ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE / ENVIRONMENTAL ASSESSMENT

Thirty Meter Telescope Project

Mauna Kea Northern Plateau and Hale Pōhaku,
Island of Hawai‘i
TMK 4-4-15: 9 and 12

Proposing Agency:
University of Hawai‘i at Hilo

This Environmental Document is Prepared Pursuant to Hawai‘i Revised Statutes, Chapter 343, Environmental Impact Statement Law and Chapter 200 of Title 11, Hawai‘i Administrative Rules, Department of Health, Environmental Impact Statement Rules

September 23, 2008

This page intentionally left blank.

NOTICE OF DETERMINATION

Name of Project:

Thirty Meter Telescope (TMT)

Applicable Law:

Chapter 343, Hawai‘i Revised Statutes

Type of Document:

Environmental Impact Statement Preparation Notice (EISPN) / Environmental Assessment (EA)

Island:

Hawai‘i

District:

Hāmākua

Tax Map Key (TMK):

TMK 4-4-15: 9 and 12

Proposing Agency:

University of Hawai‘i at Hilo

Accepting Authority:

Governor, State of Hawai‘i

Brief Description of the Proposed Action:

The proposed action involves the construction and operation of an optical/infrared telescope on an estimated four acres of presently undeveloped land within the 525-acre Astronomy Precinct of the 11,288-acre Science Reserve near the top of Mauna Kea. The proposed telescope facility would be located within the western portion of the area known as the northern plateau within the Astronomy Precinct. More specifically, the area being considered is the general vicinity of the area designed Area E in the Mauna Kea Science Reserve Master Plan (UH, 2000). Area E ranges in elevation from 13,100 to 13,300 feet and is located approximately half a mile northwest of the nine existing optical/infrared telescopes located near the summit at elevations of 13,600 to 13,775 feet. The entire Science Reserve is designated part of the State of Hawai‘i Conservation District, resource subzone.

The proposed Thirty Meter Telescope (TMT) would be an optical-infrared telescope with a 30-meter diameter primary mirror. As such the telescope would be the most capable ground-based telescope in the world, with observational powers many times greater than any available today. The telescope developer (TMT Observatory Corporation, a non-profit organization) is committed to integrating culture, science, sustainability and education in the project.

Construction of the telescope and its ancillary facilities would begin in 2010 and would be completed in approximately seven years. Once construction is complete, a staff of approximately 120 people will be necessary to operate and maintain the observatory. Each night, four to six system operators, staff astronomers and visiting scientists would operate the telescope. During the day, an estimated 40 members of the staff would work at the observatory on the summit, with the remaining approximately 80 members of the staff working at observatory facilities located outside the conservation district.

The design life of the facility is expected to be around 50 years. At the completion of the design life, the facility would be decommissioned.

Mitigation measures to reduce the level of any identified potential adverse impact will be developed during project planning and incorporated into project design and construction. Because of the cultural significance of Mauna Kea, special attention will be given to developing mitigation measures related to cultural resources. The environmental review process being initiated by this EISPN/EA will be one mechanism through which mitigation measures will be developed.

The telescope developer is also reviewing another location for the telescope on a site in Chile, and proceeding with an environmental review for that location. Following the issuance of the Draft Environmental Impact Statement (EIS) and the review of comments received during the Draft EIS comment period, a decision will be made whether to further pursue the Hawai‘i or Chile location.

Determination:

Since the proposed action would involve the use of conservation land and require a Conservation District Use Permit (CDUP), it must undergo environmental review in accordance with Hawai‘i Revised Statutes (HRS) Chapter 343 (the State EIS Law). Section 11-200-12 Hawai‘i Administrative Rules (HAR) lists 13 significance criteria, including the following:

- Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;
- Substantially affects a rare, threatened or endangered species, or its habitat;
- Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a floodplain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters; and
- Substantially affects scenic vistas and view planes identified in county or state plans or studies.

Additionally, Act 50 added the following relevant criterion:

- Adversely affect cultural practices of the community and State.

Because the threshold of significance is likely to be exceeded for at least one of the above significance criteria, the University of Hawai‘i at Hilo determined that an EIS will be prepared for this project.

Further planning and environmental review could reveal that the threshold of significance could be exceeded for additional significance criteria as well. The environmental review process being initiated by this EISPN/EA is intended to fully and accurately disclose all of the project’s impacts. Comments on potential project impacts are welcome at this time, during the scoping phase.

Reasons Supporting Determination:

The project is likely to exceed the threshold of significance for at least one significance criterion listed in Chapter 343 HRS.

Contact Person for Further Information:

University of Hawai‘i at Hilo
Office of the Chancellor
200 W. Kawaili Street
Hilo, Hawai‘i 96720-4091

This page intentionally left blank.

Table of Contents

List of Appendices

List of Tables

List of Figures

Acronyms and Abbreviations

BLNR	Board of Land and Natural Resources
CDUP	Conservation District Use Permit
CMP	Comprehensive Management Plan
DLNR	Department of Land and Natural Resources (State of Hawai‘i)
EA	Environmental Assessment
EIS	Environmental Impact Statement
EISPN	Environmental Impact Statement Preparation Notice
ESA	Endangered Species Act
HAR	Hawai‘i Administrative Rules
HRS	Hawai‘i Revised Statutes
NPDES	National Pollutant Discharge Elimination System Permit
OMKM	Office of Mauna Kea Management
TMK	Tax Map Key
TMT	Thirty Meter Telescope
UH	University of Hawai‘i
UHIFA	University of Hawai‘i Institute for Astronomy
USFWS	United States Fish and Wildlife Service

1.0 Introduction

1.1 Significance of Mauna Kea

ʻO Mauna Kea ko kākou kuahiwi laʻa (Mauna Kea our sacred mountain) expresses the feelings that modern day Hawaiians and non-Hawaiians alike have for Mauna Kea. Mauna Kea is a wahi pana, or legendary place. As with other cultures throughout the world, early Polynesians believed their highest points of land were the most sacred.

Of the four major islands in the Hawaiian group, tradition tells us that the highest and most sacred places were Mauna Waiʻaleʻale on Kauaʻi, Mauna Kaʻala on Oʻahu, Mauna Haleakalā on Maui, and Mauna Kea on Hawaiʻi (Figure 1). Mauna Kea, being the highest point throughout Pacific Polynesia, has been considered by many Hawaiian practitioners to be the most sacred of all. Mauna Kea was host to early Hawaiian traditions that included religious practices, study of the heavens, and tool making.

In addition to its cultural significance, Mauna Kea has long been known to be among the premier locations on Earth for astronomy. In 1968 the State created the Mauna Kea Science Reserve in recognition of Mauna Kea's scientific potential. In the Mauna Kea Science Reserve Master Plan (UH, 2000) the University of Hawaiʻi designed 95 percent of the Science Reserve as a Natural/Cultural Preservation Area in recognition of Mauna Kea's natural and cultural significance. We are sensitive to the cultural and natural significance of Mauna Kea and are committed to integrating culture, science, sustainability, and education in the proposed project.

1.2 Purpose of and Need for the Project

Mauna Kea currently hosts eight optical and/or infrared observatories. Each observatory hosts a single telescope except the W. M. Keck observatory which hosts the two most powerful optical/infrared telescopes, each with a ten meter diameter primary mirror. Optical/infrared telescopes use mirrors to collect and focus visible or infrared light. Mauna Kea also hosts four submillimeter and/or radio observatories.

