program effort discussed above, the following measures will be implemented by the Project to ensure that the economic benefit potential for the community and the State is realized.

- To the greatest extent possible, employment opportunities will be filled by local residents. This will include first advertising available positions locally. Positions which require a worldwide search, will be advertised simultaneously locally and nationally/internationally.
- Three full-time positions will be established for community outreach to perform WPP and general outreach activities. General outreach activities will include scientific and technical outreach to the local community and educational institutions to further the Project objectives to develop general science and technology education and allied employment opportunities. Activity will include working with the Office of Mauna Kea Management and Imiloa to develop educational, interpretive, exhibits and programs, including informational materials that explore the connection between Hawaiian culture and astronomy.
- Support of the active participation of on-going effort to strengthen science, technology, engineering, and mathematics (STEM) education in Hawai'i Island K-12 schools and informal learning organizations. Examples include the Science and Engineering Fair, FIRST robotics competitions, and Imiloa Astronomy Center of Hawai'i.
- A mentoring program for children to provide support for those interested in astronomy, technology, engineering, and mathematics during the entire elementary school-to-university graduate school educational path, with an ultimate goal of strengthening STEM skills throughout Hawai'i Island.

Prior to completion of the Chapter 343, Hawai'i Revised Statutes, Environmental Impact Statement process, the Project has been involved in a number of outreach

activities. Activities have included contributing to the following:

- Akamai intern program in 2009;
- Waiakea High School Robotics program in 2009;
- IfA Elementary School robotics program in 2009;
- Journey to the Universe program in 2009;
- Journey to the Universe program in 2010;
- Kona teachers' workshop in 2009;
- DOE mentoring program workshop;
- Imiloa outreach activities; and,
- Intern employment.
- Outreach activities should continue to include elements such as those listed above.

LAND USE PLANS, POLICIES, AND CONTROLS

The Project will comply with existing regulations and requirements, that will reduce potential impacts (as discussed in Section 3.10 of the Final EIS). Compliance with regulations and requirements will require that TMT develop and implement the various plans and programs outlined in this EIS, dealing with Cultural and Natural Resources Training Program, Invasive Species Prevention Plan, Waste Minimization Plan and component annual energy audit, a Materials Storage/Waste Management Plan and component Spill Prevention and Response Plan, and Ride-Sharing Program.

The terms of the sublease between UH and the TMT Observatory Corporation, other than observing time and payment of common costs, are considered a mitigation measure. The annual sublease rent, deposited into the Mauna Kea lands management special fund and used for the purposes set forth in Section 304A-2170, Hawai'i Revised Statutes, is considered a mitigation measure. According to Section 304A-2170, Hawai'i Revised Statutes, these funds could be used to: manage Mauna Kea lands within the University of Hawai'i Management Area, including maintenance, administrative expenses, salaries and benefits of employees, contractor services, supplies, security, equipment, janitorial services, insurance, utilities, and other operational expenses; and, enforcing administrative rules adopted relating to the University of Hawai'i Management Area of Mauna Kea, the Office of Mauna Kea Management and its implementation of the Comprehensive Management Plan.

An approximately seven-hundred and fifty foot long portion of the Access Way will be paved to mitigate the potential impact to the Submillimeter Array observatory due to dust from vehicles traveling on the Access Way near the core of the Submillimeter Array observatory. The paved section will extend from the current end of pavement near the Submillimeter Array observatory building to a location north of the Submillimeter Array core. The Project may also coordinate the replacement and remodeling of the Keck construction domes and Subaru construction cabin facilities with those currently using them, arranging with the Office of Mauna Kea Management and the Mauna Kea Observatories Support Services, to address (a) continued access to similar office, storage and presentation spaces during TMT

construction either in the potential TMT Mid-Level Facility or elsewhere at Hale Pohaku; and (b) the possible future reuse of the potential TMT Mid-Level Facility for the needed space and uses following TMT construction.

ROADWAYS AND TRAFFIC

The Project will institute a Ride-Sharing Program for the TMT Observatory as well as the Headquarters employees. The program will be mandatory for TMT Observatory employees to travel beyond Hale Pohaku, and will support ride sharing for Headquarters employees.

TMT Observatory personnel will meet at various locations around the island and travel to the summit in observatory vehicles. The locations will include the Headquarters and/or park-and-ride lots. There will be an average of five vehicles for the day shift and two for the night shift, with five persons per vehicle. With the implementation of the Ride-Sharing Program for employees plus other trips (such as deliveries), it is estimated that there will be an average of nine trips to the TMT Observatory daily, an eleven percent increase over the existing number of trips beyond Hale Pohaku.

TMT will also consider off-peak work hours for Headquarters personnel, if warranted, at the time of completion of the facilities.

POWER AND COMMUNICATIONS

A component of the Waste Minimization Plan outlined in Section 3.8.3 of the Final EIS will be an annual audit of energy use by the Project. The audit will include examining methods available to reduce energy use and maximizing energy efficiency in the design of TMT's facilities. Appropriate energy saving designs will be employed into all aspects of the buildings and facility design including: high R-rated insulation panels, radiant exterior barriers, high performance window glazing, and air filtration sealing.

Energy saving devices will be incorporated into Project facilities. Plans include: solar hot water systems, photovoltaic power systems, energy efficient light fixtures controlled by occupancy sensors, efficient Energy Star rated electrical appliances at all facilities, and design with local knowledge to maximize the use of natural ventilation and lighting at the Headquarters.

