

D. CRITERION FOUR, HAR § 13-5-30(C)(4): "THE PROPOSED LAND USE WILL NOT CAUSE SUBSTANTIAL ADVERSE IMPACT TO EXISTING NATURAL RESOURCES WITHIN THE SURROUNDING AREA, COMMUNITY, OR REGION[.]"

513. Under the version of HAR § 13-5-2 that was in effect when the CDUA was submitted to the BLNR, "Natural resource" is defined as meaning "resources such as plants, aquatic life and wildlife, cultural, historic and archeological sites, and minerals." The amendment added to this definition "recreational" and "geologic" sites, "scenic areas, ecologically significant areas," and "watersheds."
514. The TMT Observatory will not significantly add to or burden the balance of any existing impact from a level that is currently less than significant to a significant level within the Astronomy Precinct. Tr. 10/25/16 at p. 181:6-10 (Hayes). This means that the TMT Project itself will not cause substantial adverse impacts. When taken in conjunction with its proposed mitigation and applicable management and decommissioning plans, the overall effect of the TMT Project will be either neutral or provide for lesser overall impacts than current existing uses in the Astronomy Precinct.
515. Petitioners and Opposing Intervenors' argue that Mauna Kea has suffered previous "unlawful" significant and adverse impacts.
516. The CDUA and supporting documents provide sufficient information for the BLNR to consider whether the "proposed land use" itself will cause "substantial adverse impact to existing natural resources within the surrounding area, community, or region[.]" HAR § 13-5-30(c)(4).
517. Under HAR § 13-5-30(c)(4), UH Hilo has provided sufficient information to show the level of impacts on natural resources within the MKSR would be substantially the same even in the absence of the TMT Project within the MKSR.
518. The definition of "Natural resource" in HAR § 13-5-2, includes cultural, historical, and archaeological "sites"; but not necessarily cultural practices.
519. Prof. Fujikane, a witness for KAHEA, argues that the TMT FEIS's conclusion that the TMT Project will add a limited increment to the level of cumulative impact is not persuasive and does not consider the TMT Project as a whole with its proposed mitigation efforts. Her opinion focuses on a view of the cumulative impact of the TMT Project, with all existing observatories, as an added impact on the cultural concerns of certain native Hawaiian practitioners. B.13a (WDT Prof. Fujikane) at 2.
520. Under HAR § 13-5-30(c)(4), mitigation measures for the TMT Project have been considered even though "mitigation" is not expressly stated as a requirement. *Morimoto v. Bd. of Land & Natural Resources*, 107 Hawai'i 296, 303-304, 113 P.3d 172, 179-180 (2005).
521. Petitioners and Opposing Intervenors claim proposed mitigation measures do not specifically address the environmental and cultural impacts of the project. *See*

Petitioners' Collective Prehearing Statement at 4.

522. Numerous proposed mitigation measures for the TMT Project are specifically designed to address the environmental and cultural impacts of the project, including, but not limited to:
- a. The site selection and physical design of the project itself and related infrastructure to mitigate its visual, cultural and environmental impact;
 - b. The TMT Access Way design;
 - c. Implementing a cultural and natural resources training program;
 - d. Developing educational exhibits;
 - e. Restoring of Pu'u Poli'ahu;
 - f. Providing a sense of place within the TMT facilities;
 - g. Providing financial contributions to support cultural programs;
 - h. Implementing specific cultural and community outreach efforts;
 - i. Implementing cultural observance days;
 - j. Continuing consultation with the State Historic Preservation Division and Kahu Kū Mauna Council regarding the protocols for the relocation of the modern shrine at the 13N site;
 - k. Implementing arthropod and other biological monitoring;
 - l. Working with OMKM to develop and implement a wēkiu bug habitat restoration study;
 - m. Developing and implementing an invasive species prevention and control program; and
 - n. Continuing consultations with cultural practitioners.
523. Mitigation measures accepted in the approved TMT FEIS may be considered as part of the CDUA approval process. On the basis of the evidence presented, those measures are reasonable and accurate efforts to mitigate and lessen any cultural impacts in the Mauna Kea summit area as a whole which benefit would not otherwise exist without the TMT Project.
524. The approved and unchallenged FEIS for the TMT Project identifies several mitigation measures, both direct and indirect, that are aimed at ameliorating potential impacts on the environment and cultural practices. These measures mitigate the Project's potential impacts on the environment and cultural practices so that the TMT Project will not create a substantial adverse impact to these areas.
525. The TMT Project also provides significant scientific, economic and educational benefits, which are material, substantial, and highly unique.
526. Dr. Stone's testimony and other evidence demonstrated that the TMT Project is designed

to be a world-class telescope that will provide a much more advanced and powerful ground-based observatory than currently exists anywhere on Earth. The TMT Project is designed to investigate and answer some of the most fundamental questions regarding our universe, including studies relating to the formation of stars and galaxies shortly after the Big Bang and how the universe evolved to its present form. Ex. C-1 (WDT Dr. Stone) at 3; WDT Dr. Hasinger at 2.

527. TIO has committed to a substantial community benefits package, addressed in more detail below, which has provided over \$2.5 million to date for grants and scholarships for STEM education to benefit Hawai'i students. TIO has committed to providing \$1 million annually for this program.
528. TIO will pay sublease rent to the University (the first telescope developer on Mauna Kea to do so). Those funds will be used for the management of Mauna Kea through the Mauna Kea Special Management Fund, administered by OMKM. See Ex. A-134.
529. The TMT FEIS addresses the existing natural resources within the surrounding area, community, or region, as well as the potential impacts of the TMT Project. The incremental nature of a project's impacts, standing alone, cannot endlessly justify development within an existing developed area. However, in this case, the TMT Project's compliance with all applicable rules, regulations, and requirements, the Master Plan, CMP, sub-plans, and the TMT Management Plan, along with the mitigation measures committed to in the TMT FEIS, CDUA, and TMT Management Plan, demonstrate that the TMT Project will not cause substantial adverse impact to the existing natural resources within the surrounding area, community, or region under HAR § 13-5-30(c)(4). WDT White at 7; (White) Tr. 10/20/16 at 73:1-21.
530. Further specific areas of concern presented in evidence are set forth and summarized below:

i. Biologic Resources

531. Dr. Clifford W. Smith, a witness for UHH, has extensive education and experience in the field of botany. Ex. A-37. In his words:

"I have a Bachelor of Science in Botany from the University of Wales, Bangor, U.K., a Master of Science in Botany from the University of Manchester, U.K., and a Ph.D in Botany from the University of Manchester, U.K. I taught botany and biology for 32 years.

I have been studying lichens on the summit Maunakea [sic] since 1982. A list of my publications is provided in my curriculum vitae, submitted as Exhibit A-37. I prepared the following technical report on the flora found at the proposed Thirty Meter Telescope Observatory site on the summit of Maunakea [sic] in May 2009 with a few nomenclatural amendments in 2016."

WDT of Clifford W. Smith, Ph.D; UHH Witness Statement 3 filed 10/11/2016.

532. Dr. Smith testified that the highest densities and diversity of the 21 known species of lichens tend to grow on north and west facing rocks in protected locations away from direct early morning sun exposure. WDT Dr. Smith at 10; Ex. A-3/R-3 at 3-60 to 3-62.
533. According to Dr. Smith, there are two general ecosystems or habitats in the Mauna Kea summit region. They are: (1) alpine shrub lands and grasslands, which generally occur from the 9,500-foot elevation to the 12,800-foot elevation; and (2) alpine stone desert located above the 12,800-foot elevation. Ex. A-3/R-3 at 3-59 to 3-60.
534. Vegetation generally decreases in diversity, density, and size towards the summit of the mountain, moving from alpine shrub lands and grasslands above the tree line, at roughly 9,500 feet, to a stone desert above 12,800 feet. The TMT Observatory site, the Access Way, and the Batch Plant Staging Area are located in the alpine stone desert. The plant community in the alpine stone desert consists of several species of mosses and lichens, and a limited number of vascular plants. Ex. A-3/R-3 at 3-58 to 3-62.
535. A general botanical survey of the summit area above 12,992 feet was conducted in 1982 and recorded one species of algae, no hornworts or liverworts, 12 species of moss, 25 species of lichen, one fern, and five flowering plants. All species occurred in very low abundance though there were very small, highly protected pockets where the lichens and mosses were common. WDT Dr. Smith at 1-2, 10; Tr. 12/1/16 at 189:3-190:7.
536. A 2009 comprehensive survey of Area E detected 10 lichen species, 2 species of moss, and 7 vascular plants. This survey and subsequent report determined that there is a very low diversity and cover of plants in Area E and that all of the species are found at lower elevations at least on the southern side of Mauna Kea. None of the lichen or moss species are unique to Hawai'i. WDT Dr. Smith at 5-10; Tr. 12/1/16 at 154:5-156:10, 161:8- 162:11; Ex. A-3/R-3 at 3-59 to 3-62; Ex. A-5, App. K at 12-13, 21-25.
537. There are no unique plants within the proposed project site. (Dr. Smith) Tr. 12/1/16 at 154:5-156:10, 171:11-172:4.
538. Although there is vegetation in the summit region, because of the incredibly harsh environment, there is an extremely low cover of lichens, and bryophytes (less than 1%) in the summit region. Most, if not all, types of the vegetation found in the summit region can be found at lower elevations on Mauna Kea. There are no endangered or threatened species of flora in the TMT Project area. WDT Dr. Smith at 1-2, 8, 10; Tr. 12/1/16 at 174:5- 176:13, 207-208:4.
539. There are no species of flora unique to the TMT Project site. Based on this, the TMT Project will not have a significant impact on botanical resources because species and habitat of these areas are not unique to the Project site and are found elsewhere on Mauna Kea and/or on other islands of Hawai'i. In addition, any potential impacts will be appropriately mitigated by the measures described herein. Thus, the displacement of roughly 6 acres of alpine stone desert lava habitat – which is the ecosystem located above 12,800 feet and includes the summit cinder cones – is less than significant because this represents less than 0.5% of this type of habitat available. Overall, the TMT Project will

not have a substantial adverse impact on the biological resources of Mauna Kea. WDT Hayes at 31-33; Ex. A-3/R-3 at 3-69 to 3-77, 3-214; WDT Dr. Smith at 10; Tr. 10/25/16 at 126:14-20; Tr. 12/1/16 at 156:5-156:10, 203:6-23, 209:1-212:20.

540. The only resident faunal species in the alpine stone desert ecosystem above 12,800 feet on Mauna Kea are arthropods. At least 10 confirmed resident species of native Hawaiian arthropod species have been collected near the summit, including: (1) wēkiu bugs (*Nysius wēkiuicola*); (2) lycosid wolf spiders (*Lycosa* sp.); (3) two sheetweb spiders (genus *Erigone*); (4) two mites (Family Aystidae and Family Eupodidae: both species unknown); (5) two springtails (Family Entomobryidae: two species unknown); (6) a centipede (*Lithobius* sp.); and (7) a noctuid moth (*Agrotis* sp.). Several other native Hawaiian species have also been collected near the summit but their resident status is unconfirmed. Additional arthropod species, non-native to Hawai‘i, are thought to be resident to the summit area cinder cones. Ex. A-3/R-3 at 3-62 to 3-63.
541. There are no currently listed threatened or endangered species known to occur in the Astronomy Precinct. The arthropod and botanical surveys conducted in 2008 and 2009 of the TMT Project areas in the Mauna Kea summit region did not encounter any species listed as endangered or threatened under either Federal or State of Hawai‘i endangered species statutes. The Mauna Kea Silversword, an endangered species, is known to occur at lower elevations and not at the TMT Project site. One species currently considered a species of concern by the United States Fish & Wildlife Service ("FWS"), the Douglas’ bladderfern, is known to occur in the Mauna Kea summit region. The Douglas’ bladderfern was found in Area E. However, it is known to be widespread, occurring on all main Hawaiian Islands, and on Mauna Kea it is more common to the east, in the vicinity of Area F. Area E is not considered critical habitat for the Douglas’ bladderfern. Ex. A-3/R-3 at 3-64 to 3-65.
542. Hansen was called as a witness for KAHEA. He has a Master’s of Science degree in Tropical Conservation Biology & Environmental Science and a Bachelor’s of Science degree in Environmental Science from UH Hilo. Ex. B.10b. His background is in tropical conservation, biology, and environmental science, with an emphasis on botany, conservation biology, and landscape ecology. Ex. B.10b. In May 2011, Hansen began working as a field crew leader for the Mauna Kea Baseline Botanical Survey for OMKM. Ex. B.10a (WDT Hansen) at 1.
543. Hansen is not a trained entomologist and not an expert in lichen but his testimony focused on the lichens present on Mauna Kea. He identified two endemic lichen species present on Mauna Kea. He was unsure if they were endemic to Mauna Kea only, or could be found throughout the Hawaiian Islands. Tr. 1/19/17 at 160:4-10, 167:8-10. Hansen testified to the presence of unique assemblages of lichens found at the TMT Project site. Hansen acknowledged that those species of lichen can be found elsewhere on the mountain and that the particular assemblages of lichens found at the TMT Project site could be found elsewhere. Tr. 1/19/17 at 147:7-25, 192:6-22.
544. When asked about the report prepared by his superior, Dr. Gerrish, which did not focus significantly on the assemblages of lichens that he (Hansen) testified about, Hansen

admitted that there were differences between his opinion and that of Dr. Gerrish. Specifically, Hansen noted that the report prepared by Dr. Gerrish did not consider the lichen assemblage to be "significant." Tr. 1/19/17 at 194:7-195:14.

545. Hansen testified that, in his opinion, the CDUA does not meet criterion 4 because the development of the TMT Project will "dig into the mountain, move rocks and alter substrate." Ex. B.10a (WDT Hansen) at 2.
546. The wēkiu bug was previously proposed as a candidate species for Federal listing under the Endangered Species Act. On October 26, 2011, the FWS formally removed the wēkiu bug as a candidate from the Federal Endangered Species Act stating threats to the wēkiu bug did not put the species in danger of extinction throughout all or a significant portion of its range. FWS cited OMKM's continued monitoring of the bug and its habitat, scientific studies to assist in managing and protecting the wēkiu bug's populations and habitat, the CMP, subplans, and procedure for formal review of new projects all contribute to the protection and conservation of the wēkiu bug. FWS concluded that the wēkiu bug no longer met the definition of a threatened or endangered species and no longer warranted listing. WDT Hayes at 31-32. The FWS's action is documented in the official Federal Register at 76 Fed. Reg. 66,377 (Oct. 26, 2011).
547. Wēkiu bugs are found in habitat composed of loose cinder found on cinder cones above 11,715 feet on Mauna Kea. WDT Hayes at 32. The wēkiu bug is a small "true bug" that has made a remarkable adaptation in feeding behavior. Many true bugs, including most of those found elsewhere in Hawai'i, are herbivores and feed on seeds and plant juices. The wēkiu bug is a scavenger that uses its straw-like mouth to feed on insects blown up to the summit area from the surrounding lowlands. These aeolian insects accumulate in protected pockets on the cinder cones; they quickly become moribund in the cold and thus easy prey for foraging wēkiu bugs who have adapted to the harsh conditions of the summit area. Wēkiu bugs are generally concentrated on the cinder cones in the summit area, but also utilize other habitats. Ex. A-1/R-1 at 3-6.
548. OMKM has a plan to restore wēkiu bug habitat that was prepared in coordination with the wēkiu bug working group, the FWS, and University entomologists, and is currently being implemented. Tr. 12/6/16 at 20:6-20:16 (Klasen).
549. There are six arthropod habitat types in the alpine stone desert, including:
- Type 1** Snow patches. Seasonal patches of snow accumulate insects that are blown up the mountain from lower elevations. Wēkiu bugs are thought to exploit the edges of these patches, feeding on aeolian insects as they emerge from the melting snow.
- Type 2** Tephra ridges and slopes. On cinder cones, where tephra cinders are large enough (≥ 1 cm), wēkiu bugs, spiders, caterpillars (*Agrotis* sp.) and smaller arthropods are able to move within the interstitial spaces and utilize humid, protected microhabitats among the tephra. This is the habitat where wēkiu bugs are observed in greatest abundance. Smaller arthropods, like springtails (*Collembola*), and mites inhabit smaller (≤ 1 cm) tephra cinders.

Type 3 Loose, steep tephra slopes. The unstable steep outside slopes of cinder cones where tephra cinders are smaller and subject to downward creep. Wēkiu bugs are present in low abundance in this habitat.

Type 4 Lava flows. A‘ā and pāhoehoe flows with large outcrops of andesitic (iron-poor gray lava) rock are the primary habitat for lichens and mosses, lycosid wolf spiders, and centipedes. Wēkiu bugs are uncommon in this habitat, presumably because of the lack of suitable microhabitat.

Type 5 Talus slopes and fractured rock outcrops. Usually found as islands within Type 4 habitat, these are areas of talus slopes, highly fractured rock outcrops, and depressions between lava flows with glacially deposited, rounded cobbles and rocks lie on fine loess. Small voids provide suitable microhabitat for the wēkiu bug, which can occur in moderate abundance during times of high population outbreaks.

Type 6 Compacted ash, silt, and mud. Found on roadways, disturbed areas, and where fine aeolian loess accumulates. The interstitial spaces are mostly filled with fine-grained material and therefore not suitable for wēkiu bugs and lycosid spiders. Springtails and mites are the most abundant arthropods in this habitat type.

Ex. A-1/R-1 at 3-6 to 3-7; Ex. A-3/R-3 at 3-62 to 3-64.

550. The great majority (greater than 95 percent) of the area that would be disturbed by construction of the proposed TMT Observatory and Access Way consists of Type 4, 5, and 6 habitats. Surveys conducted in 2008 and 2009 show these to be free of wēkiu bugs. Only one percent of the area that would be disturbed consists of Type 3 habitat, which the spring 2009 survey showed had a few members of this species. No wēkiu bugs were identified in the affected Type 3 habitat in the summer of 2008. Ex. A-1/R-1 at 3-7.
551. The lava substrate in Area E is not considered an ideal wēkiu bug habitat. Area E is largely comprised of Type 4 habitat, with smaller areas comprised of Type 5 habitat. The loose cinder adjacent to the existing TMT Access Way is highly suitable as wēkiu bug habitat, consisting of different sized cinders larger than 1/2 inch in a depth of 2 – 10 inches above the ash layer. The bulk of the Access Way alignment is habitat similar to the lava flow terrain in Area E (Types 4 and 5), while the rest is Type 6 habitat. No wēkiu bugs were located in Area E or the Access Way during the 2008 and 2009 sampling efforts. During the 2009 sampling effort, wēkiu bugs were only found in the cinder along the southern portion of the Access Way. Ex. A-1/R-1 at 3-7; Ex. A-3/R-3 at 3-62 to 3-66, 3- 229; Ex. A-5/R-5, App. K at 20.
552. The stockpiled cinder at the Batch Plant Staging Area has already been altered and is disturbed regularly for road maintenance activity and, thus, is not suitable wēkiu bug habitat. Activity at the Batch Plant Staging Area, does not appear to impact wēkiu bug populations elsewhere. It is unlikely that construction activities at the Batch Plant Staging Area would have any significant impact on the wēkiu bug population. Ex. A-5, App. K at 20.
553. The disturbance of prime wēkiu bug habitat (Type 3) for the TMT Project would be

limited to 0.2 acres. The amount of Type 4 and 5 wēkiu bug habitat that will be affected by the TMT Project is approximately 10 acres, which is less than 0.25% of the total more than 4,000 acres of Type 4 and 5 wēkiu bug habitat that exists at elevations above 11,700 feet. Ex. A-3/R-3 at 3-70 to 3-71, 3-229.

554. The impact to wēkiu bugs resulting from construction of the TMT Access Way will be less than significant. The total population of the species will not be significantly impacted by the disturbance of a small area of habitat along the TMT Access Way. Ex. A-3/R-3 at 3-70 to 3-77.
555. Any potential adverse impacts on the wēkiu bug and its habitat, such as dust generated from excavation and site preparation, wind-blown debris, and potential introduction of invasive species, will be mitigated by the TMT Project's planned implementation of various mitigation measures listed in the TMT FEIS and CDUA. Ex. A-3/R-3 at 3-68 to 3-77. Currently, a program for inspections for invasive species prevention and control is in place with the Big Island Invasive Species Committee. (Dr. Sanders) Tr. 1/3/17 at 80:7-19. The TMT Project also imposes requirements on materials shipped to the site from any country and any supplier to control invasive species. In other words, despite varying standards for invasive species control in other countries, the TMT Project will impose the most stringent requirements for *all* shipments to the site. (Dr. Sanders) Tr. 1/3/17 at 81:21-82:21.
556. Equipment and materials will be inspected for invasive species at lower elevations, below Hale Pōhaku. TIO follows the Mauna Kea Invasive Species Management Plan and has additional invasive species controls that augment OMKM's requirements. TIO is working with the Big Island Invasive Species Committee to implement those actions. (Dr. Sanders) Tr. 01/04/17 at 43:1-44:10.
557. The TMT Project will implement the following mitigation measures with regard to potential impacts on biologic resources, including wēkiu bugs: (1) implementation of a Cultural and Natural Resources Training Program that will give TMT personnel and construction workers an annual orientation regarding Mauna Kea's natural resources; (2) implementation of an Invasive Species Prevention and Control Program that will outline steps to be taken to avoid the potential impacts associated with invasive species; (3) pursuant to CMP Management Action FLU-6, the TMT Access Way has been designed to limit disturbance and displacement of sensitive wēkiu bug habitat, including reducing the Access Way configuration to a single lane in certain areas and paving the roadway where adjacent to such habitat to reduce dust-related impacts; (4) pursuant to CMP Management Action FLU-6, construction-phase measures will be implemented to reduce impacts to sensitive habitat and arthropods will be monitored in the area of the TMT Access Way prior to, during, and for two years after the occurrence of construction on the alpine-cinder cone habitat; (5) implementation of a Ride-Sharing Program that will reduce the number of vehicle trips per day to the summit; and (6) the planting of two new māmane trees for each māmane tree directly impacted by possible TMT Project activities. Ex. A-3/R-3 at 3-75 to 3-77.
558. TIO plans to relocate as little material from the mountain as possible. The Project will

use excavated material from the grading and excavations for the building foundations and will stockpile excess material at the Batch Plant for future use in restoration. (Dr. Sanders) Tr. 01/04/17 at 58:16-24. The only materials that TIO plans to bring in from outside of Mauna Kea are those necessary for paving and will be removed from the mountain upon deconstruction of the TMT Observatory. (Dr. Sanders) Tr. 1/3/17 at 113:13-15:23.