The telescopes at Mauna Kea are used to make observations for astronomical research in areas ranging from the Solar System to the most distant reaches of the Universe. Although the existing telescopes have an important role in continued astronomy research, the proposed Thirty Meter Telescope (TMT), thus called for its 30-meter primary mirror, would provide nine times the light collecting area of a Keck telescope. The TMT is the first telescope being designed from the outset to take advantage of adaptive optics to correct the blurring of the Earth's atmosphere. With its 30-meter primary mirror in combination with a powerful adaptive optics system, the TMT would achieve a spatial resolution twelve times sharper than the Hubble Space Telescope.

These new capabilities will enable future astronomical advances, particularly in the areas of the discovery and characterization of planets around other stars and understanding of the earliest time in the formation of stars and galaxies.

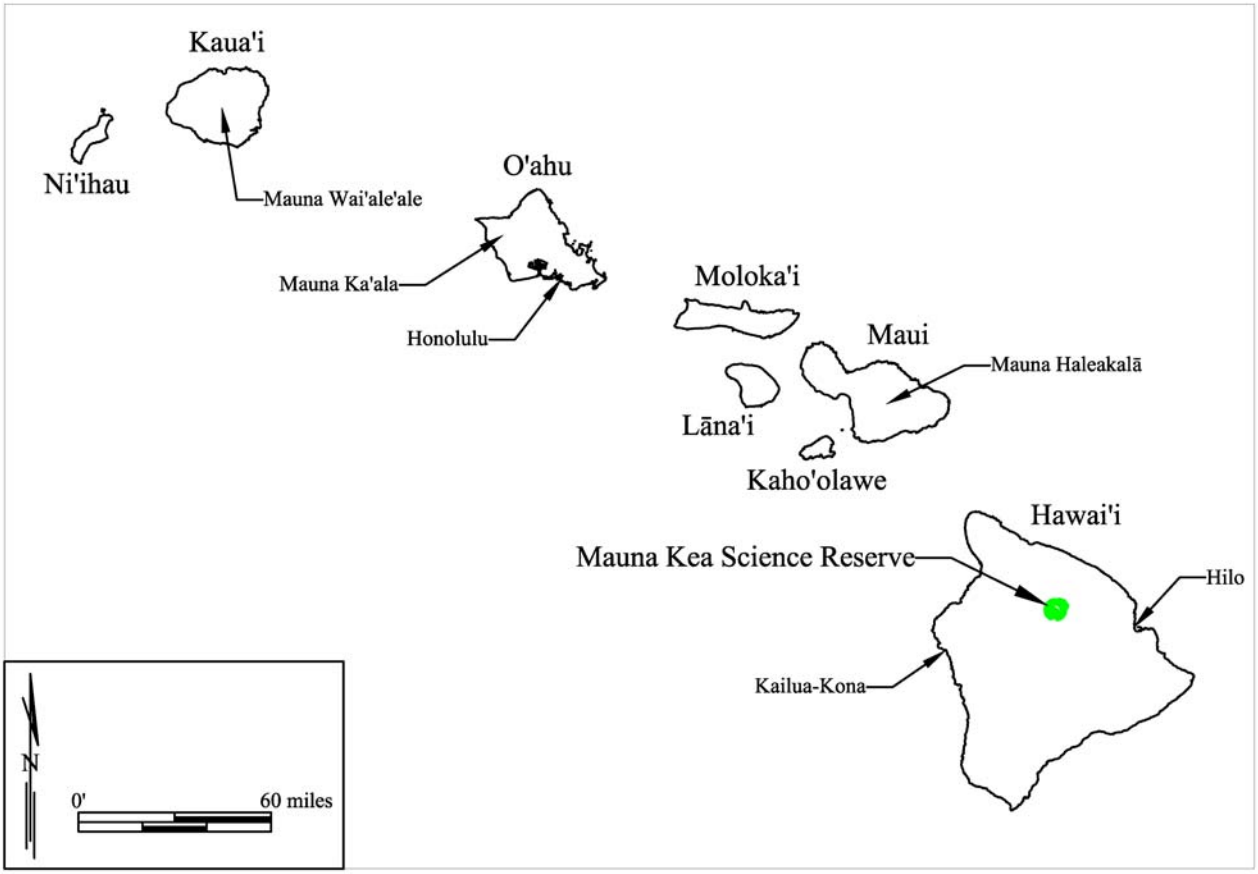

Figure 1: Project Location

1.3 Proposed Action

The proposed action is the issuance by the Land Board of a Conservation District Use Permit (CDUP) allowing the construction and operation of the proposed optical/infrared telescope. The telescope would be located on an estimated four acres of presently undeveloped land within the 525-acre Astronomy Precinct of the 11,288-acre Mauna Kea Science Reserve (tax map key [TMK] 4-4-15: 9) near the top of Mauna Kea (Figure 2). The entire Science Reserve is designated part of the State of Hawai'i Conservation District, resource subzone.

It is currently envisioned that the telescope would be located within the western portion of the area known as the northern plateau within the Astronomy Precinct. The area being considered was identified as Area E in the Mauna Kea Science Reserve Master Plan (UH, 2000) and the associated Mauna Kea Science Reserve Master Plan Final Environmental Impact Statement (UH,1999) and ranges in elevation from 13,100 to 13,300 feet; the summit of the mountain is at elevation 13,796 feet. Area E is located approximately half a mile northwest of the eight existing optical/infrared observatories located near the summit at elevations of 13,600 to 13,775 feet (Figure 3)