NOISE

The Project operations are not expected to cause a significant noise impact, and no mitigation measures beyond compliance with applicable regulations, requirements, and standards, are required. Nevertheless, the Project will implement the following mitigation measures:

Heating, Ventilation and Air Conditioning (HVAC) equipment will be placed indoors

to reduce the noise associated with HVAC equipment motors, evaporators, and condensers will be significantly reduced. The noise levels will be lower than those indicated in Table 3-17 and Table 3-18 of the Final EIS. The radius of the area exposed to noise levels greater than the Class A Standard will also be reduced.

The exhaust of the HVAC equipment will be directed through a tunnel duct that exits on the northwest side of the graded area, which faces away from noise sensitive areas. Measures along the route of the airflow will also be used to reduce the noise discharging outside of the TMT Observatory; measures will include acoustical louvers, tunnel duct wall treatments, and duct silencers.

Other openings between the interior of the observatory and outdoors, such as air intake locations, will be furnished with measures to reduce noise discharging outside of the observatory, such as acoustical louvers.

CLIMATE, METEOROLOGY, AIR QUALITY, AND LIGHTING

The TMT vehicles will be selected based on balancing the needs for fuel efficiency, low emissions, and safety for transportation to the summit. An average of five vehicles will be used for day-time trips and two for night-time trips. This required ride sharing will reduce the total number of Project trips beyond Hale Pohaku to the summit area to approximately nine trips per day (seven staff trips and two other trips such as deliveries), and will further reduce the potential impact of the Project on air quality.

The TMT Observatory will also coordinate the use of its Adaptive Optics laser guide stars with the other observatories on Mauna Kea using the existing Laser Traffic Control software system to minimize the interference between the various guide star systems in use, as well as their impact on other astronomical observations.

CONSTRUCTION AND DECOMMISSIONING

Mitigation measures during construction and decommissioning will be similar. Unless specifically called out, the decommissioning mitigation measures will be similar enough to the construction mitigation measures that they do not warrant separate discussion.

In compliance with the Comprehensive Management Plan Management Action FLU-3 and in order to aid in the eventual restoration of the area, the TMT Observatory site will be documented prior to the start of construction. This will be accomplished with high-resolution surface and aerial photography to document existing natural conditions.

The Project will comply with the requirements of the National Pollutant Discharge Elimination System (NPDES) under the federal Clean Water Act, such as the site-specific Best Management Practices (BMP) plan related to storm water and non-storm water as outlined on page 397 of the Final EIS.

Additional Disturbance and Encroachment: In addition to the NPDES BMP Plan that will require flagging of the planned limits of disturbance, the location of nearby property boundaries will be surveyed to ensure that the limits of disturbance do not encroach on neighboring parcels. This will be done at the Batch Plant Staging Area to prevent encroachment on the Ice Age Natural Area Reserve (NAR), at the potential TMT Mid-Level Facility area, if constructed, and at the Headquarters construction site.

Noise: The Project will meet with the Office of Mauna Kea Management and Kahu Ku Mauna to identify cultural events that would be sensitive to construction noise in the vicinity of the TMT Observatory site and the Batch Plant Staging Area. On up to four days identified by Kahu Ku Mauna, the Project will endeavor to reduce construction noise and activities in the vicinity of cultural practices. In addition, a connection to HELCO-supplied power will be sought early in the construction process to reduce the need to operate generators.

The program will require that construction workers use a ride sharing program with designated contractor vehicles to travel beyond Hale Pohaku. This measure is designed to limit traffic on the Mauna Kea Access Road and limit the potential introduction of invasive species. With an average construction crew of fifty to sixty persons, it is estimated that nine or ten vehicles will be required to transport the crew on a daily basis.

Roadways: Due to the expected increase of heavy traffic during construction there is a chance for more rapid deterioration of the unpaved portions of the Mauna Kea Access Road surface; TMT will arrange for the more frequent grading of the unpaved roadway.

Fire Prevention: The Project will develop and implement a Fire Prevention and Response Plan in coordination with the Office of Mauna Kea Management and outline steps to be taken during construction activities to decrease the chance of fire at Hale Pohaku, and threat to cultural and natural resources in the surrounding mamane dry forest. Elements of the plan will include:

- Welding and grinding within the Hale Pohaku Staging Area will be restricted to designated areas at least twenty feet from any combustible materials, including dry grass, and will not be performed during periods of high wind that could blow sparks beyond this twenty foot buffer. Barriers be used to isolate welding and grinding activities from combustible materials.
- Smoking will be restricted at construction sites and restricted to areas at least twenty feet from any combustible material, including dry grass. Ash trays will be provided and their use required; cigarette butts will be properly extinguished and disposed of.
- Motorized equipment will be properly maintained and inspected regularly for possible ignition sources. Carburetors and motors will be required to have protective screens and covers to reduce the likelihood of heat sources starting fires.
- Motorized equipment will be equipped with fire extinguishers. The

extinguishers will be appropriately sized to equipment.

- Contractors will notify the local fire department of their fire control plan and coordinate with them on a regular basis. Construction personnel will be required to have phones or other communication equipment at the work site to contact the fire department immediately in the event of a fire or an emergency.