559. Dust generated from an unpaved road can degrade wēkiu bug habitat by filling the voids between cinder making it more difficult for the bugs to move about. There is a potential that dust generated vehicle traffic during operation of the TMT Observatory will impact wēkiu bugs. However, the bugs only occupy habitats nearby and downwind of the Project areas during periods of high population, an uncommon event, and generally are more abundant elsewhere in the Mauna Kea summit region that will not frequently receive dust from the Project areas. Nevertheless, the Access Way will be paved where it is adjacent to, but upwind of, sensitive wēkiu bug habitat. This will reduce the generation of dust. Accordingly, the potential impact to the wēkiu bug is less than significant. Ex. A-3/R-3 at 3-74. The existing roadway is required to be paved where adjacent to sensitive habitats to reduce dust-related impacts. Construction-phase mitigation measures will be implemented to reduce potential impacts to sensitive habitat. WDT Hayes at 33.
560. The paving of the TMT Access Way will not have a significant adverse impact on wēkiu bug populations. Wēkiu bugs have been seen crossing dirt roads, but none have been observed crossing paved roads. Only wēkiu bugs that occasionally cross dirt roads while dispersing during periods of high population could be impacted by the pavement. Ex. A-3/R-3 at 3-74.
561. There is no scientific evidence that the wēkiu bug population on Mauna Kea has declined since 1982. Ex. A-5/R-5, App. K at 18.
562. TMT Project impacts on biological resources is proposed to be less than significant through implementation of the Cultural and Natural Resources Training Program and Invasive Species Prevention and Control Program. Implementation of the additional mitigation measures is planned to further reduce the potential impact of the TMT Project. Ex. A-3/R-3 at 3-76 to 3-78.
563. Petitioners and Opposing Intervenors generally dispute the University's positions regarding the fauna and flora in the vicinity of the TMT Project, primarily through the testimony of Ward, Hansen, and C. Freitas.
564. Ward offered opinion testimony concerning certain entomological, biological, and botanical issues to support her claim that the CDUA is inadequate. Ward did not offer any scientific studies or data to support her opinions. Ward conceded during cross-examination that she is not an entomologist, biologist, or botanist. Tr. 1/31/17 at 132:8-11; 117:2-4; 132:2-7 (Ward). Although Ward sits on the advisory OMKM Environment Committee, her background is in horticulture, which is a distinct field from botany, entomology, and biology. *Id.*

565. Petitioners raised general concerns regarding the introduction of invasive species caused by the TMT Project. C. Freitas testified as to her concerns regarding the protocols for invasive species management. Tr. 2/21/17 at 2/21/17 at 102:25-104:13. C. Freitas failed to produce any evidence that the TMT Project will result in the introduction of invasive species, or that such introduction would result in a significant and adverse impact on the biological resources on Mauna Kea.
566. The only recent evidence of invasive species introduction to the UH Management Area is near the Hale constructed by persons opposing the TMT Project across from Hale Pōhaku. See Ex. A-135 at 1. The invasive fire ant *Ochetellus glaber* was identified in the area on or about April 16, 2015. OMKM continues to monitor the situation and has not observed *O. glaber* on the summit of Mauna Kea. Camara testified that he has never seen red fire ants on the summit and acknowledged that the summit is a harsh environment not only for the fire ant, but for arthropods and other insects as well. Tr. 3/1/17 at 198:3-9.
567. Based on the totality of the evidence, Petitioners and Opposing Intervenors have not refuted the University's extensive scientific studies, reports and testimony that the TMT Project will not have a significant adverse impact on biological resources.

ii. Archaeological and Historic Resources

568. The archaeological process generally consists of surveying the project area, a walk through, contacting people with knowledge about the area, generating maps, photographs, recordings, historical background research, and writing a report with all historical information combined. Tr. 01/04/17 at 152:23-153:18 (Rechtman). The walkthrough consists of fieldworkers walking transects, lines, and spacing intervals. The spacing intervals are spaced sufficiently to ensure the entire site can be carefully surveyed and reviewed. (Rechtman) Tr. 12/20/16 at 47:23-48:7. Archaeologists also rely on previous surveys by other archaeologists and historical maps by map makers and surveyors. (Rechtman) Tr. 12/20/16 at 135:24- 136:2.
569. Subsurface work is done on occasion. (Rechtman) Tr. 12/20/16 at 131:17-132:20. Excavations are allowed only based on a permit to conduct archaeological studies in the State of Hawai'i. (Rechtman) Tr. 12/20/16 at 136:10-18.
570. Nees was called as a witness for UH Hilo and testified in the area of archaeology, particularly archaeological investigations on Mauna Kea. Nees has expertise in archaeology and is particularly familiar with the archaeological investigations on Mauna Kea. He has extensive experience in archaeology in Hawai'i, with over 26 years in physical anthropology, historic preservation, and archaeological monitoring. He also has experience and is familiar with the historic preservation process under Haw. Rev. Stat. Chapter 6E. Reliable, probative, substantial, and credible evidence supports Nees's opinions and recommendations. Nees has actively participated in archaeological field work on Mauna Kea since 2005 and co-authored numerous inventory survey reports for Mauna Kea. Ex. A-119 (Nees CV); WDT Nees at 1; (Nees) Tr. 12/05/16 at 188:4-8. Nees was responsible for ensuring that cultural resources on Mauna Kea were properly

recorded. (Nees) Tr. 12/05/16 at 68:4-8. Nees testified that all AIS reports prepared in relation to the TMT Project comply with Haw. Rev. Stat. Chapter 6E, and its implementing regulations found in HAR §§ 13-275 through 282. Nees also testified as to the extent of cultural and historic resources present in the Mauna Kea Summit Region Historic District, and opined that the TMT Project would not result in a substantial adverse impact to such resources within the surrounding area, community or region. WDT Nees at 1-8.

571. Rechtman was called as a witness for TIO and testified about archaeological investigations for the TMT Project on Mauna Kea. Rechtman has extensive expertise in archaeology and is particularly familiar with the archaeological investigations on Mauna Kea for the TMT Project. Rechtman has been the principal archaeologist at ASM Affiliates, Inc. ("ASM") since 2013. He has spent 38 years in the field of archaeology, with extensive experience in archaeology in Hawai'i, completing more than 800 cultural resources management projects throughout the state for private parties, as well as state, county, and federal agencies. Ex. C-11 (WDT Rechtman) at 1. Those projects included compliance with Section 106 of the National Historic Preservation Act ("**NHPA Section 106**"), cultural impact assessments, archaeological assessments, reconnaissance surveys, inventory surveys, site testing, data recovery, preservation planning, burial treatment planning, and archaeological monitoring. *Id.*; (Rechtman) Tr. 12/20/16 at 37:1-38:11. He is also familiar with the historic preservation process under Haw. Rev. Stat. Chapter 6E. Rechtman conducted five archaeological studies of the TMT Project site from 2013 to 2015. These studies included archaeological monitoring reports and archaeological field reconnaissance reports of the TMT Project site. (Rechtman) Tr. 12/20/16 at 38:12-40:9; Exs. C-12, C-14; C-15; C-16; C-39. Rechtman concluded that all of the constructed features encountered were modern in nature. Ex. C-11; (Rechtman) Tr. 12/20/16 at 37:2-40:12.
572. The National Environmental Policy Act ("**NEPA**") and NHPA Section 106 apply to federal agencies and private projects that use federal funding. (Rechtman) Tr. 12/20/16 at 136:22- 137:3. If a project involves a federal undertaking, then the federal agency must conduct its own environmental review process under NEPA and NHPA Section 106. (Dr. Sanders) Tr. 1/3/17 at 83:16-23, 229:3-8. There was no federal nexus for the TMT project requiring or allowing NEPA or NHPA Section 106 compliance. (Rechtman) Tr. 12/20/16 at 211:1-11. Therefore, NHPA Section 106 does not apply, and no federal EIS is required nor allowed. Tr. 10/25/16 at 139:12-40:14, 157:2-162:4, 182:6-183:25.
573. While the National Science Foundation ("**NSF**") previously awarded a planning grant of \$250,000 to TMT Corporation, the grant specifically stated that no funds were to be used for construction. TIO has not applied for any construction funding from the NSF. (Dr. Sanders) Tr. 1/3/17 at 33:17-19, 88:7-90:25, 228:2-15; A-126. The NSF was not involved in the design of the TMT Observatory. (Dr. Sanders) Tr. 1/3/17 at 177:9-20. The NSF has stated that it has made no commitment to the construction of the TMT Observatory, and that it has not triggered the federal review processes under NEPA or NHPA Section 106. (Dr. Sanders) Tr. 1/3/17 at 88:10-25, 227:18-25; A-125.

574. Consultation under NHPA Section 106 was not required nor allowed for the TMT Project because: 1) the proposed TMT Project does not have the potential to cause effects on federally protected historic properties; and 2) the NSF funding does not convert the TMT Project into a federal undertaking for the purposes of NHPA Section 106 because such funds were provided for the limited purpose of governance planning focused on development of a partnership model for the TMT Observatory, which would serve as a model for other similar projects at other locations in the future. The TMT project is not a federal project and will not use federal funding. Exs. A-124, A-125 and A-126; (Dr. Stone) Tr. 12/19/16 at 30:2-31:7, 227:13-228:15; (Dr. Sanders) Tr. 1/3/17 at 33:14-19, 88:8-90:6.
575. Under Haw. Rev. Stat. § 6E-2, an "**Historic Property**" means any building, structure, object, district, area, or site, including heiau and underwater sites, which is over fifty years old. "**Historic Districts**" are geographically definable areas possessing a significant concentration, linkage, or continuity of contributing properties – sites, buildings, structures, or objects united by past events or aesthetically by plan or physical development. A contributing property adds to the historic architectural qualities, historic associations, or archaeological values for which a district is significant because it was present during the period of significance, and possesses historic integrity reflecting its character at that time or is capable of yielding important information about the period. Ex. A-3/R-3 at 3-40.
576. Historic properties contribute to the Historic District's significance. The natural landscape may be considered a contributing characteristic in relation to the significance of a historic site, but find spots are not given any sort of significance in terms of impacts when archaeological surveys are done and reviewed. (Rechtman) Tr. 12/20/16 at 71:19-74:6, 105:9-14, 218:3-12; Ex. A-3/R-3 at 3-12, Figure 3-1; Ex. C-12 at 3, Figure 2.
577. In 1997, SHPD instituted a process of recording "find spots." "Find spots" are cultural resources that are obviously modern features or features that cannot be classified with any confidence because of their uncertain age or function. Ex. A-11 at 2-50. Find spots are sites that could resemble historic properties (50 years older) but are likely of more recent vintage, typically shrines of recent origin that are not contributing properties to the Historic District. (Nees) Tr. 12/5/16 at 31:17-32:13, 79:13-80:1, 86:16-88:5; 218:3-12. Find spots may or may not be historic properties, contemporary, and/or made by practitioners. (Nees) Tr. 12/05/16 at 31:21-33:1; 238:15-239:7. Find spots are generally manmade features on the landscape that appear to be a more recent construction such as pile of stones on a boulder, camp sites with tin cans, pieces of glass or other modern material cultural items. They are less than 50 years old. Generally, they are structures that are of indeterminate age, but assumed to be modern. (Rechtman) Tr. 12/20/16 at 86:16-88:5, 179:25-180:8, 252:23-253:2. They are likely to be recent because they were not recorded during the first or previous archaeological visits. (Nees) Tr. 12/05/16 at 79:9-80:11; Ex. A-55 at 5-20.
578. Find spots encountered on Mauna Kea often incorporate ti leaves. Ti leaves are considered contemporary given their organic nature. Ex. A-122 at 7-49; (Rechtman) Tr. 12/20/16 at 187:23-188:4.

Several AISs have been conducted on and adjacent to the MKSR documenting the historic properties and cultural resources of the MKSR. Reports have been completed and approved by SHPD for the following areas: (1) Astronomy Precinct of the MKSR¹; (2) Mauna Kea Access Road Management Corridor; (3) the MKSR²; (4) Hale Pōhaku Rest House; and (5) the NAR. WDT Nees at 1-2; Ex. A-55; Ex. A-56; Ex. A-122; Ex. A-123; Ex. A-5/R-5, App. G, App. H, App. I.

579. In addition to these reports, archaeological surveys were conducted for the TMT Project areas. The University prepared the CRMP to identify and manage the cultural resources in the entire the University Management Areas. The University also prepared a Mauna Kea Historic Preservation Plan that was prepared in conjunction with the Master Plan. WDT Nees at 1-2; Ex. A-11; Ex. A-48, App. F; Ex. A-3/R-3 at 3-39 to 3-41, Appendices G and H; Ex A-5/R-5, App. J.
580. Rechtman and ASM prepared the following archaeological documents for the TMT Project (1) Archaeological Monitoring Report: Geotechnical Boring (2013); (2) Archaeological Monitoring Report for the Construction of a Graded Site Pad (2014); (3) Field Reconnaissance of TMT Development Site (July 2015); (4) Updated Field Reconnaissance of the TMT Development Site (Dec. 2015); and (5) Assessment of Find Spots. Ex. C-11 (WDT Rechtman) at 1-2; (Rechtman) Tr. 12/20/16 at 38:12-40:7; Exs. C-12; C-14; C-15; C-16; C-39. In preparing these studies, ASM reviewed and considered the previous archaeological studies done on Mauna Kea and the identification of find spots on the TMT Project site as a starting point. (Rechtman) Tr. 12/20/16 at 67:19-68:21.
581. In 2012, Nees's employer, Pacific Consulting Services, Inc. ("PCSI") began archaeological monitoring of sites in the UH Management Area. (Nees) Tr. 12/05/16 at 9:9-12. Annual monitoring inspections of historic properties are conducted on Mauna Kea. WDT Nees at 1; (Nees) Tr. 12/05/16 at 188: 17-20. PCSI surveyed all of the MKSR, Astronomy Precinct and the NAR, including Area E, not knowing it was the proposed TMT Project site. (Nees) Tr. 12/05/16 at 240:9-242:15.
582. There were no challenges to the acceptance of the Astronomy Precinct AIS. (Nees) Tr. 12/05/16 at 215:24-216:2. There were also no legal challenges to the TMT FEIS, including the AISs that were attached. (Nees) Tr. 12/05/16 at 216:3-8.
583. Surveys indicate that people's activities on Mauna Kea occurred on the top of the mountain area that is now the MKSR. (Nees) Tr. 12/05/16 at 55:7-18. While there is

¹ Applicant submitted into evidence copies of: (1) SHPD's December 28, 2009 letter to Dr. McCoy accepting the draft AIS of the Astronomy Precinct of the MKSR as final (Ex. A-53), and (2) SHPD's May 26, 2010 letter accepting the draft AIS for the MKSR as final (Ex. A-63). Notwithstanding that Exhibits A-53 and A-63 were not received into evidence in this contested case hearing, see Minute Order No. 44 [Doc. 553], as amended [Doc. 649], SHPD did in fact accept the AIS for the Astronomy Precinct of the MKSR by letter dated December 28, 2009 (LOG NO: 2009.4076; DOC NO: 0912TD22) and the AIS for the MKSR by letter dated May 26, 2010 (LOG NO: 2010.0066; DOC NO: 1005TD05).

² See *supra* n.1.

- also a foot trail on the summit, the trail does not connect all sites identified on the map. (Nees) Tr. 12/05/16 at 54:19-55:4; *see* Ex. A-12 at 2-27, Figure 2-5 (Historic Properties, Traditional Cultural Properties, and Find Spots).
584. There are historic (but not ancient) campsites on Mauna Kea. Historic campsites are generally identified by features such as writing or carvings on rocks and rock enclosures. (Nees) Tr. 12/05/16 at 55:20-56:20, 101:4-23.
585. The TMT Observatory site, the TMT Access Way, and the Batch Plant Staging Area are all within the proposed Mauna Kea Summit Region Historic District – Statewide Inventory of Historic Places ("**SIHP**") No. 50-10-23-26869 – as previously defined in SHPD’s Mauna Kea Historic Preservation Plan Management Components. WDT Nees at 2-3; Ex. A-48, App. F at Figure 1.
586. The Mauna Kea Summit Historic District is not currently listed on the National Register of Historic Places. Ex. A-1/R-1 at 4-3.
587. The proposed boundary for the Mauna Kea Summit Region Historic District starts at the summit and goes down to approximately the 10,000-foot level above sea level. The Mauna Kea Summit Historic District does not include Hale Pōhaku. (Nees) Tr. 12/05/16 at 26:9-21.
588. Mauna Kea has one of the largest concentrations of shrines anywhere in Polynesia. Ex. A-122 at 7-67; (Nees) Tr. 12/05/16 at 17:3-5. There are roughly over 200 sites identified as historic properties on Mauna Kea. These sites are mostly concentrated on the eastern and northeastern sides of the mountain. (Nees) Tr. 12/05/16 at 68:17-21, 115:7-19. On the southern side, within the NAR, many sites relate to the adze quarry. (Nees) Tr. 12/05/16 at 115:21-116:4. There is not a large concentration of sites outside of the NAR and adze quarry areas on the south side. (Nees) Tr. 12/05/16 at 116:6-15.
589. Mauna Kea’s archaeological landscape consists of clusters of terraces, shrines and burial sites. (Rechtman) Tr. 12/20/16 at 184:20-17.
590. Sites consisting of rock shelters and shrines and coral located in the NAR have been carbon dated to between 1280 to 1660, which predate western contact and the arrival of Captain Cook as well as the statutory historic period of 1892. (Nees) Tr. 12/05/16 at 78:2-79:7.
591. The Mauna Kea Summit Region Historic District contains significant historic properties that are linked through their setting, historic use, traditional associations, and ongoing cultural practices. These include shrines, adze quarry complexes and workshops, burials, stone markers/memorials, temporary shelters, historic campsites, traditional cultural properties, a historic trail, and sites of unknown function. WDT Nees at 2-3; (Nees) Tr. 12/05/16 at 100:21-101:3. All of these types of historic properties are contributing properties to the Historic District.
592. SHPD is not notified when modern cultural sites are located because they do not fall under historic preservation; OMKM and KKM handle those more recent sites.

- (Rechtman) Tr. 12/20/16 at 85:9-86:3. New (find spots) as well as old sites that are identified are reported to SHPD via reports completed after the survey is done.
- (Rechtman) Tr. 01/04/17 at 155:8-10. Find spots are documented and photographed, but not evaluated. (Rechtman) Tr. 01/04/17 at 155:11-21.
593. The Mauna Kea Summit Region Historic District has been determined by SHPD to be significant under all five criteria (A, B, C, D, and E), as defined in HAR § 13-275-6. Ex. A-122 at iii; WDT Nees at 2-3; Ex. A-5/R-5, App. I at 7-3; Ex. A- 1/R-1, at 4-1; (Nees) Tr. 12/05/16 at 11:14-14:1, 29:13-22, 100:21-101:3.
594. The Historic District is significant under Criterion A because of the presence of Mauna Kea adze quarry complex which is a national historic landmark which was used for a period of 500 to 700 years or more and hundreds of shrines are inside and outside of the quarry. (Nees) Tr. 12/05/16 at 12:3-11.
595. The Historic District is significant under Criterion B because of the association with several gods who may have been deified ancestors. These include Kūkahau‘ula (SIHP No. 50-10-23-21438), Līlīnoe (SIHP No. 50-10-23-21439) and Waiiau (SIHP No. 50-10-23-21440). These pu‘u were deemed TCPs by SHPD. (Nees) Tr. 12/05/16 at 12:12-23.
596. The National Register of Historic Places also identifies a category of properties called "TCPs" based on its association with the cultural practices, traditions, beliefs, life ways, arts, crafts or social institutions of a living community. (Nees) Tr. 12/05/16 at 31:8-15.
597. Some of the current activities observed in the Astronomy Precinct are by religious persons (not necessarily native Hawaiians) making offerings to the gods as they travel through the area. (Nees) Tr. 12/05/16 at 114:8-115:1.
598. Shrines embody distinctive characteristics of traditional Hawaiian stone tools manufactured by craft specialists and a distinctive type of shrines construction found only in a few other places in the Hawaiian Islands, making the district significant under Criterion C. (Nees) Tr. 12/05/16 at 12:25-13:8.
599. Studies of the Mauna Kea adze quarry complex have made a significant contribution to our understanding of Hawaiian prehistory and history, making the district significant under Criterion D. (Nees) Tr. 12/05/16 at 13:10-16.
600. The district is significant under criterion E because of the presence of numerous burials and hundreds of shrines. Many of the shrines have been interpreted as evidence of land use practices in the form of pilgrimages to the summit of Mauna Kea and Lake Waiiau to worship gods and goddesses. (Nees) Tr. 12/05/16 at 13:18-14:1.
601. Criteria to determine historic properties for uprights includes the shape of the stones, placement of stones (by man), and associated artifacts. (Nees) Tr. 12/05/16 at 77:10-18.
602. The State-recognized TCPs that are contributing properties to the Mauna Kea Summit Region Historic District include Pu‘u Kūkahau‘ula, Pu‘u Waiiau (which encloses Lake Waiiau), and Pu‘u Līlīnoe. WDT Nees at 3. SHPD declined to designate all lands on

Mauna Kea above the 6,000-foot level as a TCP. *See* Ex. A-122 at 3-26 to 3-27. WDT Nees at 3. SHPD did not designate Pu‘u Poli‘ahu as a TCP. *See* Ex. A-122 at 3-27.