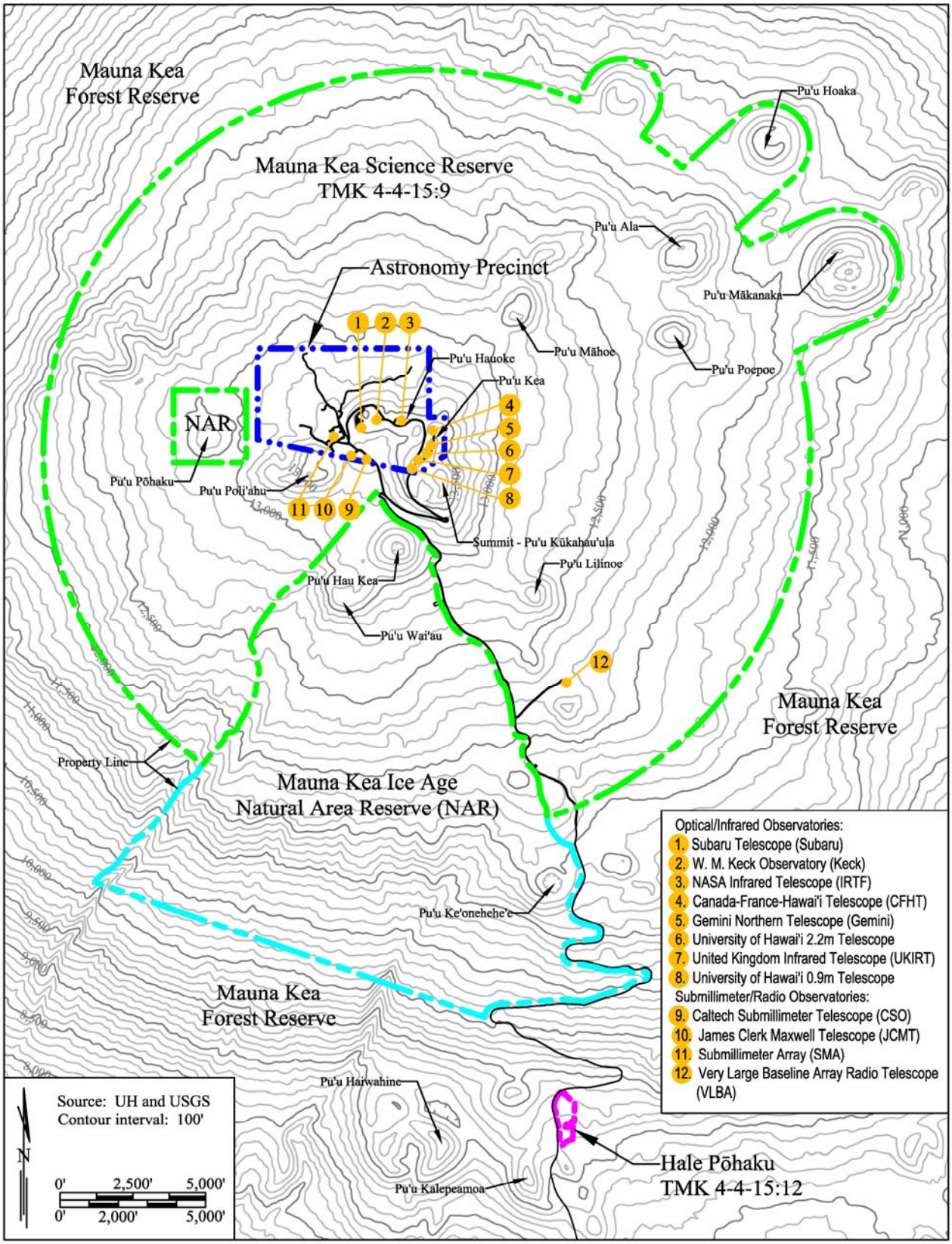

Figure 2: Mauna Kea Overview Map

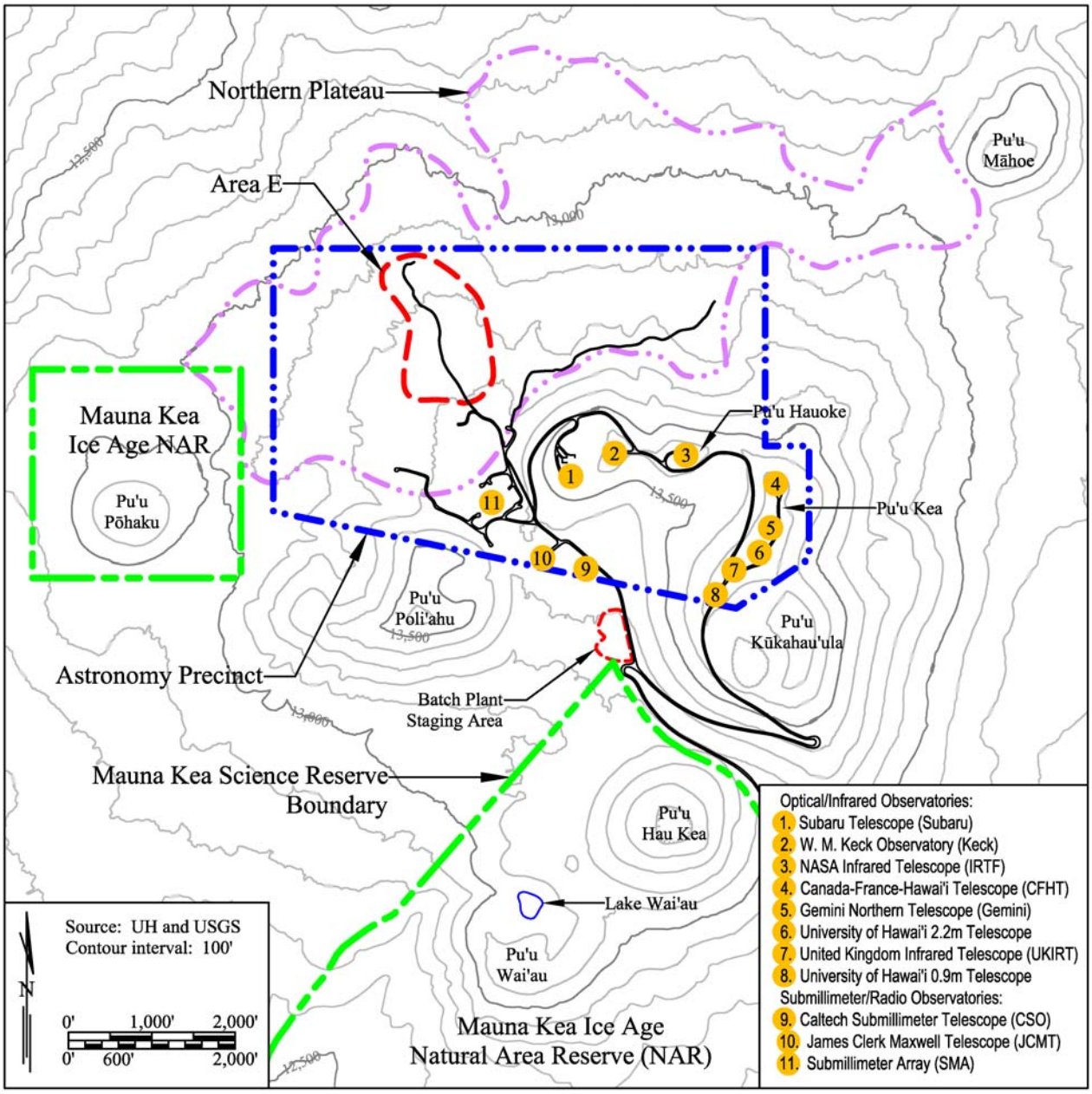

Figure 3: Mauna Kea Summit Detail Map

The proposed observatory, that would require an estimated four acres of land, would include the following:

- The telescope assembly, which includes the 30-meter primary mirror, secondary mirror, tertiary mirror, the structure to support these mirrors, the equipment required to position the telescope to observe the sky, and instruments used to collect the astronomical data;
- The dome which houses the telescope;
- Office and shop facilities adjacent to the telescope, including rooms for computers, meetings, office space,

equipment storage, electrical utilities, mirror striping, coating, and storage facilities, engineering and mechanical shops, safety equipment, and support services;

- Permanent utility building to house equipment that generates heat or vibration. The utility building would be physically separated from the telescope building to minimize the transfer of vibration and heat to the telescope; and
- A parking area for observatory staff and delivery vehicles.

Ancillary facilities would include:

- An access road from the end of the current access road near the summit to the new telescope site would need to be developed.
- Construction baseyards, possibly located at the former summit batch plant (Figure 3) and at Hale Pōhaku (TMK 4-4-15: 12; Figure 2), to provide for material storage and staging and parking at or near the summit. Baseyards may also be located outside the conservation district at an existing industrial facility near the harbor where telescope components would be received.
- Support facilities that would likely be located outside the conservation area near the main offices of the other telescopes, such as in Waimea or Hilo. These include administrative offices, laboratory, maintenance and utility shop, and warehouse space.

Construction of the telescope and its ancillary facilities would begin in 2010 and take approximately seven years. Once construction is complete, a staff of approximately 120 people will be necessary to operate and maintain the observatory. Each night, four to six system operators, staff astronomers and visiting scientists would operate the telescope. During the day, an estimated 40 members of the staff would work at the observatory on the summit, with the remaining approximately 80 members of the staff working at observatory facilities located outside the conservation district.

The design life of the facility is expected to be around 50 years. At the completion of the design life, the facility would be decommissioned.

Mitigation measures to reduce the level of potential adverse environmental impact will be developed during project planning and incorporated into project design and construction. Because of the cultural significance of Mauna Kea, special attention will be given to developing mitigation measures related to cultural resources. The environmental review process being initiated by this Environmental Impact Statement Preparation Notice (EISPN) / Environmental Assessment (EA) is one mechanism through which the mitigation measures will be developed.

TMT is committed to integrating culture, science, sustainability and education in the project. During the environmental review process TMT will work with the community to formulate a mitigation package of community and educations benefits.

1.4 Locations under Consideration

Two sites remain under consideration for the TMT: Mauna Kea, Hawai‘i and Cerro Armazones located in Chile’s Atacama Desert.

Initially, 20 locations across the globe were evaluated. Existing site selection studies, satellite studies of cloud cover and water vapor, and data from established observatory sites were used to narrow the field to these five sites:

- Cerro Tolar, Northern Chile (7,500 feet)
- Cerro Armazones, Northern Chile (10,100 feet)
- Cerro Tolonchar, Northern Chile (14,700 feet)
- San Pedro Martir, Baja California Mexico (9,300 feet)
- Mauna Kea, Hawai‘i (13,300 feet)

A number of factors relevant to carrying out astronomical research were monitored for four years at these five sites. Based on the results of those studies and other factors, Mauna Kea and Cerro Armazones in Northern Chile were selected for detailed consideration.

For Mauna Kea, the general vicinity referred to as Area E in the western portion of the northern plateau (Figure 3) is being considered as a possible site. Area E was identified in the Mauna Kea Science Reserve Master Plan (UH, 2000) and associated Mauna Kea Science Reserve Master Plan Final EIS (UH 1999), the same general area was identified in the Mauna Kea Science Reserve: Complex Development Plan (UH, 1983a) and related Final EIS (UH, 1983b) as an optical/infrared telescope siting area. More studies are required to determine which four-acre site in that area would best minimize impacts to cultural and environmental resources while still meeting the needs of the observatory. Comments on the studies to be performed to help select a four-acre site are welcome.

The telescope developer (TMT Observatory Corporation, a non-profit organization) is also proceeding with an environmental review of the Cerro Armazones site.

After the issuance of the Draft Environmental Impact Statement (EIS) and review of comments received during the Draft EIS comment period, a decision will be made to further pursue either the Hawai‘i or Chile location.

1.5 Environmental Planning Process

1.5.1 Planning Context

This project is being proposed within a complex regulatory and planning environment. A recent judicial decision addressing further development on the summit of Mauna Kea held that management plans cannot be developed on a project-by-project basis, and that a comprehensive management plan (CMP) covering the multiple land uses occurring within the area leased by the University of Hawai‘i Institute for Astronomy (UHIFA) on the summit of Mauna Kea must be in place prior to approving any new application for a CDUP (*Mauna Kea et al v. BLNR*, Third Circuit Court, Civil No. 4-1-397, 2006 HA, p 6-8).

Preparation of a CMP meeting the requirements of this judicial decision is underway. The adopted CMP is expected to contain policies and requirements to be placed on those proposing future observatory development. While those policies and requirements cannot be known until the CMP is adopted, TMT planners understand that the requirements to be established by the CMP will apply to the TMT project. Nonetheless, this EISPN/EA is being issued in advance of the adoption of

the CMP to help initiate the early consultation process required by the Hawai‘i EIS Law.

Many activities on Mauna Kea are regulated by the Office of Mauna Kea Management (OMKM), including observatory development. OMKM has established a procedure for CDUP's requested within the Science Preserve, and this procedure is being followed (Figure 4).

1.5.2 EIS and Other Environmental Triggers

Since the proposed action would involve the use of conservation land and require a CDUP, it must undergo environmental review in accordance with Hawai‘i Revised Statutes (HRS) Chapter 343 (the State EIS Law). Other State laws and regulations that would apply to the proposed action include:

- Implementing rules for the Hawai‘i EIS Law: Hawai‘i Administrative Rules (HAR) Title 11, Chapter 200 (EIS Rules);
- Chapter 6E HRS and implementing regulations: HAR Title 13, Subtitle 13, Chapter 275-284 (Historic Preservation Review Process); and
- Chapter 195D and implementing regulations: HAR Title 13, Subtitle 5, Chapter 107 (Hawai‘i Threatened and Endangered Plants).

In addition, a range of environmental laws will need to be satisfied to obtain project permits, such as the Clean Water Act. Permits potentially required are summarized in Section 2.3.

1.5.3 Significance Criteria

HAR Section 11-200-12 lists 13 significance criteria, including the following:

- Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;
- Substantially affects a rare, threatened or endangered species, or its habitat;
- Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters; and
- Substantially affects scenic vistas and view planes identified in county or state plans or studies.

Additionally, Act 50 added the following relevant criterion:

- Adversely affect cultural practices of the community and State.

Because the threshold of significance is likely to be exceeded for at least one of the significance criteria, University of Hawai‘i at Hilo has determined that an EIS will be prepared for this project.