603. Pu‘u Kūkahau‘ula (SIHP No. -21438) encompasses the three pu‘u that form the highest portion of Mauna Kea’s summit, Pu‘u Hau‘oki, Pu‘u Kea, and Pu‘u Wēkiu. All three pu‘u were given recent geographic names for these landmarks. Established by SHPD in 1999 as a TCP, Pu‘u Kūkahau‘ula bears the name of a legendary figure that appears in Hawaiian traditions and is particularly associated, by name, with legends about Mauna Kea. Kūkahau‘ula variously appears as the husband of Līlīnoe, a suitor or husband of Poli‘ahu, and as an ‘aumakua of fishermen. The initial area of the Access Way that begins the road leading to the TMT Project site would intersect the northwestern edge of Pu‘u Kūkahau‘ula for approximately 800 feet. Ex. A-55 at 5-15 to 5-20; WDT Nees at 3.
604. SHPD designated Pu‘u Līlīnoe as SIHP No. 50-10-23-21439. At the same time, SHPD designated Lake Waiau and the encompassing Pu‘u Waiau as the Waiau Site (SIHP No. -21440). The Waiau Site is located outside the MKSR, within the Mauna Kea Ice Age NAR. Pu‘u Līlīnoe is within the MKSR, southeast of Pu‘u Kūkahau‘ula. No portion of the TMT Project area is in or near Pu‘u Līlīnoe or the Waiau Site. WDT Nees at 3.
605. Pu‘u Poli‘ahu is a summit cone to the immediate southwest of the Astronomy Precinct. Poli‘ahu is identified as a goddess who plays a prominent role in many Hawaiian traditions pertaining to Mauna Kea. In the 1890s, W.D. Alexander proposed giving her name to a pu‘u in the summit region. No portion of the current project is located on Pu‘u Poli‘ahu. Ex. A-5/R-5, App. D at 17, 26-30; Ex. A-55 at 5-18; Ex. A-3/R-3 at 3-12 to 3-13; WDT Nees at 3.
606. Notwithstanding extensive surveying, no archaeological or historic sites, or burials have been found on the TMT Observatory site, on the TMT Access Way, or in the Batch Plant Staging Area. WDT Nees at 4; (Nees) Tr. 12/05/16 at 217:18-23. As identified in the CDUA for the TMT Project, Ex. A-1/R-1 at 4-1 to 4-5, recent surveys have recorded a few archaeological sites designated as historic properties that are in the general vicinity of the TMT project areas. Tr. 12/05/16 at 57:24-58:6.
607. The following sites are known to be in the vicinity of the TMT Access Way and TMT Observatory site:
 - a. SIHP No. -16172 was recorded as a shrine and consisted of a single upright with several support stones. SIHP No. -16172 is located about 225 feet north of the proposed TMT Observatory site.
 - b. SIHP No. -16167 was recorded as a shrine in 1982 and subsequently documented during surveys conducted in 1995, 1999, and 2007. The site consisted of two uprights placed in a bedrock crack. SIHP No. -16167 is located approximately 500 feet east of the proposed TMT Access Way, and about 1,300 feet southeast of the proposed TMT Observatory site.
 - c. SIHP No. -16166 was recorded as a multi-feature shrine with eight, possibly nine, uprights arranged in two groups. SIHP No. -16166 is approximately 350 feet east

of the TMT Access Way and 1,600 feet southeast of the proposed TMT Observatory site.

- d. SIHP No. -21449 consists of a single terrace constructed of stacked cobbles and small boulders with a surface composed of cobbles, small boulders, and thin flat slabs which were probably brought to the area by human agency. SIHP No. -21449 is located approximately 200 feet east of the TMT Access Way and 700 feet south of the proposed TMT Observatory site.

Ex. A-1/R-1 at 4-1 to 4-3; Ex. A-55; WDT Nees at 3-4; Ex. C-44.

- 608. Archaeological landscape is defined as built (man-made) structures having an age greater than 50 years old. (Rechtman) Tr. 12/20/16 at 176:3-12.
- 609. The TMT FEIS describes Site 21449 as first being recorded in 2005 and located about 200 feet east of the access road and 700 feet south of the TMT project site. Ex. A-3/R-3 at 3-44 to 3-46. The site was given a State Inventory of Historic Places number even though testing found no evidence of historic origin. An archaeological excavation was conducted to determine the presence or absence of cultural materials and to determine the site's function. No cultural materials or features were encountered and no human burials, or isolated human skeletal remains were present. This site is likely to be a natural feature. Ex. A-3/R-3 at 3-44 to 3-46; Ex. A-55 at 5-20 to 5-22; Ex. A-5/R-5 Appendix G at A-4. SHPD determined that it was not a historic site. (Rechtman) Tr. 12/20/16 at 151:5-152:10. SIHP 21449 is one of thousands of natural features that occur on that landscape. It remains labeled as a historic property because it has not lost its designation. It is not man made and not a historic site. (Rechtman) Tr. 12/20/16 at 152:13-21. For these reasons, this site is not on Figure 2 of Ex. C-12. (Rechtman) Tr. 12/20/16 at 80:5-81:10.
- 610. No subsurface archaeological work was done at the proposed TMT Project site except for the geotechnical testing. During the geotechnical testing done in 2013, no archaeological findings were identified and no water was located during the geotechnical work on the TMT Project site. Tr. 01/04/17 at 156:6-12. Archaeological monitors were present during all ground disturbing activity and observed all the materials excavated or removed during ground searching. (Rechtman) Tr. 12/20/16 at 78:22-79:6. A grading permit was acquired for the geotechnical work. (Dr. Sanders) Tr. 01/04/17 at 16:19-23.
- 611. ASM selected sites 16166, 16167 and 16172 for monitoring because they were the three closest sites to the area proposed for development of the TMT Observatory. (Rechtman) Tr. 12/20/16 at 79:16-25.
- 612. The TMT Project site and rocks were identified and evaluated before groundbreaking and grading for the road took place and before any rocks were broken up and placed in the crusher. (Rechtman) Tr. 01/04/17 at 156:13-23.
- 613. Opposing Intervenor W. Freitas asserted that there were two stones near the groundbreaking site that were dislodged. Mr. Rechtman testified that the stones were not in the area that was bulldozed. (Rechtman) Tr. 12/20/16 at 152:22-156:24. The stones

are not near SIHP 21448, SIHP 16172 or find spots 2005.08 or 2005.06. (Rechtman) Tr. 12/20/16 at 157:8-21. The stones were in the vicinity of the boundary of the TMT Project site; the TMT Project site is indicated by the large block in the middle of the pink area on the map identified as Figure 2 in Ex. C-12. Ex. C-12 at 3.

614. The lā'ī lei in the photo was placed next to the drill overnight. Ex. C-12 at 12, Figure 14. So it was placed after the drill was already there and when construction crews and the archaeological monitor were not present. (Rechtman) Tr. 12/20/16 at 157:18-158:20. Rechtman testified that in his opinion, the ti leaf lei placed under the drill on the TMT Project site is a cultural symbol of protest. (Rechtman) Tr. 12/20/16 at 190:21-191:14.
615. The determination of what sites were historic versus modern "find spots" was made using the criteria established by Dr. McCoy in 1995, based on reasonable scientific certainty. (Nees) Tr. 12/05/16 at 252:21-253:3. The definition of find spots was developed during earlier archaeological studies for rock constructions on Mauna Kea that are less than 50 years old. Those are not considered historic properties. (Rechtman) Tr. 12/20/16 at 40:24-41:3.
616. When certain find spots (like a building for example) turns 50 years old, it becomes eligible to be considered historic property. (Rechtman) Tr. 12/20/16 at 58:13-22.
617. There are a variety of ways to determine that find spots are less than 50 years old, one of which is if there has been work done at the site previously and evidence shows it was not previously in place, but exists in the place later in time. Determinations are also made by looking at the form, structure and style of the find spot. (Rechtman) Tr. 12/20/16 at 41:6-10.
618. Ex. A-11, Figure 2-9 identifies find spots and TCPs, as well as historic properties in the MKSR.
619. Two "find spots" (2005.06 and 2005.08) were identified within Area E. (Nees) Tr. 12/05/16 at 210:19-25; Ex. A-55 at 5-20. One was initially interpreted to be a possible pre-contact shrine, consisting of two upright stones, located in the northwestern portion of Area E. The second was initially interpreted to be a possible pre-contact temporary habitation complex, consisting of a C-shaped enclosure and two small terraces, located within a lava channel in the northern portion of Area E. Upon completion of a site visit and survey by SHPD staff of the two find spots, neither was determined to warrant historic property designation. The shrine was determined to be a modern structure constructed within the last 10 years. Ex. A-5/R-5, App. G at A-1 to A-3. The possible temporary habitation complex was determined to most likely be a natural geological feature that only gave the appearance of being possibly not naturally formed. Ex. A-5/R-5, App. G at A-4 to A-6. Therefore, neither of the find spots located within the TMT Project area is considered a Historic Property. Ex. A-3/R-3 at 3-44 to 3-46; Tr. 12/05/16 at 218:13-24.
620. Rope and cautionary signs were put up around find spot 2005.08 at the request of SHPD. (Rechtman) Tr. 12/20/16 at 97:21-98:15; Ex. C-38.

621. Find spot 2005.08 is not an historic property. It was constructed sometime in 2004 or 2005. (Rechtman) Tr. 12/20/16 at 98:8-101:2; Ex. C-38. This was determined based on prior archaeological studies and field work, as well as through discussions with esteemed archeologist Pat McCoy. The letter to DLNR notifying it of the site was submitted on August 22, 2014. (Rechtman) Tr. 12/20/16 at 99:2-24; Ex. C-38. No determination was made as to the origin or religious nature of find spots 2005.06 and 2005.08. (Rechtman) Tr. 12/20/16 at 147:11- 22.
622. The Updated Field Reconnaissance (Dec. 2015) survey found one additional offering, a rock stack location. (Rechtman) Tr. 12/20/16 at 112:21-25; Ex. C-16.
623. Professor Peter Mills, a witness for MKAH, is a professor of anthropology at UH Hilo. Ex. B.12a (WDT Prof. Mills). He testified that, in his opinion, the CDUA inadequately acknowledges the adverse impacts of the TMT Project to cultural practices because: 1) the CDUA underestimates the visual impact of the TMT Project on cultural practitioners; 2) while the CDUA emphasizes the physical impacts to tangible cultural resources, the CDUA does not adequately recognize the impacts to "intangible" cultural resources; and 3) the CDUA omits a number of "find spots" and SHPD sites 16169 and 21447. *See* (Prof. Mills) Tr. 1/25/17 at 39:19-40:10, 43:1-24, 78:14-25.
624. Prof. Mills admitted that he had not read the CDUA and the FEIS in their entirety. (Prof. Mills) Tr. 1/25/17 at 130:9-132:3. On cross-examination, Prof. Mills acknowledged that – contrary to his understanding – SHPD sites 16169 and 21447 are in fact referenced in the CDUA. *See* (Prof. Mills) Tr. 1/25/17 at 152:1-153:7; Ex. A-1/R-1 at Fig. 4.1. He further testified that the comment letter he submitted during the public comment period for the EIS makes no reference to "intangible interest" or the "area of effects" alleged in his present testimony. (Prof. Mills) Tr. 1/25/17 at 135:19-138:16; Ex. A-4/R-4 at 343. Prof. Mills also acknowledged that the time period to challenge the EIS or the AIS had expired. (Prof. Mills) Tr. 1/25/17 at 139:23-140:2.
625. Petitioner Flores asserts that the CDUA is deficient because it does not (1) make assessments based on criteria that are not part of the CDUA criteria, or (2) evaluate impacts that have in fact been analyzed. *See* Ex. B.02a at 11-12; (Flores) Tr. 1/30/17 at 223:5-232:17, 236:3-13 (asserting that the scope of the CDUA is wrong under State Historic Preservation Law), 236:14-239:6. Flores' WDT asserts that the CDUA does not assess the impacts of the TMT Project on historic properties or find spots.
626. The FEIS for the TMT Project, and the related AISs, which are part of the CDUA, do in fact analyze such impacts. *See* Ex. A-5, App. G at 52-57 (Archaeological Inventory Survey, Mauna Kea Summit Area); Ex. A-5, App. I. Flores also acknowledged that both the CDUA and EIS reference find spots. (Flores) Tr. 1/30/17 at 237:8-240:4. Flores testified that the AIS for the MKSR did not include the proposed TMT Project site, when in fact, it does. (Flores) Tr. 1/30/17 at 208:12-15. All relevant surveys and documents, specifically including the CDUA, were provided to SHPD for its review and comments. SHPD found no incompleteness in those submissions. WDT Nees at 2-3; *see, e.g.*, Ex. A-4/R-4 at 22-27; Ex. A-66.

627. There are pockets on the TMT Project site filled with eroded materials such as sand, cinders and silt. Rechtman testified that those pockets are identified as a sort of geologic phenomenon that takes place with the movement of a form of mini glacier that can happen overnight during the cooling process. So those are considered features that are naturally formed and derived – not archaeological features. (Rechtman) Tr. 12/20/16 at 134:2-19.
628. There was no physical evidence that the TMT Project site was used for piko, iwi, placenta or otherwise storing artifacts. (Rechtman) Tr. 12/20/16 at 145:9-12; Tr. 2/21/17 at 122:12- 123:2, 147:2-12.
629. There are natural formed terraces on Mauna Kea. Dr. McCoy excavated one terrace (SIHP 21449), but did not find any iwi, ashes, piko, or other artifacts. (Rechtman) Tr. 12/20/16 at 158:21-167:5; Ex. A-55 at 5-20 to 5-22.
630. The TMT Project site has been extensively and intensively surveyed. There are no known pre-existing burials or human remains located in the TMT Project area. Ex. C-11 (WDT Rechtman) at 1-2; Tr. 2/21/17 at 147:2-12; (Nees) Tr. 12/05/16 at 217:18-23; 211:13-16; Ex. A-5/R-5, App. G at Table 1, pages 39 and A-1 to A-6; Ex. A-55. There is no reasonable likelihood that there are burials in the surface or any opening to the subsurface on the TMT Project site. (Nees) Tr. 12/05/16 at 218:25-219:5.
631. Laulani Teale, called as a witness by Deborah Ward, is a Kanaka Maoli practitioner of many traditional and customary practices. Here is Teale's story:

"I am a Kanaka Maoli traditional practitioner and advanced student of many customary practices, such as laau lapaau and hooponopono. I also hold a Master's degree in Public Health, and have worked in peacemaking and community health development professionally for 16 years. Much of my work focuses on health issues affecting Kanaka Maoli. My mentor in this area was Dr. Richard Kekuni Blaisdell, M.D., with whom I was very close from 1992 until his death this past year.

Earth/Sky/Human Alignments

I have studied with many other kupuna as well. My first strong connection to Mauna Kea came through mentorship by Kamakahukilani Von Oelhoffen, a traditional Kanaka Maoli astronomer from a long navigational lineage who died in 1999, strongly connected to Mauna Kea, and a close student/assistant to Kupuna Pilahi Pahi.

It was through Kamakahukilani, an early member of Mauna Kea Anaina Hou, that I originally learned of that organization, of which I am a longtime member. Mauna Kea was her favorite site for observation and worship, and she taught about it a lot. Her focus was on the importance of alignments – between stars, between Earth landmarks and stars, between landmarks and other landmarks, and between people and all of the above. She also had a specific teaching about sound in relation to air/breath, water, foundations, and the individual person.

She taught that alignments in the heavens are reflected in alignments on earth, and that

these directly relate to alignments within and between human beings. Our relationships to one another, to the Earth, to pono within ourselves are all affected by natural alignments that are the product of Wakea and Papa relating to one another in the context of creation. She used strings, hands, and her wooden staff to measure these alignments. Human interference with this great act of continual alignment is very harmful. We can only relate to it as part of this great creation."

WDT of Laulani Teale, MPH; Ex. B.15a.

Teale testified that she believed the archaeology studies are incomplete. She acknowledged not having read all of the studies and provided no countervailing evidence to the contrary. (Teale) Tr. 1/11/17 at 95-96.

632. Diana LaRose was called as a witness for the Petitioner Flores-Case 'Ohana. LaRose is not a native Hawaiian practitioner, is not from Hawai'i, and admitted that she has no knowledge of Hawaiian history. Her testimony included assertions that she is able to pinpoint the locations of burials with a high degree of accuracy based on her subjective feelings, and that her feelings indicate there are burials in the summit area. Other than her feelings, LaRose was unable to point to any credible, probative or admissible evidence of actual burials she felt existed. She otherwise admitted that her testimony was speculative. (LaRose) Tr. 1/19/17 at 204-205, 214-215, 238-240. LaRose's speculation is not scientifically verifiable or logically credible.
633. Michael Lee, called as a witness by Opposing Intervenor Harry Fergerstrom, testified that his family has burial sites somewhere on the planned access road leading to the TMT Project site. He could not provide any specific location or demonstrate a specific location on or near the roadway. Lee testified as to his beliefs regarding the water god Kane on the northern side of Mauna Kea, and the significance of various find spots. Ex. D-1 (WDT Lee) at 2-11. Lee claimed to have knowledge of underground caves and burials near the access road that will be impacted by the TMT Project, but was unable to provide any concrete evidence of such underground caves and burials. Additionally, Lee claimed that the underground caves and burials are located in an area identified in Ex. D-4, which is not within the TMT Project site and is not within the MKSR area. Ex. D-4 shows a portion of the access road far removed from the TMT Project site, below the MKSR. (Lee) Tr. 1/23/17 at 39-40, 83, 146.
634. Opposing Intervenor Camara, a native Hawaiian practitioner and NAR Resource Manager, was unable to identify the location of any burials and admitted to having a "limited understanding" of any burials that might be located on Mauna Kea. (Camara) Tr. 3/1/17 at 167, 189-190.
635. Some known burials were identified well away from the TMT Project site on the way to the adze quarry and outside of the adze quarry. (Nees) Tr. 12/05/16 at 128:17-129:4. Pu'u Makaanaka is within the MKSR and the Historic District, but it is not within the Astronomy Precinct. There are 2 identified burials and roughly 8 possible more burials on Pu'u Makaanaka. (Nees) Tr. 12/05/16 at 169:17-172:22; 243:4-13; 216:9-21.

636. A burial treatment plan was prepared by PCSI for the entire MKSR and Mauna Kea Access Road Corridor, including the TMT Project site. Ex. A-138; Ex. A-139; (Nees) Tr. 12/05/16 at 216:22-24; 243:20-244:2; (Klasen) Tr. 12/6/16 at 141; Ex. A-138. The burial treatment plan was approved by the HIBC and SHPD. (Nees) Tr. 12/05/16 at 217:1-14; Ex. A-128. Burials on Mauna Kea are not excavated or disturbed. (Nees) Tr. 12/05/16 at 138:3-5. Though no burials have been identified within the TMT Project area, the burial treatment plan for the area that includes the TMT Project site provides that any burials found are to be left alone. (Nees) Tr. 12/05/16 at 199:9-14; Ex. C-11 (WDT Rechtman) at 2; (Rechtman) Tr. 12/20/16 at 40:10-12; Ex. A-5/R-5 at 39; Ex. A-138. Archaeological recommendations to redesign projects, which may include realigning a road so it does not go through a heiau, will be made if burials or other significant features such as a large complex of structures, are found even though that is highly unlikely given the prior studies that show none exist. (Nees) Tr. 12/05/16 at 139:5-13.
637. The TMT Project site has been extensively and intensively surveyed. There are no known historic properties located in the TMT Project area or on the TMT Project site. (Rechtman) Tr. 12/20/16 at 40:10-12; Ex. A-55; *see generally* Ex. A-3/R-3 at 3-15, 3-25, App. G. This was deduced based on modern properties being around the site, coupled with the fact that several earlier archaeological surveys of the TMT Project site did not identify those new properties. (Rechtman) Tr. 12/20/16 at 55:8-18; Ex. A-55 at 5-20 to 22; Ex. A-5, App. G at 39, A-1 to A-6.
638. The Batch Plant Staging Area is adjacent to the southwestern boundary of Pu‘u Kūkahau‘ula, across the Mauna Kea Access Road. No historic properties are known to be within this area. Two shrines are located in the general region of the Batch Plant Staging Area, both of which are more than 500 feet to the west: (1) SIHP No. -16164 is a shrine composed of two upright features: a) Feature 1 consists of three (possibly five) upright stones that are positioned along the edges of a low rectangular platform, and b) Feature 2 which consists of a single upright placed in a bedrock crack, supported by several cobbles. (2) SIHP No. -16165 consists of two single uprights about 1.4 meters apart along a ridge. Each upright is supported by cobbles. WDT Nees at 4-5; Ex. A-5/R-5, App. I at 3-9 and App. G at 18, 44.
639. Several features of the Pu‘u Kalepeamoia Site Complex (SIHP No. 50-10-23-16244) are in the general vicinity of HELCO’s Hale Pōhaku Substation. Two lithic scatters were designated as SIHP Nos. 50-10-23-10310 and -10311. These sites eventually underwent archaeological data recovery after increased erosion made preservation difficult. The data recovery fieldwork demonstrated the presence of both lithic workshops and manufacturing areas for octopus lure sinkers. WDT Nees at 5; Ex. A-5/R-5, App. I at 3-13.
640. In addition to the lithic scatters, two shrines are located across the four-wheel drive access road and to the south about 190 feet away from Hale Pōhaku. SIHP No. -10313 is a shrine with three to five upright stones, and SIHP No. -10315 is a single upright shrine. The shrines and lithic scatters are over 1,200 feet from the HELCO substation and from the nearest electrical pull box that will be accessed when the conductors in the existing conduits are replaced. None of the actions required to construct the TMT Project will

affect those historic properties. WDT Nees at 5.