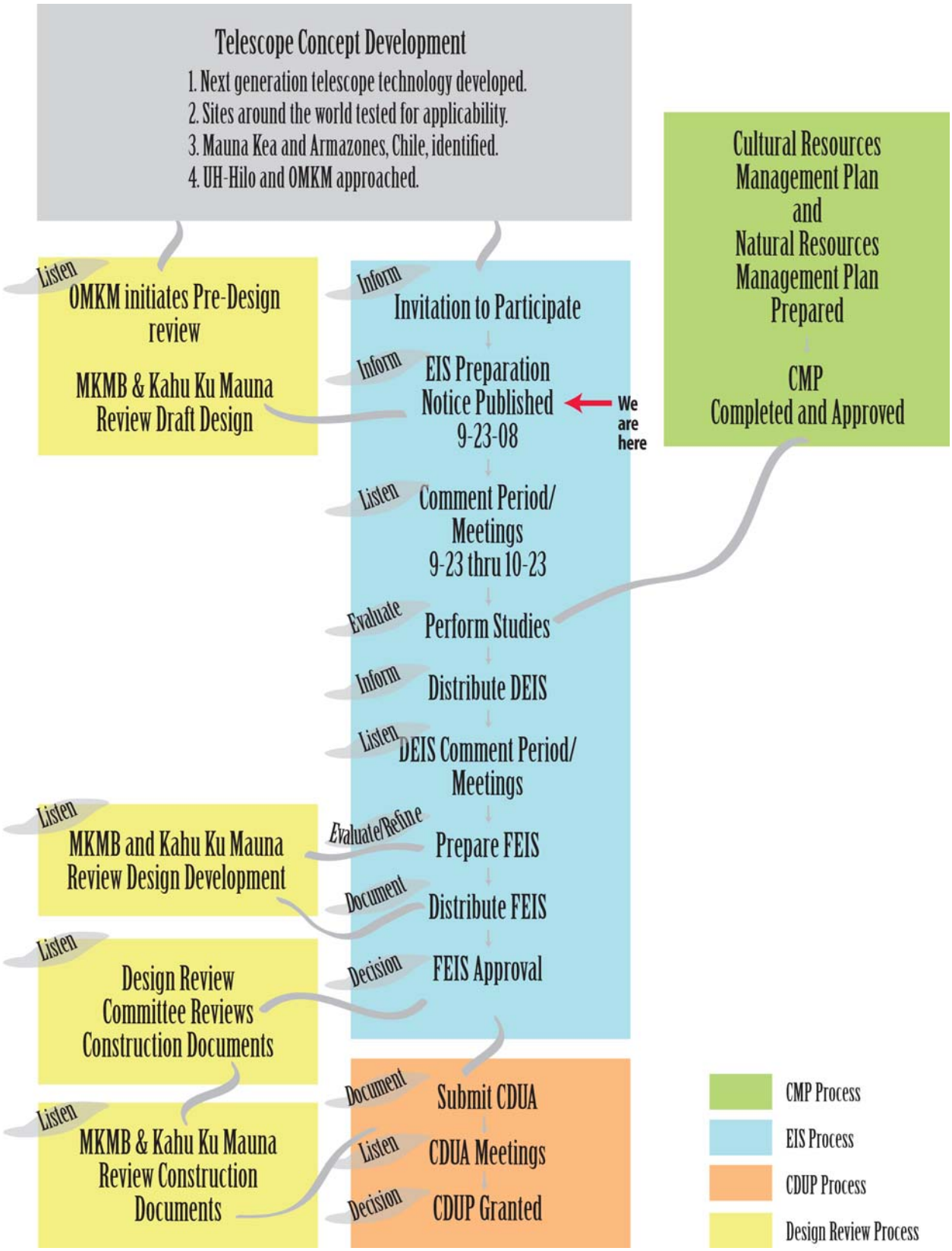

Figure 4: Environmental Review Process

1.5.4 Scoping

This EISPN/EA has been prepared as an initial step in developing the scope of the Draft EIS, hence it starts off the "scoping" process. The EISPN/EA will be announced in the Office of Environmental Quality Control's The Environmental Notice, and sent to those known to have an interest in the project. Comments on key issues, potential environmental impacts, existing information, methodologies, additional persons and organizations with a possible interest in the project, and other relevant information, are welcome.

A successful scoping process is essential to arriving at a project that can be accepted by all. The scoping process is the step where project stakeholders provide their input on the environmental study.

University of Hawai'i at Hilo is mindful that, over the years, project stakeholders have repeatedly put forward their concerns. Those concerns have been captured in the administrative records assembled for the environmental documentation that has been developed for the telescopes operating on and proposed for the summit of Mauna Kea, as well as in the master plans developed for managing the use of the summit of Mauna Kea. These prior plans, studies and processes are listed in Appendix A.

Stakeholder's concerns expressed during those prior processes that appear relevant to this project will be addressed in the Draft EIS.

The scoping process, now starting, must be accessible to all. To do so, the scoping process will include the following elements and features:

- Interactive website (www.TMT-HawaiiEIS.org) that includes: a project fact sheet and frequently asked questions, a place to input and upload comments and contact information, and an address to which comments can be sent via regular mail;
- A toll-free hotline (1-866-284-1716) where comments can be recorded;
- Direct mail of this EISPN/EA to the mailing list that appears in Appendix B and
- Public meetings, accessible to persons with handicaps, will be held, including six meetings on the Island of Hawai'i and one on the Island of O'ahu. These meetings are scheduled as listed in Table 1.

  The public meetings will be advertised as follows:

  - On the project website (www.TMT-HawaiiEIS.org) and toll-free hotline (1-866-284-1716);
  - In five newspapers: Hawai'i Tribune Herald, West

Table 1: Public Scoping Meeting Locations and Dates

Area	Date	Location	Time
Hāwī	Oct. 6 (Mon)	Kohala High School Cafeteria	5-8pm
Waimea	Oct. 8 (Wed)	Kahilu Town Hall (Waimea Family YMCA)	5-8pm
Kona	Oct. 9 (Thr)	Kealakehe Elementary School Cafeteria	6-9pm
Ka'ū	Oct. 13 (Mon)	Ka'u High/Pāhala Elementary School Cafeteria	5-8pm
Hilo	Oct. 14 (Tue)	Keaukaha Elementary School Cafeteria	6-9pm
Puna	Oct. 15 (Wed)	Pāhoa High School Cafeteria	5-8pm
Honolulu, O'ahu	Oct. 16 (Thr)	Neal S. Blaisdell Center Pīkake Room	5-9pm

Hawai‘i Today, Honolulu Advertiser, the Star-Bulletin, and Hawai‘i Filipino Chronicle; and

- On the EISPN/EA distribution cover letter.

As a precursor to the EISPN/EA, invitations to encourage public participation in the project's EIS process were sent out in August, 2008. Individuals and groups that responded to that invitation will receive a copy of the EISPN/EA and are encouraged to continue their participation in the project's EIS process.

This range of techniques is proposed to be sufficient to inform project stakeholders of the project and afford them the opportunity to provide input. Comments on other measures that could be taken to increase project stakeholder participation are welcome.

The Hawai‘i EIS Law provides for a 30-day scoping/comment period from the date of EISPN/EA publication in the Environmental Notice. While comments will be accepted throughout the planning process, after 30 days, project staff will compile the information collected and commence with studies to support the Draft EIS. The Draft EIS will document how the scoping input was considered in subsequent environmental analysis.

1.5.5 Coordination with Comprehensive Management Plan (CMP)

A CMP is in preparation for submittal to the Land Board for approval. It is expected that the CMP will provide a management framework for OMKM to address existing and future activities on Mauna Kea, including observatories. The CMP will include requirements necessary of applicants for CDUPs. Since this telescope project will need to satisfy those CMP requirements, which are presently unknown, the Draft EIS for the project will be released after the Land Board takes action on the CMP.

Until the Land Board adopts the CMP, the most recently adopted Master Plan for the summit of Mauna Kea remains in force.

1.5.6 Draft EIS Review

Availability of the Draft EIS will be announced through direct mail to all persons, organizations, and agencies on the project mailing list, newspaper advertisements, and publication in the Environmental Notice. Publication in the Notice initiates a 45-day public comment period. At least seven public hearings will be held during the Draft EIS comment period. The website at www.TMT-HawaiiEIS.org will also be updated to allow submission of comments on the Draft EIS after it is released for public review.

1.5.7 Site Selection

The required environmental review document has been completed for the Cerro Armazones site in Chile and was submitted to the Chilean government agencies for review.

Once the comments received on the Draft EIS have been reviewed, a decision will be made to further pursue either the Hawai‘i or Chile location.

1.5.8 Final EIS

A Final EIS will be prepared if the decision is made to proceed with a Mauna Kea site. The Final EIS will contain a record of all comments received on the Draft EIS and responses to those comments. Availability

of the Final EIS will be announced through direct mail to the persons, organizations, and agencies on project mailing list and publication in the Environmental Notice.

1.5.9 Accepting Authority

Governor, State of Hawai‘i

This page intentionally left blank.

2.0 Potential Impacts, Planned Studies, and Potential Mitigation Measures

The Mauna Kea setting is unique and has been described in numerous studies, management plans, environmental impact statements, and court documents. A list of available documents appears in Appendix A. A complete and detailed description of the project setting will be included in the Draft EIS.

2.1 Potential Impacts

This section presents a brief summary of the types of potential impacts currently anticipated from construction and operation of the proposed telescope on Mauna Kea. Comments on potential impacts of the telescope are welcome. In addition to the construction-phase and operational-phase impacts discussed in the following sections, the Draft EIS will discuss secondary and cumulative impacts. The Draft EIS will also indicate potential impacts that would be adverse and unavoidable.

2.1.1 Construction-Phase Impacts

Construction-phase impacts are considered short-term impacts as they do not extend beyond the construction period. Potential construction-phase impacts to be evaluated in the Draft EIS will include dust and erosion during site preparation, traffic issues associated with construction equipment and trucks, noise from construction activities, and stormwater and runoff issues. The potential for the construction work to affect traditional cultural practices and archaeological sites will also be addressed.

Mitigation measures to reduce the level of potential adverse impact during construction will be developed during project planning and incorporated into project design and construction. Measures may include efforts such as minimizing the construction footprint area, using graded roads only, walking on graded paths for everyday activity, and implementing best management practices to manage runoff, and construction materials and wastes.

2.1.2 Operation-Phase Impacts

Operation-phase impacts are considered long-term impacts and generally occur following completion of construction and continue until the facility is decommissioned. Potential operational impacts that will be evaluated in the Draft EIS include, but will not be limited to, impacts to cultural resources, historic and archaeological resources, biological resources, visual and aesthetic resources, geologic and water resources, roadways and traffic, noise, and the social and economic environment.

Environmental issues where the project's impact may exceed any of the HAR Section 11-200-12 significance criteria will be of particular focus. These include the following criteria:

- Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;
- Substantially affects a rare, threatened or endangered species, or its habitat;
- Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a floodplain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;
- Substantially affects scenic vistas and view planes identified in county or state plans or studies; and
- Adversely affect cultural practices of the community and State.

Mitigation measures to reduce the level of potential adverse impact will be developed during project planning and incorporated into project design, construction, and operation. The observatory will be designed to minimize any potential environmental, visual, and cultural impacts to the greatest extent possible.

2.2 Methodologies

Based on current information, which includes extensive recent planning and environmental processes that address the Mauna Kea summit, certain issues are expected to be confirmed as important through this scoping process. In addition to the extensive available information contained in numerous studies performed for Mauna Kea, new studies presently envisioned to support the proposed telescope's Draft EIS are described below. However, the list of detailed studies to be performed will not be finalized until the input received during this scoping process is reviewed and the CMP and supporting information are available and accepted.

Comments on topics that should receive special attention, information already available, and study methods that should be employed, are welcome.

2.2.1 Cultural and Historic/Archaeological Resources

The telescope could have impacts on cultural and historical resources, including the wahi pana, or sacred areas, or landscapes which include the summit region, the pu‘u both on and along the summit, the view-planes, Lake Wai‘au, as well as the trail system. Hawai‘i law requires a thorough investigation of impacts on cultural and historic resources.

The CMP is assembling information on cultural and historic resources. Study methods for this project will be coordinated with that ongoing work. Meetings will be held to share information and collaborate on technical approaches. Ultimately, the study methods to be used for this project will be coordinated with the State Historic Preservation Officer.

Pending more information on the CMP, a reconnaissance study in the vicinity of Area E in the western portion of the northern plateau (Figure 3) is proposed, with a more detailed study to follow once site selection advances.

The methods that will be followed to study cultural impact cannot be established until more is known about the CMP. Comments on the approach that should be taken with respect to cultural resources are welcome.

2.2.2 Biological Resources

The Mauna Kea summit area contains habitat for the Wēkiu bug (*Nysius wekiuicola*), a candidate for listing under the Endangered Species Act (ESA), and certain species of lichens and ferns. At Hale Pōhaku, where the construction baseyard would be located, the palila (*Loxiodes bailleui*), an endangered bird listed under the ESA; māmane (*Sophora chrysophylla*), a native tree that is the primary food source of the palila; and Hawai'i catchfly (*Silene hawaiiensis*), a threatened shrub listed under the ESA, may be present. Comments on additional biological resources of concern are welcome.

Potential impacts of the construction and operation of the telescope on biological resources will be evaluated. Impacts of both the telescope and associated ancillary facilities will be considered, including construction staging areas, access roads, and other areas within the zone of construction.

The following steps will be taken to assess project impacts in these areas:

- Coordinate with resource agencies, including the United States Fish and Wildlife Service (USFWS) and Department of Land and Natural Resources (DLNR). The study methodology may be adjusted based on these meetings.
- Review information from the CMP being prepared, as well as technical papers, research documents, and environmental studies of the summit, the western portion of the northern plateau, and Hale Pōhaku (possible construction staging area), to identify biological resources to be considered during the impact assessment.
- Obtain a DLNR Division of Forestry and Wildlife Arthropod Research, Collection, and Access Permit.
- Perform botanical and arthropod surveys in the proposed project areas.
- Evaluate the potential impacts of the telescope on the resources documented or surveyed.

If it is determined that the project could adversely affect protected species or critical habitat, discussions with the USFWS and DLNR would continue within the structure of Chapter 195D, HRS.

2.2.3 Visual and Aesthetic Resources

Mauna Kea is an outstanding visual resource. Some of the existing observatories are visible from sea level and intermediate elevations when the summit is clear. The visual impact of the proposed telescope is expected to be an important issue. Visual impact studies will be conducted, including simulations of future views with the proposed telescope. These studies undergo a formal process of identifying view sheds and view planes to be studied. Visual simulations will allow comparison of different visual mitigation techniques, for example those that involve telescope buildings that are oriented in various ways to minimize visual intrusion.

Comments on particular vantage points that should be studied, available information, or other information relevant to a visual impact study are welcome.

2.2.4 Geology, Soils, and Slope Stability

The summit area of Mauna Kea has been repeatedly covered by glaciers during the

Quaternary period, and the interaction of volcanic activity and ice in this area is unique in the Pacific region. Glacial features, including lava/ice contact zones, glacially polished and striated surfaces, and glacial moraine deposits are geologic features found only on Mauna Kea. Studies will be conducted to identify such features in the project area, if they are present, and to assess if they are unique at the site of the proposed telescope. Investigations of the bedrock underlying the proposed telescope and associated access roads will be undertaken to assess ground stability and suitability for construction. Mauna Kea is subject to future seismic disturbances and a summary of potential earthquake hazards to the proposed facility will be provided. Small rock samples for laboratory study may be required, and collecting permits will be requested from OMKM.

2.2.5 Water Resources and Wastewater

Groundwater conditions within the mountain are complex. Surface and groundwater resources in the project area will be identified and characterized. Potential impacts to water resources and mitigation measures will be discussed; including the project design features to avoid potential impacts to these resources.

Alternative methods to manage wastewater at the proposed observatory will be analyzed and discussed in the Draft EIS.

2.2.6 Hazardous Materials

Prior land use history strongly suggests that the proposed project area is not contaminated by hazardous materials. Therefore, the presence of hazardous materials is not anticipated to have an effect on the project or the handling of materials generated during construction.

Any hazardous materials generated during telescope construction or operation would be handled in accordance with applicable laws and regulations. The Draft EIS will discuss the hazardous materials that may be used and the methods that would be used to minimize potential impacts related to use and storage of those materials.

2.2.7 Social and Economic Conditions

Construction and operation of the telescope would have economic impacts associated primarily with the expenditure of construction funds within the local communities, and the staffing requirements of the telescope. The telescope is expected to require a permanent staff of approximately 120 people (including operational, maintenance, and support staff) with most staff being hired locally. Staff development is anticipated to increase the skills of local residents. Most of the 120 staff would be based outside the conservation district near the main offices of the other telescopes, such as in Waimea or Hilo. Only four to six system operators and a staff astronomer would operate the telescope each evening, and an estimated 40 staff present at the observatory during the day.

Anticipated economic effects will be described. Comments on ways to help local residents participate in economic benefits from this project are welcome.

The telescope is not expected to have a social impact because the staffing requirements are too small to cause demographic changes. Comments on this point are welcome. The Draft EIS will include a description of existing social conditions.

2.2.8 Recreational and Educational Use

Mauna Kea is currently used for such recreational activities as sightseeing, commercial tours, hiking, skiing, and hunting. The telescope is not expected to have a substantial impact on these activities. Comments on this point are welcome.

The telescopes on Mauna Kea provide an important educational function, and the new telescope would augment the substantial educational activities already occurring. Comments on enhancing the educational benefits that the new telescope could provide to the community are welcome.