641. Only one known archaeological site is present near HELCO's Hale Pōhaku Substation, where transformer swaps will occur. SIHP No. -10320 (also part of the Pu'u Kalepeamoia Site Complex) is a lithic scatter that lies about 200 feet west of the existing substation. None of the potential TMT Project activities in this area will be carried out near this site. WDT Nees at 5.
642. Sites on the summit and near Hale Pōhaku were used to produce fishing (octopus) lures. (Nees) Tr. 12/05/16 at 37:13-25. A pre-1778 fishing tool was identified on Mauna Kea and is detailed in the archaeological monitoring reports. (Nees) Tr. 12/05/16 at 207:13-24.
643. The AIS fieldwork was carried out in accordance with the prevailing professional standards. WDT Nees at 8; (Nees) Tr. 12/05/16 at 47:19-22. Generally, cultural practitioners are not present as consultants when archaeologists are performing field surveys. (Nees) Tr. 12/05/16 at 109:18-110:8.
644. The historic preservation work that Nees and his employer prepared with respect to the TMT Project to identify historic sites within the MKSR was done in compliance with Chapter 6E, the Historic Preservation Law. The work was reviewed by SHPD. The results of the reports were fully approved and accepted by SHPD. (Nees) Tr. 12/05/16 at 215:8- 23; WDT Nees at 8. All of the AISs done for the summit area of Mauna Kea have been reviewed by SHPD. SHPD has determined that the TMT Project would have no significant adverse impact on historic properties. *See, e.g.,* Exs. A-66, A-137.
645. SHPD recognized that the proposed mitigation measures to address impacts to cultural practices and visual impacts in the TMT Project's application documents (including the CDUA and EIS) address the project-specific and cumulative impacts to the Mauna Kea Summit Historic District and the TCPs from existing observatories on the summit. Ex. A-137 at 1.
646. TIO developed an Archaeological Monitoring Plan and submitted the draft to SHPD for review and approval on September 20, 2012. SHPD approved the TMT Archaeological Monitoring Plan on April 24, 2013. *See* (Nees) Tr. 12/05/16 at 197:20-198:18; WDT Nees at 6; Ex. A-142; Ex. C-13.*

** Applicant submitted into evidence Exhibits A-141 (Historic Preservation Mitigation Plan In Support of Construction of the Thirty Meter Telescope in the Astronomy Precinct, dated Sept. 2012) and A-143 (Letter from SHPD to PCSI approving Ex. A-143). Notwithstanding that Exhibits A-141 and A-143 were not received into evidence in this contested case hearing, see Minute Order No. 44 [Doc. 553], as amended [Doc. 649], the Historic Preservation Mitigation Plan (Ex. A-141) does in fact exist, a draft of which is attached as Appendix A to the TMT Management Plan in Ex. A-1/R-1 and referred to in SHPD's letter dated December 1, 2010 (Ex. A-137).*

647. A portion of the Batch Plant Staging Area will be restored to a more natural condition upon completion of TMT Project construction. The TIO will also fund restoration of the

- closed access road on Pu‘u Poli‘ahu to its natural state to address visual impacts of astronomy-related development on the summit region of Mauna Kea. WDT Nees at 7; Ex. A-1/R-1, Ex. B, App. A, at A-9.
648. The TMT Project will develop and implement construction best management practices to avoid potential disturbance of land beyond the planned limits of disturbance. WDT Nees at 7; Ex. A-1/R-1, Ex. B, App. A at A-9.
649. The TMT Project will camouflage the existing HELCO pull-boxes and other utility boxes that are visually distracting or intrusive at the summit as well as other key locations on Kūkahau‘ula by treating them so that they blend and integrate visually with the natural environment. WDT Nees at 7; Ex. A-1/R-1, Ex. B, App. A at A-9.
650. The TMT Project will develop and implement a Cultural and Natural Resources Training Program, as required by the CMP and to help mitigate any potential effects on historic properties generally. Cultural event training as a part of mitigation would benefit the public and cultural practitioners. (Nees) Tr. 12/05/16 at 64:9-20. As discussed in the CMP, the Cultural and Natural Resources Training Program will include educational instruction and materials designed to: (1) 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; (2) make it clear that any disturbance of a historic property is a violation of Haw. Rev. Stat. § 6E-11, and punishable by fine; and (3) provide guidance and information about what constitutes respectful and sensitive behavior within the summit area. Ex. A-3/R-3 at 3-51 to 3-52; WDT Nees at 7.
651. To mitigate the TMT Observatory’s visual effect within the Historic District, the TMT Observatory specifically chose site 13N within Area E. Additional design efforts to reduce the Observatory’s size, finish, and coloring have been taken to address the TMT Observatory’s potential visual impact. The TMT Observatory will not be visible from Pu‘u Wēkiu (which is the actual summit of Mauna Kea), Lake Waiau, and Pu‘u Līlīnoe, three traditional cultural properties in the summit region of Mauna Kea. Ex. A-3/R-3 at S-12, Table ES-1, 3-31 to 3-32, Ex. A-5/R-5, App. G at 57-58 & Figure 26; WDT Nees at 6; Ex. C-18. This is due to the presence of the northern ridge of Kūkahau‘ula (Pu‘u Wēkiu) blocking the view from the summit peak. Ex. A-3/R-3 at 3-31.
652. Rechtman testified that he and members of the ASM team have participated in OMKM’s cultural orientation. Rechtman has participated in 3 orientations to date. (Rechtman) Tr. 12/20/16 at 82:2-83:11. The orientation included discussions regarding cultural resources and find spots related to native Hawaiian traditional and customary practices. (Rechtman) Tr. 12/20/16 at 83:23-: 84:2.
653. Two of the ASM staff members who worked on the TMT Project reports are native Hawaiian, including the cultural monitor. (Rechtman) Tr. 12/20/16 at 214:17-215:22.
654. To mitigate the TMT Access Way’s effect on Pu‘u Kūkahau‘ula and the Historic District, the Access Way has been devised to reduce disturbance by designing it as a single lane

configuration in certain areas, and coloring the pavement of the roadway to blend with the surroundings, and paving the roadway for a length of approximately 1,600 feet. Ex. A-1/R-1 at 2-14; WDT Nees at 6.

655. To mitigate the general effects of the development of the TMT Observatory, the Project will work with OMKM and 'Imiloa to develop exhibits for the VIS and 'Imiloa regarding cultural and archaeological resources as well as to develop a TMT outreach office that will work with 'Imiloa and native Hawaiian groups to support and fund programs specific to Hawaiian culture and archaeological resources. Ex. A-3/R-3 at 3-52 to 3-54; WDT Nees at 8.
656. The TMT Project will not result in the loss or significant destruction of any historic properties within the MKSR. Physical impacts on the only two historic properties physically affected, Pu'u Kūkahau'ula and places in the Mauna Kea Summit Region Historic District, will be minimal and will not be significant. The TMT Project will not have a substantial adverse impact on any historic properties within the MKSR. Ex. A-3/R-3 at 3-48 to 3-55.
657. Appropriate mitigation for archaeological and historic properties may consist of keeping the status quo or omitting some proposed actions. (Nees) Tr. 12/05/16 at 60:8-61:12.
658. The mitigation measures for addressing any effects on cultural practices that have been developed for the TMT are consistent with those stipulated in the CMP and CRMP. WDT Nees at 8; (Nees) Tr. 12/05/16 at 47:11-17. The mitigation measures contained in the CMP and CRMP are sufficient to protect historic sites. (Nees) Tr. 12/05/16 at 50:12-16.
659. PCSI conducts ongoing monitoring of the archaeological and historic sites on UH Hilo-managed lands. Monitoring entails going back to the sites previously recorded and then documenting, photographing and re-mapping those sites in order to assess any changes, alterations or damage. WDT Nees at 1; (Nees) Tr. 12/05/16 at 98:1-4; 188:18-25. Monitoring is done by returning to the sites once a year. The entire MKSR is surveyed once every five-year period. (Nees) Tr. 12/05/16 at 96:6-97:13.
660. ASM's archaeological monitoring for the TMT Project site consisted of monitoring the little road extension, the grading of the loop road, and all of the bore locations as shown on Ex. C-12, Figure 6 (Map of Bore Locations). (Rechtman) Tr. 12/20/16 at 92:15-23.
661. The ASM archaeological monitor did not notice any oil spots or residue on the ground associated with drilling activities on the TMT Project site. (Rechtman) Tr. 12/20/16 at 96:14-17.
662. New ahu, shrines, and other features were located and documented in annual monitoring done during the period 2012-2016. (Nees) Tr. 12/05/16 at 189:9-14. These ahu or properties documented during this period were not reported to SHPD because they are considered recently constructed find spots. (Nees) Tr. 12/05/16 at 189:16-20.
663. A few practitioners construct ahu on Mauna Kea today, although in some instances, their construction and location are based more on political disagreements over land uses rather

than cultural practices. (Nees) Tr. 12/05/16 at 192:7-19; (W. Freitas) Tr. 3/2/17 at 184:22-188:14; 194:20- 194:24, 199:2-199:22, 201:12-202:4, 252:12-253:12, 259:4-266:22, 268:13-269:13; Tr. 2/16/17 at 25:22-26:3, 91:7-13.

664. Petitioners called witnesses Aloua, Rios, and Dr. Abad to argue that the archaeological studies conducted in connection with the TMT Project are inadequate.
665. Ruth Aloua, a witness for Petitioner Flores-Case `Ohana, is a "Kanaka Maoli (Native Hawaiian) and cultural practitioner from Kailua-Kona." WDT of Ruth Aloua, Ex. B.24a. In her words:

"I received my Bachelor of Arts in Anthropology from the University of Hawai'i at Hilo in 2011. Three years later in 2014 I graduated from Simon Fraser University in British Columbia, Canada with a Master of Arts in Archaeology. I have worked as an archaeologist for private firms and the National Park Service. The knowledge that I gained through these experiences is implemented through community organizing and through the restoration of Kaloko Fishpond where I am a *kia'i loko* (fishpond guardian). When not in the fishpond or attending community meetings, I spend my time farming as an organic farmer growing a wide range of produce and raising pasture animals. My knowledge and skills range from familiarity with archaeological and anthropological practices, policies, management plans, at the county, state, and federal level, agriculture and aquaculture food production, to place-based knowledge grounded in the people, place, and culture of the Kona District.

My testimony provides insight into several issues regarding missing assessments, inaccurate findings, questionable conclusions and inconsistencies made by researchers regarding the archaeological resources and cultural practices associated with Mauna Kea."

WDT of Ruth Aloua, Ex. B.24a.

666. Aloua testified that the archaeological studies conducted in connection with the TMT Project fail to, *inter alia*: 1) take into account the impacts to the Mauna Kea Summit Region Historic District 2) include adequate consultation of cultural practitioners; and 3) adequately consider impacts to find spots "CSH 1" and "CSH 2." Ex. B.24a (WDT Aloua) at 1-2; (Aloua) Tr. 2/14/17 at 203:2-206:22; (Aloua) Tr. 2/15/17 at 15:1-20:12; *see* Ex. A-140.
667. Aloua's *curriculum vitae*, as well as her written and oral testimony itself, demonstrated that she lacks the requisite historical practice and expertise as a credible scientific expert. Ex. B.24b (CV Aloua); Tr. 2/14/17 at 201:8-12; Tr. 2/15/17 at 44:6-60:23. Aloua did not review the CDUA, EIS, or their incorporated documents in depth, nor did she review the archaeological studies conducted for the MKSR and the Astronomy Precinct. (Aloua) Tr. 2/14/17 at 202:22-203:1, 206:11-15; (Aloua) Tr. 2/15/17 at 61:8-70:8. Aloua was not aware that issues she raised in her testimony were in fact specifically addressed in the EIS and referenced archeological documents. (Aloua) Tr. 2/15/17 at 66:3-86:4. Aloua could not provide a qualified and informed opinion regarding the archaeological studies

conducted in connection with the TMT Project. Accordingly, little weight is afforded Aloua's testimony that challenges those studies and reports.

668. Rios testified that the examination of archaeological/historic resources failed to take into account the intangible relationships between certain features on Mauna Kea. Rios's testimony was based primarily on her stated ability to connect with and receive information from a spiritual realm. Rios testified that she received 'ike kupuna (or ancestral insight) that certain ahu or shrines are energetically connected to one another, are aligned with certain tides, and connect as a portal to the celestial bodies of the universe. (Aloua) Tr. 2/15/17 at 149:1-152:23. Rios's testimony does not prove unverifiable and intangible connections between certain ahu or shrines on Mauna Kea that may be affected by the TMT Project. Even if such connections were assumed, Rios's testimony failed to provide tangible, logical, scientific, or admissible evidence of specific connections that would be affected by the TMT Project.
669. Dr. Abad is the director of Kealaiwikuamo'o at Kamehameha Schools and received her Ph.D. in anthropology with a specialization in Hawaiian archaeology from the University of Hawai'i at Manoa. Ex. B.08b (CV Dr. Abad). Her opinion that the CDUA does not meet the criterion stated in HAR § 13-5-30(c)(4) is based on her opinion that the CDUA does not adequately consider the appropriate "region" surrounding the TMT Project site, and the CDUA does not adequately address impacts on certain cultural sites, cultural practices and historic properties. Ex. B.08a (WDT Dr. Abad) at 5-12. A large portion of Dr. Abad's testimony focused on her assertion that the unit of analysis for the CDUA should be at a regional level based upon legal requirements, as well as archaeological and cultural considerations. Dr. Abad was unable to specify exactly what larger region should have been considered in the CDUA. Dr. Abad acknowledged that the CDUA did in fact address areas of concern in a larger region outside of the project area, outside the MKSR, and within the historic district, including Lake Waiau and Kūkahau'ula. Dr. Abad also acknowledged that section 3 through 8 of the AIS were included in the CDUA for consideration. (Dr. Abad) Tr. 1/19/17 at 22:2-25:6, 129:14-133:21.
670. In Dr. Abad's opinion, the proposed mitigation measures for the TMT Project do not "outweigh" the negative impacts of the project. Ex. B.08a (WDT Dr. Abad) at 18-19. Dr. Abad's assertion is unpersuasive given her personal biases and her opinion that the TMT Project would cause harm no matter where it is located on Mauna Kea. (Dr. Abad) Tr. 1/19/17 at 135:18-23.
671. Dr. Abad also placed great emphasis on Bulletin 38 (Ex. B.01i), claiming it should be afforded significant weight due to its status as a federal government document and that it should be considered authoritative on the subject of historic properties. Ex. B.08a (WDT Dr. Abad) at 15-16; (Dr. Abad) Tr. 1/19/17 at 36:15-37:20, 40:4-10.
672. Bulletin 38 is not applicable because the TMT Project is not a federal project. Furthermore, Bulletin 38 does not support Dr. Abad's position concerning the immovability of significant historic properties:

The fact that the community as a whole may be willing to

dispense with the property in order to achieve the goals of the project does not mean that the property is not significant, but ***the fact that it is significant does not mean that it cannot be disturbed, or that the project must be foregone.***

Ex. B.01j at 4 (emphasis added); Tr. 1/19/17 at 136:4-141:3.

673. While Dr. Abad claimed her views are based in part on applicable law, she is not an attorney, and has not reviewed applicable case law, including the Hawai'i Supreme Court's *Kilakila O Haleakalā* opinion, in preparing her testimony. Tr. 1/19/17 at 129:2-11.
674. Ching testified as to certain alleged inadequacies in the archaeological studies and analyses conducted in connection with the TMT Project. See, e.g., Tr. 1/24/17 at 206:5-208:7, 223:1-223:14. Ching has no education or experience in the field of archaeology.
675. Petitioners and Opposing Intervenors have not refuted the University's prima facie showing that the TMT Project will not have a significant impact on archaeological and historic resources.

iii. Cultural Resources and Practices

676. Traditional and customary cultural practices have been defined as those customs and practices of a living community of people that have been passed down through generations, usually orally or through practice. Traditional and customary cultural practices are those practices that fall within the purview of Article XII, Section 7 of the Hawai'i State Constitution. Ex. A-67 at 1-2; Ex. A-11 at 2-18 to 2-19.
677. Some native Hawaiians consider the large number of shrines as evidence of Mauna Kea being a sacred center. These shrines have been interpreted as remains of the historically undocumented but now known pattern of pilgrimage to worship, presumably the snow goddess Poli'ahu and other mountain gods and goddesses such as Kūkahau'ula, Līlīnoe, and Waiau. Ex. A-122 at 7-12; (Rechtman) Tr. 12/20/16 at 185:18-186:8.
678. There is current evidence of at minimum two functional classes of shrines in the MKSR: (1) occupational specialist shrines related to adze manufacture, and (2) all others, which appear to be non-occupational. Ex. A-122 at 6-14; *see generally* Ex. A-122 at 6-53 to 6-75.
679. Prior to Western contact, Mauna Kea was considered by some accounts kapu, uninhabitable and not available to the general public for areas above the habitable tree line. (Rechtman) Tr. 12/20/16 at 193:24-194:3; *see also* Ex. A-122 at 2-19. David Malo, who was a contemporary of pre-Western contact times, reported that such areas were considered a wasteland and off limits above the tree line for lack of utility. *See* Ex. A-122 at 2-19, 7-16 to 7-17, 7-62.
680. Mauna Kea has been referred to as a burial ground and a living temple. (Rechtman) Tr.

12/20/16 at 194:4-10.

681. Mauna Kea and its summit cinder cone to this day still play an important role in religious and cultural practices to many native Hawaiians and non-native Hawaiians. Ex. C-12 at 1; (Rechtman) Tr. 12/20/16 at 218:8-11.
682. Lithic materials found along the trail, and among shrines, burials, and dwelling structures, were markers on the routes that pre-contact adze makers used. These include nine pathways to various sections of Hawai'i Island. Ex. A-122; (Rechtman) Tr. 12/20/16 at 186:21-187:6.
683. Some Native Hawaiians have traditionally viewed the summit region, including Kūkahau'ula, as the realm of the ancestral akua (gods, goddesses, deities) who are believed to take earthly form as the pu'u, the waters of Lake Waiau, and other significant features of the mountain's landscape. A number of traditional and customary practices are derived from these beliefs which have led to related contemporary cultural practices. Ex. A-11, Section 4.2.1.1; Ex. A-5, App. I at 2-9 to 2-12.
684. Notwithstanding the University's position that cultural practices do not appear to be encompassed by the definition of "Natural resource" contained in HAR § 13- 5-2, both the University and the DLNR identified and assessed such practices as resources to be considered under the criterion of HAR § 13-5-30(c)(4).
685. The TMT Project considers and provides efforts to mitigate negative impacts to culture. Tr. 11/15/16 at 136:16-137:7. The CDUA relies on the consultation and findings of the FEIS, including the cultural inventory assessments contained therein as well as the extensive public comment letters and responses. (White) Tr. 10/20/16 at 57:12-21; (White) Tr. 10/24/16 at 170:14-20, 226:18-24. The University and developers of the TMT Project engaged in direct and regular consultation with Kahu Kū Mauna. (White) Tr. 10/20/16 at 63:6-13. The HAR do not require the University to separately retain or consult cultural practitioners for purposes of preparing the CDUA.
686. Numerous research studies, plans, and impact assessments have been prepared in recent times documenting the cultural practices and resources on Mauna Kea, including native Hawaiian traditional and customary practices. These various materials include:
 - a. the CMP, which provides information and management actions to protect, preserve, and enhance the cultural resources and native Hawaiian traditional and customary practices of Mauna Kea within the UH Management Area (Ex. A-9);
 - b. the CRMP, which provides an overview of cultural resources and was formulated to ensure that the University fulfills its mandate to preserve and protect cultural resources and native Hawaiian traditional and customary practices within the UH Management Area (Ex. A-11);
 - c. "Mauna Kea-Ka Piko Kaulana o ka 'Āina" (meaning "Mauna Kea-The Famous Summit of the Land"), which provides a review of historic records and information collected through oral history interviews with

- kūpuna and kama'āina pertaining to Mauna Kea (Ex. A-5/R-5 at App. F);
- d. the Mauna Kea Master Plan, which includes an Oral History and Consultation Study and Archival Literature Research (Ex. A-48, App. I) and a CIA (Ex. A-48, App. N; Ex. A-5, App. E);
 - e. the FEIS for the TMT Project including all public comment letters and responses (Ex. A-3/R-3);
 - f. the CIA produced for the TMT FEIS (Ex. A-5/R-5 App. D);
 - g. the AIS for the Mauna Kea Summit Region produced for the TMT FEIS (Ex. A-5/R-5 at App. G);
 - h. the TMT CDUA (Ex. A-1/R-1);
 - i. the TMT Management Plan (Ex. A-1/R-1 at Ex. B);
 - j. the TMT Draft Historic Preservation Plan (Ex. A-1/R-1 at Ex. B, App. A);
 - k. the TMT Historical and Archaeological Site Plan (Ex. A-1/R-1 at Ex. B, App. C);
 - l. the Mauna Kea Historic Preservation Plan Management Components (Ex. A-48 at App. F);
 - m. the Archaeological Assessment Report for Hale Pōhaku (Ex. A-5/R-5 at App. H);
 - n. the Final Environmental Assessment for the CMP (Ex. A-51);
 - o. the Final AIS for the Mauna Kea Access Road Corridor (Ex. A-56); and
 - p. the Final AIS for the MKSR and the Final AIS for the Astronomy Precinct [Ex. A-55; *see also* (Nees) Tr. 12/05/16 at 49:10-12 (Mr. Nees confirming the AIS for MKSR and Astronomy Precinct, respectively, included the TMT Project site but were not performed specifically for the TMT Project)].

Ex. A-3/R-3 at 3-8 to 3-10.

687. The CRMP found that there are a number of different kinds of cultural practices occurring on Mauna Kea. There are two broad categories of cultural practices: (1) traditional and customary practices, and (2) contemporary cultural practices. Ex. A-11 at 2-18 to 2-19.
688. Numerous research studies, plans, and impact assessments identify the potential impacts the TMT Project and astronomy-related development may have on cultural practices and resources, including native Hawaiian traditional and customary practices. These include, but are not limited to, the following:
 - a. the CMP (Ex. A-9);
 - b. the CRMP (Ex. A-11);
 - c. the FEIS for the TMT Project, including all public comment letters and

- responses (Ex. A-3/R-3);
 - d. the CIA produced for the TMT FEIS (Ex. A-5/R-5 at App. D);
 - e. the AIS for the Mauna Kea Summit Region produced for the TMT FEIS (Ex. A-5/R-5 at App. G);
 - f. the TMT CDUA (Ex. A-1/R-1);
 - g. the TMT Management Plan (Ex. A-1/R-1 at Ex. B);
 - h. the TMT Draft Historic Preservation Plan (Ex. A-1/R-1 t Ex. B, App. A);
 - i. the TMT Historical and Archeological Site Plan (Ex. A-1/R-1 at Ex. B, App. C);
 - j. the Mauna Kea Historic Preservation Plan Management Components (Ex. A-48 at App. F);
 - k. the Archeological Assessment Report for Hale Pōhaku (Ex. A-5/R-5 at App. H);
 - l. the Final Environmental Assessment for the CMP (Ex. A-51);
 - m. the Final AIS for the Mauna Kea Access Road Corridor (Ex. A-56);
 - n. the Final AIS for the MKSR; and
 - o. the Final AIS for the Astronomy Precinct (Ex. A-55; *see also* (Nees) Tr. 12/05/16 at 49:10-12 (Mr. Nees confirming the AIS for MKSR and Astronomy Precinct, respectively, included the TMT Project site but were not performed specifically for the TMT Project).
689. No known customary and traditional practices occur within the Area E location site of the TMT Observatory.
690. W. Freitas testified that he began conducting his practices on the summit of Mauna Kea in 2015, the same time he began actively opposing the TMT Project. (W. Freitas) Tr. 3/2/17 at 252:23-253:12. It was during this time that W. Freitas oversaw the construction of two new ahu structures in the TMT Project site area that were built, in part, as a response to the TMT Project. (W. Freitas) Tr. 3/2/17 at 194:20-194:24, 199:2-199:22, 201:12-202:4, 259:9- 259:17
691. There are no known burials or funerary relics of any significance found or located within the TMT Project site and no proof of any related ongoing cultural or historical practice of any significance. Ex. C-11 (WDT Rechtman); Tr. 2/21/17 at 147:2-12; (Nees) Tr. 12/05/16 at 217:18-23; 211:13-16.
692. The new structures (ahu) built on or near the TMT Project site are modern practices because they were built within the last two years and appear to be, at least in part, for the purpose of protesting the TMT Project by W. Freitas and others. (Nees) Tr. 12/05/16 at 253:14- 22; Tr. 3/2/17 at 259:4-262:17, 268:13-24. The two ahu were encountered by Rechtman during a field reconnaissance survey of the TMT Project site and the access road on July 7, 2015. (Rechtman) Tr. 12/20/16 at 169:16-21. It has not been conclusively

established that the two uprights are in fact on the TMT Project site, but they are near the boundary of the TMT Project site. (Rechtman) Tr. 12/20/16 at 88:6-14.

693. Archaeologists generally would not classify a new construction as a cultural placement unless they witnessed it being constructed by a cultural practitioner. (Rechtman) Tr. 12/20/16 at 41:21-42:4. However, upright stones and ahu are generally associated with traditional, religious or spiritual practices. (Rechtman) Tr. 12/20/16 at 147:24-148:4. W. Freitas testified he conducted no prior practices on Mauna Kea before he assisted in constructing the ahu. He constructed the ahu on the existing access roads to the TMT Project knowing it would interfere with and block construction workers and traffic to the proposed approximate 5- acre TMT Project site within Area E. (W. Freitas) Tr. 3/2/17 at 198:11-199:25, 232:5-11, 252:7- 254:23.
694. Archaeologists do not distinguish between religious, cultural and spiritual significance when assessing a modern cultural placement. Archeologists describe what is present at a site. If it is determined to be modern, whether it is marking a foundation for a weather station or consists of a spiritual offering, it is not analyzed or evaluated within the archaeological study. Its existence is documented. (Rechtman) Tr. 12/20/16 at 45:22-46:11.
695. A cultural act does not exclude a spiritual act. (Rechtman) Tr. 01/04/17 at 147:22-148:7.
696. A ho‘okupu (offering) is something that is left at a place by somebody to commemorate something (sometimes consisting of one or two rocks stacked on each other). (Rechtman) Tr. 12/20/16 at 107:25-108:2, 109:14-18. Not all ho‘okupu are considered native Hawaiian cultural offerings but some are considered other than traditional. (Rechtman) Tr. 12/20/16 at 108:3-6.
697. Likewise, Prof. Flores testified that he believes that all spiritual and cultural practices are one and the same, but that not all religious practices are spiritual and cultural. (Flores) Tr. 1/30/17 at 234:9-19.
698. The rock ho‘okupu or ti leaf wrapped offerings and sites are not similar to the other type of historic properties found on the summit of Mauna Kea. (Rechtman) Tr. 12/20/16 at 109:19-24.
699. Opposing Intervenor Temple of Lono argued that non-native Hawaiians can take part in the traditional Hawaiian faith. Mr. Rechtman testified as to his belief that non-native Hawaiians can practice the traditional Hawaiian faith, but such rights are recognized as constitutionally protected only for native Hawaiians. (Rechtman) Tr. 01/04/17 at 142:25-143:9.
700. Recent uprights could be connected to native Hawaiian cultural practices that may be entitled to protection, if reasonably exercised. (Nees) Tr. 12/05/16 at 88:7-13. For example, if the practice results in a land use such as the building of a structure, or introduction or new material, or the movement of natural features on Conservation District zoned lands, such practice would be reviewed under Conservation District Rules, or Administrative Rules related to the land designation, such as Forest Reserve or Natural

Area Reserves. (Nagata) Tr. 12/12/2016 at 26: 3- 16; Ex. L-18. Modern cultural practices are identified based on the movement or rearrangement of uprights. (Nees) Tr. 12/05/16 at 97:15-19.

701. No known traditional and customary practices are associated with the proposed 5-acre TMT Project site. Since 2015, contemporary Hawaiian practices have taken place on the site, including the construction of two ahu. *See, e.g.*, Ex. T-1 at 3; (Prof. Johnson) Tr. 02/16/17 at 21:13-18, 25:22-26:3, 91:7-13.
702. The Mauna Kea summit also known as Kūkahau‘ula (cluster of cinder cones) is considered to be a wahi pana, or storied place. It serves as a site for various practices including traditional and modern shrine construction, pilgrimage, prayer, and offerings. Ex. A-1/R-1 at 4-6; Ex. A-5/R-5, App. D at 185, 191-194; Tr. 2/16/17 at 19:1-16.
703. Petitioners offered evidence that building the TMT Project on Mauna Kea offends, and is contrary to the beliefs of some members of the community, including some native Hawaiians. Petitioners also acknowledge that native Hawaiian cultural and religious practices are not codified, but rather are individual and personal in nature and vary from practitioner to practitioner. *See, e.g.*, (Pisciotta) Tr. 2/13/17 at 108:5-16; (Case) Tr. 1/11/17 at 228:1- 229:25; (Dr. Abad) Tr. 1/19/17 at 77:2-78:1; (Kihoi) Tr. 2/14/17 at 110:1-111:7, 122:12-131:9. There is no single native Hawaiian viewpoint or opinion on any subject, including the TMT Project. Some native Hawaiians, including native Hawaiian cultural practitioners with lineal or other significant ties to Mauna Kea – such as Ishibashi and Baybayan – support the TMT Project and testified that it would have no adverse impact on their cultural practices. *See* Ex. A-138a; WDT Baybayan at 1; WDT Ishibashi at 1-3; (Baybayan) Tr. 11/02/16 at 15:11-15:14.
704. Dr. Coleman and Dr. Kaluna are native Hawaiians who conduct cultural practices on Mauna Kea and testified that the TMT Project would have no adverse impact on their practices. (Dr. Kaluna) Tr. 1/5/17 at 21:12-20, 25:14-26:4, 96:7-23. Although he does not consider himself a cultural practitioner, Warfield, a native Hawaiian member of PUEO, testified in support of the TMT Project, despite his personal and cultural ties to Mauna Kea. WDT Warfield at 1-2; (Warfield) Tr. 2/15/17 at 190:22-198:25. Likewise, even though he does not consider himself a cultural practitioner, N. Stevens does conduct cultural practices on the summit of Mauna Kea and testified that the TMT Project will not impact his practices. (Stevens) Tr. 12/16/16 at 194:13-23, 216:15-217:4.
705. Jonathan Kay Kamakawiwo‘ole Osorio, Ph.D. was called as a witness by KAHEA. Here is his story:

"I was born in Hilo, Hawai‘i and currently reside in Honolulu. My father was born in Hilo to Eliza Leialoha Kamakawio‘ole whose parents and ancestors come from Hāmākua and Kohala. My mother’s maternal great grandmother, Pi‘ikea was born in Keauhou, Kona. Ancestors on both sides of my family are pili i ka mokupuni ‘o Hawai‘i.

I am also Professor of Hawaiian Studies at the University of Hawai‘i Mānoa where I have taught courses in the history of the Hawaiian kingdom, history of music, history of law

and Hawaiian literature since 1992. I have been a member of the board of directors of KAHEA since 2008 and I have testified in opposition to the granting of the CDUP for the construction of the Thirty Meter telescope at the DLNR; and have testified in opposition to the extension of the management lease to the University of Hawai‘i. I have written essays in opposition to the construction of the TMT on Mauna Kea that appeared in the Honolulu Star Advertiser. 1Every scholarly article or public speech or presentation that I have given from 2011 to 2016 2has contained references this controversy, and my analysis of its importance.

I do not believe that the struggle over the future of Mauna Kea is a conflict between Hawaiians and non-Hawaiians, nor is it a clash between western science and Hawaiian cultural beliefs. This conflict is actually between people who see the history and future of Hawai‘i very differently from one another, and the issue is about how we manage resources and how we align our laws, our economy and the values of a whole, yet diverse society in Hawai‘i in order to connect a ruptured past, contentious present and very uncertain future."

WDT of Jonathan Kay Kamakawiwo`ole Osorio, PhD.; Ex. B.07a.

Prof. Osorio testified that there are clear distinctions between Wao Akua and Wao Kanaka, differences in expectations and practices and what is allowed in those areas. (Prof. Osorio) Tr. 01/12/17 at 68:16-22. Wao Akua, according to Prof. J. Osorio, are "...places essentially where human activity is generally curtailed," whereas "Wao Kanaka" is a place for human habitation. (Prof. Osorio) Tr. 1/12/17 at 68:2-15. He also testified that it is not true to say that human presence is not allowed in the Wao Akua. It is not that you do not want human presence or that human presence is barred – you want them to come as a supplicant, leaving as small a footprint as possible. (Prof. Osorio) Tr. 01/12/17 at 68:23-69:7.

706. Prof. Osorio testified that the University’s action in applying for the permit to build TMT in Wao Akua is in alignment with some of the University’s goals but not with the goal of preserving Hawaiian values, traditions and culture. (Prof. Osorio) Tr. 01/12/17 at 106:3-15.
707. One of the foremost authorities and scholars of Hawaiian culture, David Malo, lived on the island of Hawai‘i in pre-Western contact and pre-abolition of the kapu system times. He made no mention of traditional or historic practices atop the summit of Mauna Kea and reported that it was considered wasteland or the realm of the gods. Ex. A-122 at 2-19, 7-16 to 7-17, 7-62; Ex. A-130 at 37-38; (Prof. Mills) Tr. 1/25/17 at 156-157.
708. Malo reported that the Wao Akua is actually not traditionally considered an area above the tree-line or near the summit area, but it was an area below the tree-line. A-130 at 37-38 ("The belt below the *kua-mauna*, in which small trees grow, is called *kua-hea*, and the belt below the *kua-hea*, where the larger sized forest-trees grow is called *wao*, or *wao-nahele*, or *wao-eiwa*"). Traditionally, the summit areas were known as *kua lono*. Ex. A-130 at 37-38; (Nagata) Tr. 12/16/16 at 210:8-211:6; (Prof. Mills) Tr. 1/25/17 at 145:1-147:4.

709. Dr. Coleman testified that many things that are claimed to be "cultural truths" have no firm basis in prior use historically. Just because someone remembers certain cultural practices a certain way, does not establish that they are traditional and cultural practices that are recognized by all. (Dr. Coleman) Tr. 1/5/17 at 128:20-129:9.
710. In 2007, Chad Kālepa Baybayan, called as a witness by UHH, was awarded the rank of Pwo; in the hierarchy of Wayfinders in the Satawalese tradition, a Master Navigator for Voyages Upon Any Ocean. This was recognized in the Constitution of the Federated States of Micronesia. (Baybayan) Tr. 11/02/16 at 9:25-10:13; WDT Baybayan. Here is his story:
- "Aloha, my name is Chad Kālepa Baybayan and I have served as Captain and navigator fo the Hawaiian deep-sea voyaging canoes Hōkule‘a , Hawai‘iloa, and Hokūalaka`i. I am a graduate of UH Hilo’s Ka Haka `Ula O Ke`elikolani College of Hawaiian Language, and I hold a Master’s degree in Education from Heritage College. I am a former employee of the `Imiloa Astronomy center of Hawai‘i and am currently working on the Polynesian Voyaging Society’s Malama Honua World Wide Voyage
- I have worked with students and educators sharing the powerful story of the mariner explorers and astronomer navigators who settled these islands. Along with four other Hawaiian men, I was granted the rank of Pwo and inducted into a society of non-instrument master navigaors in the Satawalese tradition, and extendd the privilege to teach and pass on the skills, on technizues, and values of the Oceaic Wayfinder. A copy of my curriculum vitae was submitted as Exhibit A-121."
- WDT of Chad Kālepa Baybayan, page 1; UHH filed 10/11/2016.
711. Baybayan has experience working with ‘Aha Pūnana Leo to revitalize the Hawaiian language, and ‘Imiloa Astronomy Center. He now works with the Polynesian Voyaging Society on the Malama Honua Worldwide Voyage. (Baybayan) Tr. 11/02/16 at 10:13-23.
712. Baybayan testified that his relationship to the sacred mountain, Mauna Kea, is that the summit serves as a beacon for leading him back home to his family. This relationship is spiritual but not religious. This perspective is based upon the tradition of oceanic exploration and the legacy of people who left the safety of the shoreline and sailed away to discover the stars. (Baybayan) Tr. 11/02/16 at 11:2-12.
713. Baybayan testified that construction of the project would be appropriate and culturally consistent. (Baybayan) Tr. 11/02/16 at 11:13-11:18, 12:9-12:16. He also testified that it is culturally consistent to advocate for Hawaiian participation in the field of science that continues to enable Hawaiian tradition of exploration and a legacy of discovery, and a field of work for Hawaiians to lead. WDT Baybayan at 3; (Baybayan) Tr. 11/02/16 at 135:8-135:11; 12:9-16.
714. Baybayan’s position does not oppose astronomy. He views it as appropriate to construct the TMT telescope, which is a facility used to advance astronomical science. His view was developed from sharing experiences with people from all walks of life, international and local, including fishermen, craftsmen, carpenters, cultural practitioners, firemen,

- policemen, students, teachers, educators, researchers, and policy makers. (Baybayan) Tr. 11/02/16 at 11:13-12:2.
715. Baybayan is involved with the Hōkule‘a seafaring efforts, which is an indigenous project, led by indigenous, intelligent Hawaiians, whose mission is spiritual and embraces science and technology as a principal mechanism for designing a strategy for success. (Baybayan) Tr. 11/02/16 at 12:3-8. In Baybayan’s opinion, the highest level of desecration rests in actions that remove the opportunity and choices from the kind of future our youth can participate in and learn from. (Baybayan) Tr. 11/02/16 at 12:9-16.
716. Petitioners offered evidence that ahu built on Mauna Kea have been removed from an area of the South facing summit access roadway above Hale Pōhaku. This is not near the TMT Project site. Ex. B.01x; (Dr. McLaren) Tr. 11/15/16 at 80:1-83:19, 86:22-88:11.
717. The OMKM cultural resource manager is responsible for alerting Kahu Kū Mauna regarding any new cultural features. (Nagata) Tr. 12/12/16 at 211:22-212:5. Kahu Kū Mauna’s position is that objects that are considered cultural require a permit and if not permitted, then they should be removed. This policy reflects existing DLNR rules and regulations regarding land use. (Nagata) Tr. 12/12/16 at 141:19-142:9. If a structure is going to remain in place for more than 30 days in the Conservation District, that is considered a land use requiring a permit under DLNR rules. *See generally* HAR § 13-5-2. However, if a structure poses a health or safety risk, it will be removed right away. (Nagata) Tr. 12/8/16 at 106:4-107:19; L-18.
718. Dr. McLaren knows of no written policy that says an ahu or lele should not be allowed to remain after built. (Dr. McLaren) Tr. 11/15/16 at 84:10-13.
719. Dr. Kaluna testified in support of the TMT Project and her view that the pursuit of astronomy on Mauna Kea is a beautiful blend of culture and science. She testified about how her father placed her piko in a bottle and placed it in the ocean establishing a life-long bond with the water. She pursued a graduate degree in astronomy studying water on asteroids, part of her passion of studying water in our solar system. While on Mauna Kea, she gives offerings and prayers at the lele at Hale Pōhaku. Astronomy on Mauna Kea will allow us to study our origins. Dr. Kaluna believes that One’s origin and genealogy are critical aspects of Hawaiian culture. Ex. C-8 (WDT Dr. Kaluna) at 1-2.
720. Dr. Kaluna supports the TMT project because the proponents of the project have proceeded with honorable intentions, worked with community members, promoted educational opportunities, and attempted to respect the cultural significance of the mountain. Ex. C-8 (WDT Dr. Kaluna) at 1-2; Tr. 1/5/17 at 64:2-20, 70:15-19, 78:1-24.
721. Dr. Kaluna, who earned her Ph.D. in astronomy, developed her relationship with Mauna Kea as a result of her involvement with astronomy on the mountain. Dr. Kaluna conducts cultural practices on Mauna Kea, which includes giving offerings and prayers at the ahu lele behind the visitor center adjacent to Hale Pōhaku. Her work in the astronomy field has allowed her to continue her cultural practices and understanding the significance of Mauna Kea. Ex. C-8 (WDT Dr. Kaluna) at 1-2; (Dr. Kaluna) Tr. 1/5/17 at 21:7-20, 32:2-

14, 39:25-41:25.

722. Dr. Kaluna affirmed that her practices will not be impacted by the TMT Project. Tr. 1/5/17 at 26.
723. Dr. Coleman, a native Hawaiian astronomer, testified in support of the TMT Project, stating that the TMT Project does not conflict with Hawaiian culture, rather, it represents a return to things that were important to Hawaiians in the past. Dr. Coleman testified that it would be contrary to Hawaiian culture not to take advantage of the opportunity to construct TMT in Hawai'i, because Hawaiian culture is rooted in astronomy, which is what led Hawaiians to Hawai'i initially. Ex. C-17 (WDT Dr. Coleman) at 1-3; Tr. 1/5/17 at 92:10-17, 105:18-107:3.
724. Dr. Coleman received his bachelors in physics from the University of Notre Dame and a Ph.D. in astronomy from the University of Pittsburgh and has worked as an astronomer in Hawai'i since 1987. Ex. C-17 (WDT Dr. Coleman) at 1.
725. Dr. Coleman testified that his genealogy connects him to the Kumulipo, and therefore, the Big Bang. The TMT Project would allow him and all Hawaiians to look back in time as far as possible. In the Hawaiian sense, this would be to literally investigate their ancestors. Ex. C-17 (WDT Dr. Coleman) at 1-2.
726. For Dr. Coleman, although each Hawaiian may have a different opinion, the Mo'okini Heiau in Kohala is more important spiritually and culturally than the summit of Mauna Kea to the Hawaiian people. In fact, there are many other places he considers more important than Mauna Kea. Although Mauna Kea is sacred, it is not so sacred that the TMT Project cannot be built upon it, particularly since will advance benefits for the Hawaiian people. According to Dr. Coleman, Mauna Kea is not mentioned in the Kumulipo. He was unable to locate any literature stating that Mauna Kea is sacred in the way Petitioners and Opposing Intervenors have described, despite his extensive research on the topic. Ex. C-17 at 2-3; (Dr. Coleman) Tr. 1/5/17 at 132-133; *see also* Ex. A-130, Tr. 1/25/17 at 143:6-147:4.
727. Dr. Coleman himself conducts cultural practices on Mauna Kea. This includes asking permission to enter Mauna Kea through oli. These practices will not be impacted by the TMT Project. (Dr. Coleman) Tr. 1/5/17 at 96:7-23. Dr. Coleman testified that each person must make his or her own determination regarding the sacredness of Mauna Kea. Ex. C-17 (WDT Dr. Coleman) at 2-3; (Dr. Coleman) Tr. 1/5/17 at 132:10-133:3.
728. Dr. Coleman opined that many things claimed to be "cultural truths" are in fact not so. (Dr. Coleman) Tr. 1/5/17 at 128:15-129:9.
729. Petitioners offered the testimony of Kanahale to rebut Dr. Paul Coleman's testimony concerning Mauna Kea's significance. (Kanahale) Tr. 1/24/17 at 138:11-139:2, 142:8-144:11.
730. Kanahale also testified that water from outside of the Wao Kanaka region should not be brought to the Wao Akua region on Mauna Kea. (Kanahale) Tr. 1/24/17 at 195:4-196:6.