2.2.9 Air Quality and Lighting

Air quality will be discussed since some dust and exhaust emissions would be generated during construction. Mitigation measures for construction-phase air pollutant emissions will be discussed.

Operation of the telescope would not emit airborne pollutants.

Lighting is another key issue both for existing telescopes on the mountain and for people viewing Mauna Kea. Lighting plans will be coordinated with OMKM and the University of Hawai‘i. This impact and any mitigation measures will be discussed in the Draft EIS.

2.2.10 Roadways and Traffic

Traffic generated during construction and operation of the telescope, and traffic safety, will be discussed. Currently, traffic volumes generated by existing telescopes on Mauna Kea are low.

2.2.11 Noise

Most noise emissions would be generated either during construction or from certain indoor equipment. These noise emissions, potential impacts, and possible mitigation measures will be discussed in the Draft EIS.

2.3 Permits and Approvals

The key permits and approvals needed for telescope construction to proceed include a Conservation District Use Permit (CDUP) and a National Pollutant Discharge Elimination System Permit (NPDES). A list of all permits required will be presented in the Draft EIS. Comments on permits and approvals that could be needed are welcome.

This page intentionally left blank.

3.0 References

University of Hawai‘i (UH), 2000. *Mauna Kea Science Reserve Master Plan*. Available on the web http://www.hawaii.edu/maunakea/. Prepared by Group 70 International, Inc., adopted by the UH Board of Regents on June 16, 2000.

UH, 1999. *Mauna Kea Science Reserve Master Plan Final Environmental Impact Statement*. Prepared by Group 70 International Inc. for UH. December 1999.

UH, 1983a. *Mauna Kea Science Reserve: Complex Development Plan*. Prepared by Group 70 International, Inc. for Research Corporation of the University of Hawai‘i. February 1983 (amended May 1987).

UH, 1983b. *Mauna Kea Science Reserve: Complex Development Plan Final Environmental Impact Statement*. Prepared by Group 70 International, Inc. for Research Corporation of the University of Hawai‘i. January 1983.

This page intentionally left blank.

Appendix A: Select Prior Studies and Plans

Master/Management Plans

Mauna Kea Science Reserve Master Plan (June, 2000)

Revised Management Plan for the UH Management Areas on Mauna Kea (March 10, 1995)

Mauna Kea Science Reserve: Complex Development Plan (February, 1983; amended May, 1987)

University of Hawai‘i Research Development Plan (1982)

Research Development Plan for the Mauna Kea Science Reserve and Related Facilities (September, 1981)

Hale Pōhaku Complex Development Plan (1980)

The Mauna Kea Plan (May, 1977)

Environmental Documentation

Final Environmental Assessment, University of Hawai‘i, 24-Inch Telescope Observatory Renovation (August, 2006)

Draft Environmental Impact Statement for the Advanced Technology Solar Telescope, Haleakalā, Maui, HI, National Science Foundation (September, 2006)

Panoramic Survey Telescope & Rapid Response System (Pan-STARRS), Environmental Impact Statement Preparation Notice (December, 2006)

Final Environmental Impact Statement for the Outrigger Telescopes Project (February, 2005)

Final State Environmental Assessment for Mauna Kea Astronomy Education Center, University Science and Technology Park, University of Hawai‘i at Hilo, Waiākea, South Hilo, Hawai‘i (August, 2002)

Mauna Kea Science Reserve Master Plan Final Environmental Impact Statement (December, 1999)

Final Environmental Assessment: Temporary Optical Sites for the W.M. Keck Observatory Twin Kick Telescope Interferometer (September, 1998)

Final Environmental Assessment, Use of State Lands for the Institute for Astronomy’s Hilo Facility (December, 1997)

Final Environmental Assessment for the Proposed Hilo Base Facility of the Gemeni North 8-meter Telescope (April, 1997)

Final Environmental Assessment for the Proposed Hilo Base of the Subaru Observatory in Hawai‘i (August, 1995)

Environmental Assessment for the Gemini Northern 8-Meter Telescope, Mauna Kea, Hawai‘i (December, 1993)

Amendment to the Mauna Kea Science Reserve Complex Development Plan, Final Supplemental Environmental Impact Statement, VLBA Antenna Facility (September 1988)

Amendment to the Mauna Kea Science Reserve Complex Development Plan, Final Supplemental Environmental Impact Statement for Construction Camp Housing (October, 1985)

Mauna Kea Science Reserve: Complex Development Plan Final Environmental Impact Statement (January, 1983; amended 1987)

A 10-meter Telescope for Millimeter and Submillimeter Astronomy at Mauna Kea, Hāmākua, Hawai‘i, Final Environmental Impact Statement (August, 1982)

Revised Environmental Impact Statement for Hale Pōhaku Mid-Elevation Facilities Master Plan, Hāmākua, Mauna Kea, Hawai‘i (February, 1980)

Final Environmental Impact Statement, Existing Operations of the UH Observatory and the Construction and Operations of the New IRTF and UKIRT Observatories, Mauna Kea Science Reserve, County of Hawai‘i, Hawai‘i (May, 1975)

Final Environmental Impact Statement: Proposed Telescope and Observatory Facilities Mauna Kea (Summit), Hawai‘i (May, 1974)

Appendix B: EISPN/EA Mailing List

Federal Agencies

U.S. Army Corps of Engineers
U.S. Department of Agriculture – National Resources Conservation Service
U.S. Department of Commerce – National Oceanic and Atmospheric Administration
U.S. Department of Energy
U.S. Department of Homeland Security
U.S. Department of Interior
- Fish and Wildlife Service
- National Parks Service
- U.S. Geological Survey

U.S. Department of Transportation
U.S. Environmental Protection Agency
National Aeronautics and Space Administration – Office of Space Science, Astronomy and Physics Division

State Agencies

Department of Accounting and General Services
Department of Agriculture
Department of Budget and Finance
Department of Business, Economic Development and Tourism
Department of Defense
Department of Education
Department of Hawaiian Home Lands
Department of Health
Department of Land and Natural Resources
Department of the Attorney General
Department of Transportation
Hawai‘i State Civil Defense
Office of Hawaiian Affairs

University of Hawai‘i

Center for Hawaiian Studies
College of Agriculture, Forestry, and Natural Resource Management (Hilo)
College of Hawaiian Language (Hilo)
College of Tropical Agriculture and Human Resources (Mānoa)
Environmental Center
‘Imiloa Astronomy Center of Hawai‘i
Institute for Astronomy
Mauna Kea Support Services
Office of Mauna Kea Management
Kahu Ku Mauna
Mauna Kea Management Board
Water Resources Research Center

County of Hawai‘i

Big Island Visitors Bureau
Civil Defense Agency
Department of Design and Construction
Department of Environmental Management
Department of Finance
Department of Parks and Recreation
Department of Planning
Department of Public Works
Department of Research and Development
Department of Transportation Services
Department of Water Supply
Fire Department
Mass Transit Agency
Office of Housing and Community Development
Office of the County Clerk
Office of the Prosecuting Attorney
Police Department