There is evidence that in 2016, Case poured water originating from Mount Shasta (California) into Lake Waiau, which is inconsistent with the cultural norm not to do so as described by Kanahale. Exs. C-45 and C-45a; Tr. 2/14/17 at 122:12-131:9; Tr. 2/15/17 at 175:5-176:14. Those differing practices show that there is substantial flexibility when it comes to interpreting Native Hawaiian culture and traditions.

731. Water from Lake Waiau is collected by some cultural practitioners for use in healing and ritual practices. The TMT Project would not affect this practice, nor would it affect the quality of the water in Lake Waiau. There will be no adverse effect associated with the TMT Project on this cultural practice. Ex. A-3/R-3 at 3-26 to 3-28. Lake Waiau is located 1.42 miles from the TMT Project site. Ex. C-18.
732. Historically, depositing piko on Mauna Kea has been associated with Lake Waiau. The TMT Project would not affect cultural practices at or near Lake Waiau. There is no evidence that the vicinity of the TMT Observatory has ever been used for depositing piko. The vast majority of the MKSR, as well as the Mauna Kea Ice Age NAR, including Lake Waiau, would remain unaffected by the TMT Project and available for depositing piko. Ex. A-3/R-3 at 3-27.
733. The scattering of cremation remains is considered an ongoing contemporary cultural practice. There is no evidence that the vicinity of the TMT Observatory has ever been used for the scattering of cremation remains. The approximate 5-acre area occupied by the TMT Observatory would not be available for scattering of cremation remains during the life of the project. Certain individuals may decide not to scatter cremation remains in the vicinity of the TMT Observatory. Significant undeveloped natural areas are still available for scattering ashes throughout the MKSR and summit areas. Ex. A-3/R-3 at 3-27 to 3-29.
734. Consideration of burials is a recognized and essential part of the Hawaiian religion. (Rechtman) Tr. 12/20/16 at 193:15-19.
735. The TMT Project site has been extensively surveyed. No known burials exist in any of the TMT Project areas. Ex. C-11 (WDT Rechtman) at 2; (Rechtman) Tr. 12/20/16 at 39:12-40:12; (Nees) Tr. 12/05/16 at 211:6-21, 217:2-24; Ex. A-138 at i; Ex. A-5/R-5 at Appendix G 39. The closest known burial sites are the two identified burials located in the cinder cones on Pu‘u Makanaka, and roughly eight possible more burials on that pu‘u. (Nees) Tr. 12/05/16 at 169:18-172:23. A burial treatment plan was prepared for all burials in the Mauna Kea Science Reserve. Ex. A-138; (Nees) Tr. 12/05/16 at 216:22-217:8; *see also* Ex. A-139. Pu‘u Makanaka is not in the Astronomy Precinct, on the summit, or close to the TMT Project site; it is several miles away. (Nees) Tr. 12/05/16 at 216:10-22. If any inadvertent or unknown burial were discovered at the TMT Project site, the burial treatment plan for the MKSR has an approved plan for handling such discoveries, including leaving burials in place. Ex. A-138 at 31. As a result, the TMT Project is not anticipated to have an adverse effect on any inadvertent burials or burial blessing practices on Mauna Kea. Ex. A-3/R-3 at 3-27 to 3-29.
736. Dr. Kahakalau, a witness for the Flores-Case ‘Ohana, testified that in her experience

almost every large construction project has inadvertently discovered burial sites. However, Dr. Kahakalau acknowledged that reports indicate that there are no burials located on the remote and high elevation approximate 5-acre TMT Project site. (Dr. Kahakalau) Tr. 1/9/17 at 179:7-179:13. Dr. Kahakalau's statement that every large construction project has inadvertently discovered burial sites is not evidence of actual burials at the remote and isolated TMT Project site.

737. Dr. Kahakalau acknowledged a plot of land is not considered a burial site just because there is the possibility that an inadvertent burial might be found in that location. (Dr. Kahakalau) Tr. 1/9/17 at 181:12-181:17.
738. The TMT Observatory cannot be seen from Pu'u Wēkiu. The TMT Project will not have an adverse effect on solstice and equinox observations occurring on Pu'u Wēkiu. Ex. A-3/R-3 at 3-21, 3-31; Ex. A-5/R-5, App. D at 127, 139, 142; WDT Hayes at 15-17.
739. OMKM can close the Mauna Kea access road for reasons specified in the CMP. Tr. 11/15/16 at 73:20-74:5. When the road is closed to the public, observatory personnel can still access the summit because they have the proper vehicles, are familiar with the snow conditions, and can navigate the landscape safely. (Dr. McLaren) Tr. 11/15/16 at 74:6-75:6.
740. The CMP requires that access for cultural practitioners to culturally significant sites on Mauna Kea be maintained. According to the CMP, native Hawaiian traditional and customary practices shall not be restricted except where safety, resource management, cultural appropriateness, and legal compliance considerations may require reasonable restrictions. The TMT Project will comply with this requirement and, as a matter of policy, will train TMT employees to respect, honor, and not unreasonably interfere with cultural or religious practices. Ex. A-9 at 7-7; Ex. A-3/R-3 at 3-23 to 3-26.
741. Prof. Fujikane believes the land for the proposed TMT Project site is a cultural resource because the formation of the land is referenced in the Mo'olelo. (Prof. Fujikane) Tr. 1/9/17 at 225:5- 225:19. Prof. Fujikane testified that the excavation of the TMT Project site would eliminate the ability to connect the land to the Mo'olelo because the land formations will have been changed. (Prof. Fujikane) Tr. 1/9/17 at 225:14-19; 255:16-256:15.
742. Other than limiting access to the actual construction site for safety reasons and to the interior of the TMT Observatory facilities once they are completed, the TMT Project will not restrict anyone from any portion of the Mauna Kea summit area. WDT White at 9; (White) Tr. 10/20/16 at 63:18-24, 135:2-13. During construction, cultural practitioners on the Northern Plateau would be exposed to noise, dust and the sight of construction equipment. (White) Tr. 10/20/16 at 135:14-23. Those impacts will be temporary.
743. If the TMT Observatory is built, there will be limitations on access to the buildings themselves. There is no prohibition on access to the areas outside of the TMT Observatory. Upon decommissioning of the TMT Observatory, cultural practitioners will be able to access the entire site. (White) Tr. 10/24/16 at 223:4-16.

744. N. Stevens credited the astronomy community for ensuring that people can easily, freely, and safely travel to Mauna Kea to practice cultural practices and share in the grandeur of the mountain. Ex. C-9 (WDT Stevens) at ¶ 5.
745. Numerous research studies, plans, and impact assessments identify the mitigation measures, as well as actions the BLNR can take, to reasonably protect cultural practices and resources on Mauna Kea, including native Hawaiian traditional and customary practices. These include but are not limited to the:
- a. CMP (Ex. A-9);
 - b. CRMP (Ex. A-11);
 - c. FEIS for the TMT Project (Ex. A-3/R-3);
 - d. CIA produced for the TMT FEIS (Ex. A-5/R-5 at App. D);
 - e. AIS for the Mauna Kea Summit Region produced for the TMT FEIS (Ex. A-5/R-5 at App. G);
 - f. TMT CDUA (Ex. A-1/R-1);
 - g. TMT Management Plan (Ex. A-1/R-1 at Ex. B);
 - h. TMT Draft Historic Preservation Plan (Ex. A-1/R-1 at Ex. B, App. A);
 - i. TMT Historical and Archeological Site Plan (Ex. A-1/R-1 at Ex. B, App. C);
 - j. Mauna Kea Historic Preservation Plan Management Components (Ex. A-48 at App. F);
 - k. Archaeological Assessment Report for Hale Pōhaku (Ex. A-5/R-5 at App. F);
 - l. Final Environmental Assessment for the CMP (Ex. A-51);
 - m. Final AIS for the Mauna Kea Access Road Corridor (Ex. A-56);
 - n. Final AIS for the MKSR and the Final AIS for the Astronomy Precinct (Ex. A-55; *see also* (Nees) Tr. 12/05/16 at 49:10-12 (Mr. Nees confirming the AIS for MKSR and Astronomy Precinct, respectively, included the TMT Project site but were not performed specifically for the TMT Project));
 - o. Final AIS of the Mauna Kea Ice Age Natural Area Reserve (Ex. A122);
and
 - p. Final AIS of Hale Pōhaku Rest House 1 and 2 and Comfort Station (Ex. A-123)
746. The mitigation measures proposed for the TMT Project, as outlined in Appendices A (Draft Historic Preservation Mitigation Plan) and C (Historical & Archeological Site Plan) of the TMT Management Plan (Ex. A-1/R-1 at Ex. B), will prevent substantial adverse impact to existing and identified historic and cultural resources within the

surrounding area, community, or region. WDT Nees at 6-8; Ex. A-71.

747. The University and TIO have established measures to avoid and minimize direct and indirect impacts on cultural practices, including but not limited to the following:
- (1) selecting a site off of the Kūkahau‘ula summit and away from known historic and traditional cultural properties and cultural resources;
 - (2) selecting a site that minimizes the impact of the TMT Project on viewplanes;
 - (3) complying with all applicable provisions of the CMP and sub-plans;
 - (4) engaging in direct and regular consultation with Kahu Kū Mauna, with the broader Hawai‘i Island community, and with cultural practitioners on various issues;
 - (5) establishing an outreach office to engage with the larger community;
 - (6) developing and implementing a Cultural and Natural Resources Training Program for all TMT staff and construction workers; and
 - (7) minimizing TMT Observatory operations (up to 4 days per year) to accommodate cultural activities on culturally sensitive days of the year.

Ex. A-71; Ex. A-1/R-1 at 2-6 to 2-26; Ex. A-3/R-3 at 3-31 to 3-37, 3-54 to 3-55; WDT White at 8-9; (White) Tr. 10/20/16 at 59:5-9, 62:21-63:24; (White) Tr. 10/24/16 at 15:12-17:15, 19:5-22:23.

748. The TMT Observatory will reduce operations to minimize daytime activities on up to four days a year in observance of native Hawaiian cultural practices. That mitigation measure was adopted at the suggestion of the State of Hawai‘i Historic Preservation Division. (Dr. Sanders) Tr. 1/3/17 at 189:8-23.
749. TIO will implement a Cultural and Natural Resources Training Program that will require all construction managers, contractors, supervisors, construction workers, and TMT staff to be trained annually regarding the potential impacts to cultural and archaeological resources and the measures to prevent such impacts. Ex. A-3/R-3 at 3-34 to 3-35; WDT Nees at 7.
750. In accordance with the CMP and with the commitments described in the TMT FEIS, TIO will hire a cultural resource specialist to work in conjunction with the archaeological monitor at all times and in all places or situations where on-site archaeological monitoring is required. Cultural monitors will have the appropriate background to serve as a cultural monitor and cultural resource specialist for cultural matters. Cultural monitors will provide direct oversight of construction activities and will regularly provide Kahu Kū Mauna and OMKM with a report of activities and findings. WDT Nees at 6-8; Ex. A-9; Ex. A-1/R-1, Ex. B, App. A, at A-7 to A-8.

751. TIO developed an Archaeological Monitoring Plan in accordance with HAR § 13-279 et seq. The Archaeological Monitoring Plan was accepted by SHPD on April 24, 2013. Cultural and archaeological monitors will be present at construction sites on Mauna Kea and will have authority to stop work if cultural finds are made, including historic properties. They will also inform workers of the possibility of inadvertent cultural finds, including human remains. Ex. A-3/R-3 at 3-35; Ex. A-142.
752. Pursuant to HAR § 13-284 et seq., TIO developed and will implement the Archaeological Mitigation Plan and in consultation with native Hawaiian organizations and the Office of Hawaiian Affairs, will seek their views on proposed mitigation. Ex. A-3/R-3 at 3-35.
753. TIO plans to implement a Ride-Sharing Program to reduce the number of vehicle trips between Hale Pōhaku and the TMT Observatory. This step is anticipated to further reduce the Project's impact on the spiritual and sacred quality of Mauna Kea by reducing dust, transient noise, and general movements in the summit region. Ex. A-1/R-2 at 4-25 to 4-26; Ex. A-3/R-3 at 3-36; WDT Nees at 8.
754. TIO committed to fund a CBP of \$1 million per year, to be administered via the THINK. THINK Fund purposes could include scholarships and mini-grants; educational programs; college awards; educational programs specific to Hawaiian culture, astronomy, math, and science; and community outreach activities. Ex. A-3/R-3 at 3-35 to 3-36; WDT Nees at 7; WDT Dr. Hasinger at 5.
755. TIO conducts community outreach including consulting with the Kahu Kū Mauna council regularly regarding cultural impact issues. The TMT outreach office policy is to have an open door with the native Hawaiian community over issues of concern. TIO has committed to support, financially and through use of its outreach office, the following measures related to cultural resources:
- (1) hosting an annual cultural event or training;
 - (2) the translation of chants or mele and the use of their teachings;
 - (3) the translation of modern astronomy lessons into the Hawaiian language;
 - (4) development of exhibits regarding cultural, natural, and historic resources in coordination with OMKM and 'Imiloa that could be used at the VIS, 'Imiloa, TMT facilities, or other appropriate locations; and
 - (5) developing a TMT outreach office consisting of two full time staff who will work with native Hawaiian groups and 'Imiloa to support/fund programs specific to Hawaiian culture and archaeological resources.
- Ex. A-3/R-3 at 3-35 to 3-37.
756. The TMT Project has committed to operate in accordance with the TMT Management Plan, the CMP and its sub-plans, as well as other relevant rules, regulations, and requirements. The mitigation measures and management actions proposed in the TMT

Management Plan, together with the broader management and mitigation actions to be implemented through the CMP and sub-plans, will prevent substantial adverse impact to the various resources of Mauna Kea and the surrounding area, community, or region. Ex. A-1/R-1 at Table 2.1; WDT White 9; (White) Tr. 10/20/16 at 62:14-20.

757. Evidence was presented that certain Petitioners and Opposing Intervenors have been conducting cultural practices on Mauna Kea since at least 2000. These practices have occurred within the presence of the thirteen observatories at the summit and were not prevented or curtailed by these astronomical facilities. *See, e.g.*, (Camara) Tr. 3/1/17 at 188:7-191.
758. Dr. Kahakalau, a witness for the Flores-Case ‘Ohana, testified that there are many ways native Hawaiians can honor Mauna Kea without going up to the summit. Tr. 1/9/17 at 102:1-103:25. According to Dr. Kahakalau, *mana* can be acquired from honoring Mauna Kea by practitioners actively refraining from going up to the summit in honor of Mauna Kea’s sacredness. (Dr. Kahakalau) Tr. 1/9/17 at 100:22-101:7. It is Dr. Kahakalau’s belief that unless a practitioner is specifically a Poli‘ahu or mauna practitioner, then that practitioner should not go to the summit of Mauna Kea. (Dr. Kahakalau) Tr. 1/9/17 at 39:5-39:18.
759. N. Stevens noted that in ancient Hawai‘i, it was kapu for maka‘āinana to travel to the summit area of Mauna Kea. Until the kapu system broke down, only the ali‘i and kahuna were allowed to go to the summit. Ex. C-9 (WDT Stevens) at ¶ 4.
760. White testified that he observed two ahu at the TMT Project site on October 5, 2016 that were not present during his prior visits to the site. (White) Tr. 10/24/16 at 27:12-28:2.
761. Rechtman testified that in addition to recent ahu construction, two upright stones near the TMT boundary were placed just off to the side of the construction work area and not actually on the TMT Project site. (Rechtman) Tr. 12/20/16 at 88:6-14.
762. Ahu are dated by assessing the characteristics of its construction (ahu are constructed rocks). There is no physical way to take an ordinary individual rock and date it from an archeological standpoint. Dating is a visual determination by the archaeologist, sometimes coupled with other historical information (*e.g.*, looking at older maps and seeing which sites or ahu have been marked and looking to see if it still exists today). (Rechtman) Tr. 12/20/16 at 135:5-23.
763. Pisciotta has been conducting her cultural practices since the early 1990s when she was employed at the CSO Observatory. (Pisciotta) Tr. 2/13/17 at 194:13-195:5. Her practices consisted of:
- a) caring for burials;
 - b) collecting water from lake Waiau;
 - c) monitoring or observing the adze quarry; and
 - d) observing stars, constellations and the heavens.

Tr. 2/13/17 at 195:4-196:8.

Her practices included going to the summit for the equinox and solstice. These practices averaged once a month every year up to the present in addition to the solstice and equinox events. (Pisciotta) Tr. 2/13/17 at 196:19 – 198:3. These practices would not be altered by the TMT Observatory since they occur at areas away from the TMT Project site.

764. Pisciotta testified concerning alleged impacts to site plane views. Ex. B.01a (WDT Pisciotta) at 7-9. She states that her viewplanes from the summit ridge area towards Haleakalā or other areas would be materially affected or blocked. *See e.g.*, Ex. C-19. Pisciotta's cultural concerns were fully considered in the CIA and EIS process where she was interviewed extensively and placed numerous written materials in the record. Ex. A-5/R5, App. D at 31-39, 100, 131-146, 182-188, 191-193, D-1 to D-9.
765. Pisciotta further objected to any policies and signage that discourage the contemporary practice of stacking rocks. The policies and signage Ms. Pisciotta finds objectionable pre-exist the TMT Project. Ex. B.01a (WDT Pisciotta) at 13.
766. Pisciotta claims that TMT would impede her ability to track the setting sun, but admits that those observations have been performed at the summit and she and others have been doing that for years. Specifically, Pisciotta referred to a "need to track the . . . precession," described as a "26,000-year cycle ... [that] is the measure of the wobble of the earth's axis, and the time it takes for the wobble to make a complete cycle." For Pisciotta, tracking this "wobble" is important because "relative to earth the pole stars appear to change over time"; "[i]f the pole stars change it drastically impacts navigation"; and if these changes are not noted, celestial navigators will get "lost at sea." Ex. B.01a (WDT Pisciotta) at 7. Other than Pisciotta's sworn testimony, no verifiable evidence supporting native Hawaiians tracking the wobble, or a Hawaiian term for precession, a western concept. Similarly, other than Pisciotta's sworn testimony, there is no verifiable evidence reconciling the 26,000 years it takes to complete the wobble cycle with how this affected navigation by native Hawaiians to Hawai'i less than 2,000 years ago. No other independent witness confirmed or verified these statements.
767. Pisciotta also testified that the po'e kahiko (ancient Hawaiian people) conducted ceremonies meant to keep track of the motions of the celestial bodies and their relationship to the observers on earth. WDT Pisciotta at 7. Importantly, she admits that the TMT would be below the horizon if they were viewing the sunset from the Keck Observatory on the summit ridge. (Pisciotta) Tr. 2/13/17 at 198:14-200:14; Fig. 3-24 of Ex. A-3/R-3 at 3-100.
768. Baybayan, who is a Master wayfinder, disagreed with Ms. Pisciotta's assertion that celestial navigators will get lost at sea if they do not track changes in the location of the pole stars over time. He testified that according to his training and practice, traditional celestial navigation is not dependent on going to the summit of Mauna Kea and making observations from there. (Baybayan) Tr. 11/02/16 at 14:12-14:16. For Baybayan it is most appropriate and logical to train celestial navigators along a coastline or from a

- coastal location. (Baybayan) Tr. 11/02/16 at 22:21-23:10.
769. Baybayan testified that the only summit area used for wayfinding practices and teaching is on Kaho‘olawe, which would not be affected by the TMT Project. (Baybayan) Tr. 11/02/16 at 99:1- 99:8. Dr. Coleman confirmed that Hawaiian star knowledge was mostly confined to what can be seen from lower elevations because the human eye works better at lower elevations and therefore, stars are more visible from lower elevations than at the summit of Mauna Kea. Tr. 1/5/17 at 107:8-108:11, 169:3-8.
770. Baybayan also testified that if cultural sites, particularly heiau used by traditional navigators, were destroyed, navigators would nonetheless be able to continue to use the heiau. (Baybayan) Tr. 11/02/16 at 25:24-26:20. Baybayan further testified that the telescopes are not noticeable to navigators when they sail into Hawai‘i. (Baybayan) Tr. 11/02/16 at 43:23-44:6. He clarified that his understanding of desecration means something that has been there historically, such as a man-made structure from pre-history, pre-contact, that’s established and recorded, and is purposefully removed. (Baybayan) Tr. 11/02/16 at 75:18-76:3.
771. Baybayan does not believe that Mauna Kea is considered a public monument or structure, but recognizes that it is a cultural treasure, a place of worship and burial. (Baybayan) Tr. 11/02/16 at 76:5-21.
772. According to Baybayan, the current system of Hawaiian wayfinding is a hybrid system built on tradition as well as academics. (Baybayan) Tr. 11/02/16 at 57:8-58:20. Modern wayfinders use both traditional methods but also use modern technology such as GPS and chart plotters on a board. (Baybayan) Tr. 11/02/16 at 97:14-97:18. An example is Hikianalia, the second boat in the Malama Honua voyage that is equipped with modern technology and has access to modern navigational tools such as GPS. (Baybayan) Tr. 11/02/16 at 143:7-143:16.
773. For Baybayan, the TMT project is consistent with Hawaiian’s ancestral forbearers, and will benefit tomorrow’s generation as an important tool for modern Hawaiian society. (Baybayan) Tr. 11/02/16 at 59:20-59:25, 68:24-69:6. TMT will contribute to the scientific endeavor to sustain life on this planet. (Baybayan) Tr. 11/02/16 at 80:9-81:13.
774. Baybayan believes that cultural practices can coexist with the TMT Project and there is enough room on the island for everyone to conduct their personal practices. Collaboration between the community and TMT has been the nature of Hawaiians for generations and generations. (Baybayan) Tr. 11/02/16 at 73:10-73:13. (Baybayan) Tr. 11/02/16 at 93:18-94:14.
775. Prof. Johnson, a witness for Opposing Intervenor W. Freitas, is not a native Hawaiian practitioner. He is a religious studies professor at the University of Colorado. He focuses on comparative studies of religion, religious freedom, and living indigenous traditions, particularly American Indian and native Hawaiian religions. Ex. T-1 (Prof. Johnson WDT at 1). He is not an expert in land use planning or environmental review. See Ex. T-1 (Prof. Johnson CV at PDF page 10). In his opinion, the entire mountain is one religious

site. (Prof. Prof. Johnson) Tr. 02/16/17 at 60:14-23. He opined that there are sacred places, churches for Hawaiians, that do not include physical structures, but are just natural land formations. (Prof. Johnson) Tr. 02/16/17 at 75:5- 16.

776. Prof. Johnson was present on Mauna Kea on June 22, 2015 when the first two ahu on the TMT Project site were installed in the middle of the access roadway to the TMT Project site. Ex. T-1 at 3. That group included W. Freitas, a stone mason by trade, who was a primary person responsible for designing and installing the ahu in the specific locations in or near the TMT Project site. (Prof. Johnson) Tr. 02/16/17 at 20:13-21:22. Prof. Johnson's testimony concluded that the two ahu on the TMT Project site were the first ahu to be built in that location. (Prof. Johnson) Tr. 02/16/17 at 21:13-18. He acknowledged that the ahu did not exist on the site at the time that the FEIS was considered and approved and that the ahu were placed after the location of the TMT Project site was made known to the public. (Prof. Johnson) Tr. 02/16/17 at 25:22-26:3, 91:7-13. That testimony confirms and corroborates the evidence that no prior ahu or religious practice occurred at that specific location prior to its designation as the TMT Project site. He also testified that members of the native Hawaiian community disagree about the status and meaning of the ahu, as some of the stones came from the Kona shoreline, and not from the surrounding summit area, thus breaking protocol. Ex. T-1 at 5.
777. Prof. Johnson argues that the presence of new ahu constructed on the TMT Project site, after the site was known and the project heavily opposed, triggers a requirement for a new EIS. Tr. 2/16/17 at 17:4-17, 28:3-21; 53:14-18. This argument, however, is unsupported under Hawai'i law and would produce an absurd result. The purposes of HRS Chapters 343 and 6E are to inventory existing conditions at the time that the studies are done. To provide protection to these new structures placed after the project site is known and in direct and obvious protest of that project would allow persons who oppose a proposed project to stop it simply by placing a stone in the area or initiating a new practice that incorporates recognized traditional practices from other areas on the island.
778. While Prof. Johnson opined that requiring a permit to build an ahu might be considered offensive to some from a religious perspective, he agreed the State has a right to regulate cultural practices. He acknowledged that in any democratic system where there are competing interests and rights, there are mechanisms, even within Hawai'i state law, that enable reasonable recognition of religious freedoms if administrative procedures are adequately followed. (Prof. Johnson) Tr. 02/16/17 at 78:7-17; 94:12-15; *see also* Ex. A-145 (KKM October 13, 2010 meeting minutes, contemplating a form of regulation of lele construction). Prof. Johnson also acknowledged that while a practitioner may be unable to get a permit in the middle of the night during moments of crisis, one of the benefits of a permitting system to build an ahu is that it should provide ongoing protection of an approved ahu. (Prof. Johnson) (Prof. Johnson) Tr. 02/16/17 at 80:10-81:6.
779. Prof. Johnson acknowledged that W. Freitas had no legal title or property interest to the land upon which he had placed the ahu and W. Freitas had not practiced in the area before the recent protests in 2015. (Prof. Johnson) Tr. 02/16/17 at 94:16-20. Prof. Johnson testified that placing the ahu in the middle of the narrow, bumpy four-wheel

- drive road does not cause a health or safety concern because the ahu were quite prominent and one could drive around them. (Prof. Johnson) Tr. 02/16/17 at 92:2-10.
780. Prof. Johnson conceded that protestors standing in the access road for the purpose of blocking traffic do pose a safety and health risk. (Prof. Johnson) Tr. 02/16/17 at 94:7-11.
781. Prof. Johnson testified that if a native Hawaiian cultural practitioner says that the TMT telescope is consistent with the ancient Hawaiian practice of studying the stars, the telescope would be a possible expression of traditional Hawaiian ideals. (Prof. Johnson) Tr. 02/16/17 at 122:16-23. This testimony was consistent with Baybayan's testimony that the proposed TMT Project is consistent with Hawaiian culture and Trask's testimony that the concept of geothermal can be traced back to King Kalākaua, who also happened to own a telescope. *See* (Trask) Tr. 03/01/17 at 111:5-112:1; Ex. C-54.
782. Prof. Johnson testified that the TMT Project will adversely impact religious practitioners. Prof. Johnson acknowledged that he was not aware of the dispute surrounding the TMT Project until the fall of 2014. There is no evidence he conducted or reviewed any peer reviewed studies concerning impacts to native Hawaiian practitioners on the mountain. Ex. T-1 at 3. When questioned about whether the protestors standing in the road block access posed a public health and safety concern, Prof. Johnson was evasive and attempted to avoid answering the question. Only after being asked repeatedly to answer, Prof. Johnson finally did admit that protestors blocking the road pose a health and safety concern. *See* (Prof. Johnson) Tr. 02/16/17 at 113:15-116:14; Ex. C-46; Ex. C-47.
783. Mililani B. Trask was a witness for Camara. She is "an indigenous Hawaiian attorney licensed to practice in the State of Hawai'i and a United Nations Expert in the field of international indigenous human rights." WDT of Mililani B. Trask at page 1. She had no previous traditional or cultural practices in the Area E location and does not conduct any practices on the summit of Mauna Kea. (Trask) Tr. 2/28/17 at 249:25-250:1. Her testimony was principally concerned with sovereignty and her political reasons for opposing the TMT Project. Trask noted, quoting portions of the CMP, that contemporary practices undertaken by native Hawaiians on Mauna Kea may or may not have a basis in traditional practice, and that the revival of an ancient practice, without established continuity to the past, can only be considered a modern interpretation and thus must be considered a contemporary practice. WDT Trask. Trask also agreed that unrestricted public access to the summit is a problem. (Trask) Tr. 03/01/17 at 85:24-86:9; Ex. A-155 at 4.
784. Trask's and N. Ho's involvement with Mauna Kea and collaboration with the State of Hawai'i can be traced back to the mid-1990s. *See* Exs. A-152, A-153, A-154. On June 2, 1995, Trask wrote a letter to Michael D. Wilson, then-Chairperson of the BLNR, and Mr. Don Hall, then Director of IfA, seeking to form a cultural review committee for Mauna Kea. Ex. A-152. Chairperson Wilson responded positively that such a committee would be a good idea for Mauna Kea and that DLNR would be interested in working with Trask's group, and directing her to contact SHPD for further consultation. Ex. A-153.
785. On February 4, 1997, N. Ho wrote a letter to Senator Malama Solomon expressing

- concern as to certain issues on Mauna Kea. Ex. A-154. Mr. Ho's letter to Senator Solomon was responded to by Chairperson Wilson on May 22, 1997. Ex. A-155. Trask agreed with Chairperson Wilson's statement in response to N. Ho. that unrestricted public access to the Mauna Kea summit is a problem. (Trask) Tr. 03/01/17 at 85:24-86:9; Ex. A-155 at 4.
786. In addition to her formal correspondence with Chairperson Wilson, Ms. Trask testified that she also engaged in conversations with Chairperson Wilson in his personal capacity. (Trask) Tr. 3/1/17 at 89:6-14, 91:19-92:5.
787. Trask noted, quoting portions of the CMP, that chief among the contemporary practices was the use of Mauna Kea as a spiritual and religious site of prayer and contemplation, which included building family ahu or altars and the placement of offerings to honor families or as a form of personal spiritual worship. WDT Trask at 2.
788. Ronald Fujiyoshi, a witness for W. Freitas, is not a native Hawaiian practitioner. He was the pastor of the Ola'a First Hawaiian Church in Kurtistown, Hawai'i. (Fujiyoshi) Tr. 3/2/17 at 99:2-5, 171:16-23, 174:13-19; Ex. T-2 (WDT Fujiyoshi) at 1. In Fujiyoshi's view, the TMT Project will interfere with native Hawaiian religious practices. Ex. T-2 (WDT Fujiyoshi) at 3. Fujiyoshi testified that "public opinion" holds that Mauna Kea is sacred; however, he was unaware of the poll (Ex. I-1) showing that 46% of native Hawaiians support the project and 45% are opposed. (Fujiyoshi) Tr. 3/2/17 at 138:7-141:3; Ex. T-2 (WDT Fujiyoshi) at 6.
789. Opposing Intervenor Temple of Lono has no actual religious practices on the summit area and none in the Area E location for the TMT Project. The Temple has no congregation. WDT Nobriga at 1. Nobriga, the Kahuna of the Temple, testified that he believes his practices will be affected by the development of the TMT Project. Nobriga has never constructed an altar or shrine on Mauna Kea. Nobriga admits that he has been able to conduct his practices and faith since 1980 with the 13 existing telescopes in place on Mauna Kea. (Nobriga) Tr. 3/1/17 at 47:14-22, 64:12-23, 70:1-76:21. Nobriga offered no specific evidence as to how the TMT Project specifically would restrict or otherwise prevent his practices or any practices on Mauna Kea.
790. The Temple's position was fully reviewed and considered in a prior comment letter to the EIS process in 2010, through written submission and statements from its representative, Fergerstrom. Ex. A-4/R-4 at 153-62.
791. The two ahu built and installed by W. Freitas and others on the access road in and near Area E in 2015 were placed for political or protest reasons to halt the TMT Project, and were not placed in accordance with any recognized traditional practice performed by W. Freitas or others at the locations of the two ahu within Area E. W. Freitas, who is from Oahu originally, had not been on the area where the two ahu were placed prior to 2015. He acknowledged the two ahu were placed in the road path where vehicles that need to access the site for construction would traverse and that he personally opposed the project at that time. (Freitas) Tr. 3/2/17 at 184:22-188:14; 194:20-194:24, 199:2-199:22, 201:12-202:4, 252:12-253:12, 259:4-266:22, 268:13-269:13.

792. Opposing Intervenor Joseph Kualii Lindsey Camara is a native Hawaiian practitioner and a lineal descendant of kupuna of the ali‘i of Mauna Kea. WDT Camara at 1. In his words:

"I, Joseph Kualii Lindsey Camara reside with my ohana in the wao maukele of Kaumana on the slopes of Mauna Kea. Our wai is Wailuku Stream. I am a lineal descendant of Kukahauula of Mauna Kea (Exhibit H-8). This ancestor lived as a Kanaka (man), and also remains with us today on Mauna Kea as a Puu, an elemental deity or akua, and a vessel for the Wai Kapu A Kane. The remains, the iwi of Kukahauula and many more of my kupuna (ancestors) rest on Mauna Kea and need vigilant care to prevent desecration. I, like many Hawaiians am a descendant of Umi a Liloa. Umi placed a kapu on Mauna Kea and part of his vast legacy was to protect the sacred Mauna Kea from desecration. This legacy and kuleana are now mine to uphold. I am a native Hawaiian and my family's history is woven into the landscape of Mauna Kea. My ancestry documents the un-severable bond that I have with this sacred mountain. This Mookuauhau and belief system passed on to me, assures that I, and other lineal descendants always think of Mauna Kea as a living family member. It assures that I care for our Mauna as I would a kupuna, always with respect and as someone I turn to for wisdom. It assures that I consider the Mauna's needs before my own. When I look at Mauna Kea I do not see an inanimate geologic mass with a good view of the heavens, I see an elder who provides every resource needed for my safety, wellbeing and survival. I see my kupuna who should always be treated with the deepest respect and gratitude. I am blessed to work on Mauna Kea as a resource manager in the Mauna Kea Ice Age Natural Area Reserve (NAR)."

Joseph Kualii Lindsey Camara, Testimony against TMT Development, WDT (revised) at page 1.

Camara has never notified SHPD of his lineal descendant claims and has never been officially recognized as a lineal descendant by any state agency. (Camara) Tr. 3/1/17 at 123:21- 124:3, 126:7-17, 186:2-8. He has conducted native Hawaiian practices on Mauna Kea, though not in the Astronomy Precinct. He believes that the iwi of his ancestors are located on Mauna Kea. (Camara) Tr. 3/1/17 at 167, 189:21-190:6. Camara is a member of KAHEA, and has been involved in protests against the TMT Project. He was also part of a group opposed to the TMT Project that has petitioned the United Nations for a sacred site designation. WDT (revised) Camara at 9.

793. Wiremu Carroll, a witness for Opposing Intervenor Kanaele, is a native Hawaiian, who was born in New Zealand and is now a member of ROOK. (Carroll) Tr. 3/2/17 at 54:24-55:9, 61:11-15. Carroll has not lived in Hawai'i continuously. (Carroll) Tr. 3/2/17 at 88:16-89:6. Carroll asserts:

"Therefore, Be it known that the physical grading operations on Mauna Kea commissioned by TIO/TMT and executed by Goodfellow Construction, the prime contractor, were done under Color of Law as defined in 18 U.S. Code § 242 – Deprivation of rights under Color of Law, And

Therefore, 2 Be it known that the physical grading operations on Mauna Kea commissioned by TIO/TMT and executed by Goodfellow Construction, the prime contractor, were done in violation of H.R.S. §711- 1077 Desecration, And

Therefore, Be it known that, among other violations, the arrest and prosecution of citizens preventing the desecration of protected conservation land was done in violation of 18 U.S. Code § 241 – Conspiracy against rights of citizens and 18 U.S. Code § 242 – Deprivation of rights under Color of Law." [sic]

WDT of Ali`i Sir Wiremu Carroll, Special Witness for Kaliko Kanaele Sr.

794. Opposing Intervenor Kalikolehua Kanaele is a native Hawaiian cultural practitioner who has been connected to Mauna Kea since birth when his parents took him there. He is also a member of the ROOK, Heiau Mamalahua Helu`elua. (Kanaele) Tr. 3/1/17 at 231:2-9, 250:19-252:16; WDT Kanaele at 2. Kanaele is an Opposing Intervenor. He complains that Maunakea Observatories Support Services staff have denied practitioners access to the summit in the past. WDT Kanaele at 6.
795. Kakalia also testified about her emotional reaction to the proposed project, but had no traditional or cultural practices within the Area E site location that would be impacted by construction. Kakalia expressed her opinion that the TMT Project cannot meet the eight criteria because the project will impact her family practice, community, and well-being. PHS Kakalia; (Kakalia) Tr. 2/27/17 at 115:1-115:12. She stated that she believes that there is no area on Mauna Kea on which TMT could be built and that there is nothing that can be done or said that would cause her to reconsider or change her opposition to the TMT Project. Tr. 2/27/17 at 156:10-156:23, 208:8-210:21.
796. Tajon testified as a witness for Kakalia. Ex. O-15 (WDT Tajon). Tajon acknowledged that plurality of cultures exist in Hawai`i, but suggested that the native Hawaiian culture should dominate simply based on residency in Hawai`i. Tr. 2/27/17 at 42:13-43:5; A-144.
797. Hearing Officer Witness, Wilma Holi, is a native of Kauai and acknowledges she does not conduct practices on Mauna Kea. Holi has never been to Mauna Kea. Tr. 2/23/17 at 81; Ex. Z-1-A. Holi conducts cultural practices with respect to salt gathering on Kauai. Ex. Z-1-A. Holi stated general concerns regarding the impacts of development.
798. Noelani Kaopua-Goodyear appeared as a witness for Opposing Intervenor Sleightholm. In Prof. Kaopua-Goodyear's words: "Aloha kākou. My name is Noelani Goodyear–Ka`ōpua. He Kanaka `Ōiwi Hawai`i au. I was born and raised on O`ahu, but my Kanaka

Maoli and Chinese greatgrandparents lived on Hawai‘i island before relocating their families to Kalihi. On the Hawaiian side, my genealogy is deeply rooted in ka Moku o Keawe for dozens of generations, as far back as we can trace our lineage.

I earned my BA magna cum laude at the University of Hawai‘i at Mānoa, as a double major in Hawaiian Studies and Political Science. I received my PhD at the University of California, Santa Cruz, having completed a dissertation titled, *Kū i ka Māna: Building Community and Nation Through Hawaiian Schooling*, in 2005.

Since 2007, I have worked at the University of Hawai‘i at Mānoa, where I am currently an Associate Professor of Political Science, specializing in Native Hawaiian and Indigenous politics. I have also served as interim chair of the Political Science department and have helped to create the Nā Ko‘oko‘o Native Hawaiian leadership cohort and Native Hawaiian Initiative of the College of Social Sciences. My research has focused on Hawaiian and Indigenous social movements, including land struggles; on Indigenous governance; on the politics of education; and on the ways that Indigenous peoples perpetuate cultural knowledge and practice even while living under conditions of settler colonialism. As an educator, I teach and mentor undergraduate, MA and PhD students. In addition to my Political Science students, I often sit on the dissertation and MA thesis committees of students in the College of Education, as well as Hawaiian and Pacific Islands Studies, because of my extensive work in these fields." WDT Noelani Kaopua-Goodyear at 1; Ex. I-6.

799. Prof. Kaopua-Goodyear testified that she has performed mele and hula on various locations on Mauna Kea. She has no historical or familial native Hawaiian cultural practices on the summit area of Mauna Kea. She has never engaged in traditional or cultural practices on the Northern plateau Area E section of Mauna Kea. Tr. 2/22/17 at 148:12-149:21, 226:4-228:3. She had no practice before 2011 and has only been to the summit once, in 2011. Ex. J-6 (WDT Goodyear-Kaopua) at 4; Tr. 2/22/17 at 211:21-24, 227:1-25.
800. Prof. Kaopua-Goodyear confirmed that nothing would change her mind about the TMT project. She believes the development of TMT is an act of colonization in violation of United Nations consensus to end colonization, although she admits that she is not an expert in international law. Tr. 2/22/17 at 158:17-159:19, 212:3-19. She acknowledges that native Hawaiians have many different opinions about TMT and she did not speak for all native Hawaiians. She agrees that some native Hawaiians support the TMT Project. An article she authored, entitled "Protectors of the Future" (Ex. J-9), did not inform the reader of any support for the TMT Project by native Hawaiians. Prof. Kaopua-Goodyear was unaware of the poll indicating that approximately half of the native Hawaiian population supports the TMT Project. Tr. 2/22/17 at 211:3-18, 233:1-22, 243:20-244:9; Ex. C-49.
801. Nelson Ho, a witness called by Opposing Intervenor Sleightholm, opposes the proposed TMT being built on Mauna Kea. In his words: "The proposed Thirty Meter Telescope (TMT) should be built. It will be a magnificent scientific instrument. But it should not be built on Mauna Kea. One key reason is because land use mismanagement—and the

unseemly politics behind it—has persisted since the beginning of the 1968 UH lease. Those practices must not be allowed to continue. It is this chronic mismanagement and unseemly politics that created the controversy, and continue to fuel widespread community opposition to TMT and the other telescope projects waiting in line behind it (such as the Canada-France-Hawai'i Telescope's so-called "upgrade" to replace it with a new \$100 million High Dynamic Range 10-meter telescope)." Amended WDT of Nelson Ho, at 1; Ex. J-8.

802. N. Ho testified that he has no traditional or cultural practices in Area E and stated he considers himself to be a long-standing opponent to development on the mountain. Tr. 2/22/17 at 120:24-121:2. N. Ho testified that he and Ward contributed substantially to the Sierra Club letter that they both signed and submitted as part of the TMT EIS process. Tr. 2/22/17 at 127:4-128:20. N. Ho also admitted that OMKM had the opportunity to review and comment on the DEIS. Tr. 2/22/17 at 132:9-16.

803. Opposing Intervenor Cindy Freitas describes herself as "a Native American, descended of the native inhabitants of Hawai'i prior to 1778 and born and raised in Hawai'i my entire life. Amended WDT of Cindy Freitas, at 1; Ex. S-2-a. In her words: "I learned my cultural traditional customary religion practices though my families Lineage. [sic]

My grandmother and grandfather is the strongest mentor for me in my growing up and raised me in a traditional cultural way. We would go to the mountain and do prayers ("Pule") for many different things. Also I have witness things beyond my understanding till I got older and mostly my grandparents also made sure that we do not desecrate any thing on land, ocean or any were else to be respectful of your surroundings. [sic]

My grandparent would speak the manaleo style (Old Hawaiian language) which tried to teach the next generation but because of the influence of time we only learn a little of the language She would take us to the mountain and learn to plant our food, raise our livestock and take care of the land so that the land would take care of the people in their culture practices.

We were thought in the Ahupua`a style (from the ocean to the mountain). While we work mostly in the middle of the Ahupua`a we would also go to the ocean and fish as well. My grandparents would always tell us to pule first before we fish and also give a ho`okupu (is a gift of abundance of mountain food that we bring) and leave it on a rock at the ocean shore line and ask for permission to fish and be safe. Then our catch would be a bounce so that we share with the people that live close to us. We also leave a fish on a rock when we get to the mountain for ho`okupu as well. [sic]

As I grew I never forgot my upbringing. Now with a family of my own I teach them also the cultural customary traditional religion practices as well and we as parents learn though our children. [sic]

I have enrolled my 2 girls as Kula Kaiapuni O Kona in the early 2000 and we grew with the school with all kinds of chants, pule and protocols. Today the school is name Ehunuikaimalino and located at Konawaena location. Though this school I have learn

also so much cultural customary religion practices as well. [sic]

As for Mauna Kea and everywhere else in the world I have deep respect for the natural resources and native plants and things that live within the earth. Today because of the fast development we as people need to keep our natural resources and help to save what is there."

Amended WDT of Cindy Freitas, at 1; Ex. S-2-a.