Elected Officials

U.S. Senator Daniel K. Inouye
U.S. Senator Daniel K. Akaka
U.S. Congressperson Neil Abercrombie (1)
U.S. Congressperson Mazie Hirono (2)
Governor, State of Hawai‘i, Linda Lingle
State Senator Lorraine R. Inouye (1)
State Senator Russell S. Kokubum (2)
State Senator Paul Whalen (3)
State Representative Dwight Y. Takamine (1)
State Representative Jerry L. Chang (2)
State Representative Clift Tsuji (3)
State Representative Faye P Hanohano (4)
State Representative Robert N. Herkes (5)
State Representative Josh Green (6)
State Representative Cindy Evans (7)
Mayor, County of Hawai‘i, Harry Kim
Hawai‘i County Council, Chairman Pete Hoffmann (9)
Hawai‘i County Council, Vice Chair K. Angel Pilago (8)
Hawai‘i County Councilperson Dominic Yagong (1)
Hawai‘i County Councilperson Donald Ikeda (2)
Hawai‘i County Councilperson J Yoshimoto (3)
Hawai‘i County Councilperson Stacy Higa (4)
Hawai‘i County Councilperson Emily I. Naeole (5)
Hawai‘i County Councilperson Bob Jacobson (6)
Hawai‘i County Councilperson Brenda Ford (7)

Local Schools

Connections
DeSilva Elementary
Ha‘aheo Elementary
Hawai‘i Academy of Arts and Sciences
Hawai‘i Prepatory Academy
Hilo High
Hilo Intermediate
Hilo Union
Holualoa Elementary
Honaunau Elementary
Honoka‘a Elementary
Honoka‘a High and Intermediate
Ho‘okena Elementary
Innovations
Ka ‘Umeke Ka‘eo
Kahakai Elementary
Kalanianaole Elementary and Intermediate
Kanu o ka ‘Āina
Kapi‘olani Elementary
Ka‘ū High and Pāhala Elementary
Kaumana Elementary
Ke Ana La‘ahana
Ke Kula Nawahiokalaniopuu Iki Lab
Ke Kula ‘o ‘Ehunuikaimalino
Kea‘au Elementary
Kea‘au High
Kea‘au Intermediate
Kealakehe Elementary
Kealakehe High
Kealakehe Intermediate
Keaukaha Elementary
Keonepoko Elementary
Kohala Elementary
Kohala High
Kohala Intermediate
Konawaena Elementary
Konawaena High
Konawaena Intermediate
Kua o ka La
Laupāhoehoe High and Elementary
Mountain View Elementary

Na‘alehu Elementary and Intermediate
Pa‘auilo Elementary and Intermediate
Pāhoa Elementary
Pāhoa High and Intermediate
Volcano School of Arts and Sciences
Waiākea Elementary
Waiākea High
Waiākea Intermediate
Waiakeawaena Elementary
Waikoloa Elementary
Waimea Elementary
Waimea Middle
Waters of Life
West Hawai‘i Explorations Academy

Libraries

Hawai‘i State Library
Hawai‘i Island Libraries:
- Bond Memorial
- Hilo
- Hōlualoa
- Honoka‘a
- Kailua - Kona
- Kea‘au
- Kealakekua
- Laupāhoehoe
- Mt. View
- Nā‘ālehu
- Pāhala
- Pāhoa
- Thelma Parker

Kaua‘i Island Libraries:
- Hanapēpē
- Kapa‘a
- Kōloa
- Līhu‘e
- Princeville
- Waimea

Lāna‘i Island – Lāna‘i
Maui Island Libraries:
- Hāna
- Kahului
- Kīhei
- Lahaina
- Makawao
- Wailuku

Moloka‘i Island – Moloka‘i
O‘ahu Island Libraries:
- ‘Aiea
- ‘Āina Haina
- ‘Ewa Beach
- Hawai‘i Kai
- Kahuku
- Kailua
- Kaimukī
- Kalihi-Pālama
- Kāne‘ohe
- Kapolei
- LBPH
- Liliha
- Mānoa
- McCully-Mō ‘ili‘ili
- Mililani
- Pearl City
- Salt Lake
- Wahiawā
- Waialua
- Wai‘anae
- Waikīkī-Kapahulu
- Waimānalo
- Waipahu

University of Hawai‘i at Mānoa Hamilton Library
University of Hawai‘i at Hilo Library
Legislative Reference Bureau

News Media

Honolulu Advertiser
Honolulu Star Bulletin
Hawai‘i Tribune Herald
West Hawai‘i Today

Organizations

‘Ahahui Ku Mauna
‘Ahahui Mālama I Ka Lōkahi
American Friends Service Committee
Association of Hawaiian Civic Clubs
Bishop Museum
Center for Biological Diversity
Conservation Council for Hawaii

Earthjustice
Edith Kanakaʻole Foundation
Environment Hawaii
Environmental Defense
EnviroWatch
Friends of Haleakala National Park
Hawaiʻi - Laʻieikawai Association
Hawaiʻi Institute for Human Rights
Hawaiʻi People's Fund
Hawaiʻi Audubon Society
Hawaiʻi Conservation Alliance
Hawaiʻi Ecotourism Association
Hawaiʻi Island Chamber of Commerce
Hawaiʻi Island Economic Development Board
Hawaiian Ecosystems at Risk
Hawaiian Historical Society
Hawaiʻi's Thousand Friends
Healthy Hawaii Coalition
Historic Hawaiʻi Foundation
Kaʻu Preservation
KAHEA
Kanaka Council Moku O Keawe
Kilakila o Haleakalā
Kohala Center
Kohanaiki ʻOhana
Kona-Kohala Chamber of Commerce
Life of the Land
Malama O Puna
Maui Tomorrow Foundation, Inc.
Mauna Kea Anaina Hou
Na Maka o ka ʻĀina
Native Hawaiian Advisory Council
Native Hawaiian Chamber of Commerce
Nature Conservancy of Hawaii
Pele Defense Fund
Pulama Ia Kona Heritage Preservation Council
Royal Order of Kamehameha I
Sierra Club

Individuals

Mona Abadir
Catherine Allegretti
Taft Armandroff
Lisa Asato
Warlito Astrande
Lisa Bail
Carl Barash
L. Barbero
Daryl Berg
David Bohn
Leon Buchner
Fred Cachola
Jerry Carr
Donna Ching
Anthony Ching Ako
Duane L. & Gretchen W. Cobeen
Kenneth Conklin
Andrew Cooper
Keith Davenport
Laurel De Mello
Hajime Dochin
Jaline Eason
Ron Englund
Duane Erway
June Fernandez
Dennis Florer
Roy and Allie Forbes
Rick Frazier
Fred Fukuchi
Jody Fulford
Paul Gessert
T. Ilihia Gionson
Mark Goldman
William Golisch
Linda Gregoire
Charles Grogan
Cory Harden
Cory Harden
John Hayes
William Healy
Sandy Hess
Mary Holley
William Hoohuli
Russell Kackley
Jo-Ann Kalamau
Ciro Kamai
Nahoku Kamakawiwoole

Ana Kariaga
Jim Klyman
Wiley Knight
Graham Knopp
Klement Kondratovich
Manuel Kuloloio
Kerstin Lampert
Joan Lander
Evelyn Lane
Denise Lindsey
Paul Lowe
Christy Luce
Jim LuPiba
Anthony Marzi
J. Mauhili
David Milotta
Lee Motteler
LaVerne Nahinu
Elijah Navarro
Daniel Navratil
Ron Needham
Christopher Neyman
Thomas Orton
Christian Pa
Brittany Pierce
Gerald Pozen
Greg Pronesti
Paul Rambaut
Herbert Ritke
Robert Rodman
Alexa Russell
Joan Schaal
Barbara Schaefer
John Sevick
David Seyfarth
David Shaw
Gail Silva
Edward Smart
Teena Smart
Daniel Stauffer
Aaron Stene
Justin Stevick
William Stormont
Ann Strong
Gyongyi Szirom
Jack Telaneus
John Tremblay
Ash Tsuji
Damon Tucker
Rob Van Geen
Carla Von
Bob Ware
Bob Wilkins
James ‘Kimo’ Wilson
Peter Young