804. Opposing Intervenor C. Freitas testified that she conducts cultural practices on Mauna Kea, including the summit area. Tr. 2/21/17 at 145:3-147:1; Ex. S-2a at 1.
805. Opposing Intervenor William Freitas is a native Hawaiian cultural practitioner. Here is his "History of Experience": "I, William Freitas, a practitioner of many Cultural Hawaiian Religious Traditions of the practices of our Hawaiian People that I have engage in and are taught to me by my Kupuna, Uncles' Aunties and my Mother and Hawaiian family's that live these traditions and shared hands on knowledge passed to them from beyond 1778. [sic]

I am a Pohaku Kane (stone missionary). My experience started at a young age of 5 years old with my mother as we were picking kukui nuts to make Ina Mona. I found a stone under the kukui leaves in the dirt. My mother said it was a special stone use for food and medicine. Then she chanted with prayers for protection and permission to malama (care for). This special stone which is still in my possession, is the connection to my heritage as a Kanaka Maoli Ko Pa Aina and the journey that directs me to protect my birth right for the future of myself and family. [sic]

I have witness many moments as I grew up on the island of Hawai`i, of ceremonies done by my mother, Aunties and Uncles, for all different occasions, land blessing, house blessing, casting out bad spirits, call of winds, rain, sun and protection, asking for good catch when going fishing, placing of offerings, for good production by continued practice for channeling prayers and giving offerings on existing and newly established stone Ahu's (altars) to give the highest respect to the Wakea (creator) of our Akua's (life forms that represent sustaining elements). [sic]

I have been working with Pohaku from age 5 years old til present day. Pohaku is a part of me in many unexpected opportunities and moments in my life. [sic]

I was a Licensed Contractor for 16 years until 2008 as a result of Corporate Greed caused a economic down fall, left me no option but to dissolve the business. [sic]

I have had many opportunities to build, Ahus, Walls, restore heiau's, fish ponds, Kahua's (foundation) for Ku`ula stones (fishing shrines) foundation for Hale's (thatched building) stone enclosures ect., throughout the Islands. At presen time I am building traditional thatched Hale's along with ceremonies as these traditional structures are built. See Exhibits T-3.i 1 to T-3.11 , Pictures letters of acknowledgments by Malia Kipapa, Walter Wong and Reed Flickinger. [sic]

I William Freitas is the Grandson of Kahau`aulahilahikeohokaole known as Lahilahi, born 1896, my mothers mom, I was 5 years old when she passed. [sic]

This name is a genealogical name, that extends way be on 1778, before the time of Pa`ao's voyage to Hawai`i (Hawai`i). Knowledge Given to me by my mother Josephine T. Ahuna, as she was a curator of Hulihe`e Palace in the 1970's, with the late aunty Iolani Luahine of Hula, Chants and knowledge of our ancestor's. [sic]

My mother and aunty Iolani Luahine, and the late Kumu Hula of many, Uncle George Naope at one time were Haumana (students) of the late Kumu Hula Tom Hiona with knowledge of our ancestor's traditions of spiritual connection to Papahanaumoku (mother of life) Mauna O Wakea (father of creation), today known as Mauna Kea. [sic]

In the Wao Akua (realm of the deities of water) lives there Daughters, Kahau`ula, Poliahu, Waiiau (where Mo`oinanea resides) and Lilinoe, there Son too, Born Haloa (deity of Kalo (taro) along with many other deities, this knowledge is a big part of our religious understanding of Kanaka maoli Ko Pae Aina, connection to the creation of our existence, the KUMULIPIPO (beginning of TIME instilled chants and prayers, passed down from our ancestors from generation to present time. This is a Vital Necessity of Our spirit for the future of Kanaka Ko Pae Aina to survive by. [sic]

Now today (THIS AREA IS IDENTIFIED AS THE University of Hawai`i Science Reserve for Astronomy by the university). Desecration of the Highest Level. Created by the BLNR in 1969. [sic]

With this knowledge as well as witnessing many spiritual ceremonies by these women and others as I grew, to understand my connection to our kupuna iwi (ancestors) land, ocean, and water that is always acknowledged to our creator. Akua (Gods), Makua Kane I Ka Lani, (father in heaven) Io, (highest), all and more ways we refer to Wakea. Mauna a Wakea (Mauna Kea). To give the highest respect to all our akua's. (All life sustaining elements). For our ability to exist in the middle of the pacific.

My Koko (blood), qualifies me as a descendant beyond 1778. With that, my kuliana is to give this knowledge to my children, grandchildren, and the unborn to help those may find a lineage in my genealogy, so they can do the same. I know that all kanaka mauoli Ko Pae Aina, are all related in one way or another. See PASH law presidents" [sic]

WDT William Freitas, 1-2; Ex. T-3.

806. Opposing Intervenor W. Freitas says that his first time engaging in cultural practices on Mauna Kea was on April 2, 2015. While he has no previous practice on Mauna Kea, W. Freitas testified that he believes his present or future planned spiritual, religious, and cultural practices will be impacted by the TMT Project. He acknowledged that his cultural practices are intact today despite the presence of the existing telescopes on the summit areas of Mauna Kea. Ex. T-3.0 (WDT W. Freitas) at 2; Tr. 3/2/17 at 227:6-9, 252:7-253:12, 271:20-272:12. W. Freitas has constructed ahu on Mauna Kea, though he admits the first ahu he constructed was on June 22, 2015. Tr. 3/2/17 at 259:4-262:25, 268:13-22. Prior to 2015, he had never been to the summit of Mauna Kea to perform any

practices; he had only done so from areas below the summit. Tr. 3/2/17 at 252:23-254:8.

807. Opposing Intervenor Mehana Kihoi is a native Hawaiian practitioner. Here is her story:

"I am Mehana Kihoi, I am a Native Hawaiian cultural and spiritual practitioner. I am a Native Hawaiian beneficiary as defined by the Hawaiian Homes Commission Act of 1921, and a beneficiary of the Ceded Lands Trust under Section 5(f) of the Admissions Act. I am a descendant of Native Hawaiians who inhabited the Hawaiian Islands prior to 1778 as established through my genealogical lines of Pa'ao and Hewa Hewa Nui. My ancestors and subsequent generations, gathered adze only found on Mauna Kea, to build their voyaging canoes. My ancestors honored Mauna Kea as a place of spiritual worship, where they would offer their deepest prayers to our creators Papa and Wakea.

I have a spiritual, cultural, psychological, physical, close and significant relationship to Mauna Kea that is tied to my identity as a Native Hawaiian. The health and well-being of Mauna Kea are tied directly to my own health and well-being because of my close and significant relationship to the land there. Mauna Kea is my spiritual place where I connect to my ancestors and my creators Papa and Wakea. Mauna Kea is where I achieve my highest level of spirituality. Mauna Kea is a sacred place.

My ancestors were stewards of Mauna Kea and ensured that these sacred lands remained untouched because of its importance to the creation of Native Hawaiians. I empower my own child by teaching her the spiritual practices at Mauna Kea so that one day she may carry these traditions to her children, and future generations. Having a direct ancestral connection to Mauna Kea, I am an active steward of this land to ensure there is no more further desecration of this land because it is tied to my spiritual and cultural identity, health and well-being as a Native Hawaiian.

I am an indigenous native Hawaiian woman, a mother, and a victim of domestic violence. Many years ago, I experienced physical and emotional trauma that left me with 5 broken parts of my face, and deep psychological & emotional pain. Pain that could never have been healed thru pharmaceutical drugs or western therapy. The Mauna is who healed me. The Mauna is where I go to, to ask my ancestors for guidance and strength. The Mauna is who gave me the courage to trust again."

Pre-Hearing Statement of Mehana Kihoi, page 1; Ex. F-1.

808. Kihoi's first visit to Mauna Kea was in 2012. She testified to this in relation to Criterion 7 and Criterion 8, generally, based on her stated emotional and psychological effects from the proposed project. Kihoi's practices have included pilgrimages to Mauna Kea since 2012 on numerous occasions. Kihoi was able to conduct her practices on Mauna Kea despite the presence of 13 existing telescopes, paved roads, and power and telecommunication lines. Tr. 2/14/17 at 109:1-25, 120:1-121:6. Prior to the October 7, 2014 groundbreaking ceremony, she had never been to the area of the proposed TMT Project site. Tr. 2/14/17 at 118:1-8. While Kihoi testified to engaging in certain practices generally over 33 years, those practices have not been directly on Mauna Kea, until recently. Kihoi believes in the sacredness of Mauna Kea. She agrees that native

Hawaiians have many different forms and types of practices that are personal to each individual. Tr. 2/14/17 at 108:7-111:7.

809. Kihoi's mother, Sarah Puaola Kihoi, is a native Hawaiian practitioner, called as a witness by Kihoi. Sarah Kihoi presents her background and support for her daughter as follows:

"I am Sarah Puaola Kihoi, I have an educational background in Sociology BA; I am a certified Ho'oponopono practitioner under the teachings of Malia Craver; a licensed lomilomi massage therapist in the State of Hawai'i; I have worked 30+ years with alienated youth dealing with social and emotional grief patterns with YMCA, Kamehameha School and Bishop Museum; I have worked with the State Correctional Office as a Youth Correctional Officer; I am currently on the Coalition Team "Families Against Domestic Violence"; I am presently developing programs for incarcerated Native Hawaiian women who have/are experiencing deep social, emotional, and psychological trauma; and for the past 20 years, my position as a Community Builder Facilitator for the Queen Lili'uokalani Children's Center I develop cultural, and educational programs specializing in intergenerational enrichment activities.

13 years ago, my daughter, "Mehana", and granddaughter, "Tali", was involved [sic] in a horrific incident, which left my daughter with broken bones in her face, jaw, eyes and neck. Tali was just 7 months old and was inches away, in her mothers arms when this happened. They both fell to the ground. After surgery, we all needed to find a place to hide for our safety. This was a week before Thanksgiving. My daughter could not eat, since her jaw was clamped shut. I was thankful that they both were alive.

Your Honor, it still brings me to tears to write this. We haven't had time to deal with these deep wounds. We have been trying to survive and deal with life. As I reflect over thirty plus years of service and as a cultural practitioner dealing with historical trauma, that has developed social, emotional, psychological struggles amongst our people. Nothing... could have prepared me to deal what was in front of me. My most precious daughter, and grand daughter was so close to death.

What did come into LIGHT was my background as a Lomi Lomi practitioner, oli, my knowledge in medicinal Hawaiian plants, and most importantly, the power of prayer. Through these modalities, my daughter does not have a single scar on her face. Although, she healed physically, deep inside her spirit was still broken. It has been 13 years of dealing with this broken spirit, needing to be filled.

Then, Mehana found her call, her "kahea", to go to Mauna Kea. Sometimes she would leave before dawn and come home late. From Honaunau to the Mauna that is a hike. As a mother I continued to worry.

As our ohana, with genealogy of thousands of years, Mauna Kea has housed our iwi, bones of our Kupuna. It is by no mistake that, this Mauna Kea, continues to heal my daughter in her spiritual quest."

WDT of Sarah Puaola Kihoi; Ex. F-2.

S. Kihoi's practices do not include pilgrimages to Mauna Kea. Her experiences on Mauna Kea are minimal. Ex. F-2 (WDT S. Kihoi); Tr. 2/14/17 at 141:23-148:23, 170:3-6, 178:15-179:21. She had never travelled to Mauna Kea until the efforts in June 2015 to protest the access of workers to the project site. Tr. 2/14/17 at 170:3-6.

810. Opposing Intervenor, Leina`ala Sleightholm, called as a witness by Mehana Kihoi, is a native Hawaiian practitioner. Here is her story:

"My name is J. Leina`ala Sleightholm. I come from the `ohana Keli`ipio, and Kuamo`o. I am a kanaka `oiwi and can trace my genealogy back to the Battle of Kuamo`o in 1819. I am a 42 year old wife, and mother of 6 children of which I birthed 5. I was born in Wahiawa, O`ahu and moved to Pahoa, Moku o Keawe in 1978 with my parents, and younger sister. At the age of five, we moved to the wahi of Keahuolu where my father was the caretaker. In 1988 we moved to Ka`awaloa, Kona Hema where my parents remain today. I currently reside in Waikoloa, Kohala Hema, Moku o Keawe.

On October 7, 2014, I was moved to go to the mauna for the purpose of protecting my mountain from the desecration of the groundbreaking ceremony for the proposed Thirty Meter Telescope (TMT). I stood alongside my mother, and dozens of other people chanting, praying, and singing while armed police officers approached. As I stood there chanting at the guardrail, I saw a female police officer remove a handful of zipties from her back pocket, and I immediately was overcome with a sadness so deep and profound, and one that I had never felt before but will come to be very familiar with it in the coming months. I looked at my mother with tears rolling down my cheeks and whispered, "why does it have to come to this". Those were the only words I could form for the emotional and spiritual sadness I was feeling at that time, as I looked around to see kanaka `oiwi from near and far standing together in love, and prayer for our mauna regardless of the threats that stood across the street. It was that day where my entire world shifted. The mauna called, and I answered. After that day, I came home and passed out on the living room floor for about 5 hours, and when I woke up, I went to take a shower and couldn't bring myself to wash the mauna dirt from my hair that night and finally did the next evening. It took me at least two weeks to recover from the feelings which I couldn't quite identify at that time, but it felt as if my physical body was at home, but my spirit was still on the mauna. Over the course of those two weeks, I had heard similar experiences and feelings from other people who were there. This would be the first "cut" I would endure over the course of the next two years.

On the evening of March 25, 2015, I again was guided by my kupuna to go to the mauna, where I and a few others would hold vigil for the next 3-5 days until hundreds began to arrive. During the duration of that time, I was in constant high alert that the mountain which had called me, which was also my church, and I regard as my kupuna was in jeopardy of being harmed by threatened construction work. Each day my fear became more and more intense. The only way to describe it in this human realm is as if my grandmother was in danger of her life. "This would be the next 3-5 cuts"

April 2, 2015 myself and many others, grounded deeply in pule, made our pilgrimage to the summit and stood arm in arm chanting, praying as police and DOCARE officers

began to bare down on us, ripping our arms apart from each other, while one forcefully grabbed each of our heads pulling it to his to exchange ha (life force/breath), against our will. I remember my arms being twisted behind my back and ziptied, all the while I continued to chant for the mauna, looking at each officer's face and recognizing that so many of them were kanaka too, some were childhood classmates, and others, family friends. I couldn't process all that happened that day, and felt spiritually numb as we were driven down the mountain in the police vehicle to the Hilo cellblock. What I did know is that I felt something in the very core of my being shift. From that day, and for the next three weeks I would remain close to home, barely able to get myself out of the house. I felt very vulnerable, tearful, and even unable to watch videos or see pictures of the arrests without breaking down in tears, literally immobilizing me. More than a year later, there are a few videos documenting that day that I haven't seen until just recently, and my reaction is the same, and I'm jolted back to that day with my arms being ripped from my mother's, and brother Elston's. Looking into the eyes of my own people carrying guns on their sides, and hands full of zipties hearing the chilling cries of our people which hauntingly replays in my mind till today, 'AUE...' AUE...and seeing the shocked and frightened faces many of which were dirt streaked from tears. "Cut, cut, cut, cut, cut, cut, cut".

On the evening of September 08, 2015 I was guided to be on the mauna again in ceremony, and to pule for our brothers who were holding vigil, for the continued protection of the mauna, and to mahalo our Akua, 'aumakua, kupuna, and 'ohana. My ceremony began at Pu'uhuluhulu before going up to Hale Pōhaku, where myself, my hula sisters, and my mother continued in protocols of ceremony throughout the evening into the early morning hours. After taking some time to malama ourselves, we joined hands in a tight circle, and I felt my body begin to tremble from the very cellular level of my being to the top of my head, down to the bottoms of my feet. It was not because I was cold, and from there I entered a different state, and I only remember seeing flashes of light, and the next thing I knew, I felt myself being yanked very forcefully, then realizing I had actually been kneeling on the ground, my arms again twisted behind my back with more force than before and ziptied. As I stood next to the police vehicle, a chant loudly burst forth from my na'au, "E IHO ANA O LUNA, E PI'I ANA O LALO, E HUI ANA NA MOKU E Kū ANA KA PAIA!!" As I looked on at the chaotic scene up on the hillside next to Hale Kukia'imauna where we had just been hand in hand in prayer. All I saw was a tangled confusion of officers, dust, lights from flashlights darting around, and my sisters and mother one by one being restrained, and walked down to where I was being led into the paddy wagon. We were removed from the mountain, processed at the Hilo cellblock, fingerprinted, mugshots taken, and released on bail to our awaiting families outside. I don't know how long it was, but I again, like I had felt in April, didn't want to leave the house, when and if I could even get myself out of bed I would only go anywhere with my husband, and only to see very close friends or family. I felt like I was in a dream, walking around with my eyes open but like I was floating, extremely tearful, on edge, and it felt like I was floating in the air with a very thin string connecting me to the ground...like a leaf aimlessly blowing in the wind. Like the last time, I couldn't, and still cannot watch videos of that night without breaking down in heaving cries. I watch in those videos, my mother, the grandmother of my children roughed up, having her arm twisted so hard her shoulder hurt, ziptied and arrested like a criminal while holding hands in a circle of

wahine, while praying. Our only weapon was ceremony. The video of our arrests plastered on the morning news....again we were portrayed like criminals. (This would be the deepest cut that ultimately would take longer to heal)

I stand here today, unrecognizable from who I was just a couple of years ago. The traumas inflicted on me all too often shows in my eyes, and the fake smile I wear. So throughout my recount of events I end with "cuts" because I was urged by a close friend to read a blog that spoke of the trauma we have endured for generations and it's likened to cuts. Much like the supporters of the proposed TMT project often say, "what difference does one more telescope make? There's already so many up there it's not like the mountain hasn't already been desecrated. One more won't make a difference." What they fail to see, like with me, each cut, each time an earthmoving machine disturbs another stone, we had a hundred cuts before that are still unhealed and this one, the last one they say, WILL be the final cut which would be the finishing slice."

WDT of Leina`ala Sleightholm, pages 1-4; Ex. F-3.

Sleightholm did not conduct any practices on Mauna Kea until October 7, 2014, when she ascended the mountain to protest the TMT project. Sleightholm has followed the principles of Petitioner Case, and both oppose the TMT Project. Tr. 2/14/17 at 12:15-22, 26:21-29:1, 42; Ex. F-3 (WDT Sleightholm) at 1.

811. Petitioner Paul Neves is a Kumu Hula. In his words: "I have been a Kumu since October 23, 1999. My Kumu was Kumu Hula Wayne Panoke and his Kumu was Kumu Hula Nona Beamer. I have two Halau, one is a combined Hilo and San Francisco Halau, and my second one is in Washington D.C.. I have about 100 students in all. [sic]

I recently directed and produced the Princess Ka`iulani Hula Drama titled "Shattered Vase" that premiered this last April in Hilo to an audience of about 1000 people and was also presented in Washington D.C.. [sic]

I was the first Kumu to present Hula Kahiko at the Native Museum of the American Indian in Washington D.C.. I have presented at the Kennedy Center, as well. I have presented Kupuna in Hula Competitions—and have taught at least 1000 student since becoming a Kumu Hula. [sic]

I am a member of the Royal Order of Kamehameha I. My position in the Order is Ali`i Noeau Loa, which is a position given to one that has previously served as Ka Lai Moku (or one who has held the 2nd highest position). I now can consult at the highest level."

WDT of Mr. Paul K. Neves; Ex. B.18a.

While he is a practicing Catholic, he began his native Hawaiian practices related to Mauna Kea in the late 1980s. Neves has been involved in solstice and equinox ceremonies on the summit of Mauna Kea since 1999. Ex. B.18a (WDT. Neves) at 1; Tr. 1/31/17 at 239:6. His practices related to Mauna Kea continue through the present, amongst the existing telescopes on Mauna Kea. Tr. 1/31/17 at 220:5-12, 244:8-17. His practices include lele. He is unaware of any lele located on the proposed TMT Project

site. Tr. 1/31/17 at 163:12-15, 241:1-11.

Petitioner Neves testified that the TMT Project will obstruct his view of Haleakalā from the summit ridge area of Mauna Kea and will be a dominant feature. WDT Neves at 4. His practices include pilgrimages to Mauna Kea, approximately four times per year, though he admits that one need not always travel to the Mauna Kea summit to conduct these practices. He has practiced from his home, and states that offerings can be made at lower elevations. He acknowledged that there is no one particular place that you need to stand on Mauna Kea in order to view Haleakalā. Tr. 1/31/17 at 202:4-20, 207:3-10, 219:1-10, 245:5-20.

812. Petitioner Ward is not a native Hawaiian practitioner. She has no traditional or cultural native Hawaiian practices related to Mauna Kea. Ward's interest in Mauna Kea is for recreation and hiking, which she believes will be impacted by the TMT Project. Ward had no prior practice of hiking in the rough lava areas of the TMT Project. Her main concern is the view towards the northwest will be impacted by the existence of the completed project. Tr. 1/31/17 at 17:3-18:14, 22:2-25, 57:19-58:23, 64:8-65:23, 110:3-19. Ward's use of Mauna Kea for recreation purposes began when there were telescopes already existing on Mauna Kea. Tr. 1/31/17 at 17:15-18:9.
813. During the 1980s and 1990s, Ward did not witness any native Hawaiians engaging in traditional or cultural practices on Mauna Kea. Tr. 1/31/17 at 17:19-18:14, 113:3-9.
814. Ward offered various legal, hydrological, entomological, cultural, archaeological, biological, botanical and medical arguments to support her view that the CDUA does not meet the eight criteria in HAR § 13-5-30(c). Ward did not offer any credible evidence to support that she has any expertise or is otherwise qualified to provide expert or scientific opinions relating to these subjects. Ex. B.17a (WDT Ward); Ex. B.17b (CV Ward).
815. Dr. Coleman also did not observe cultural practices on Mauna Kea from the mid-to-late 1980s through the 1990s. Ex. C-17 (WDT Dr. Coleman) at 2; Tr. 1/5/17 at 155:2-156:4.
816. Petitioner E. Kalani Flores is a native Hawaiian practitioner who has been conducting his cultural and spiritual practices since the late 1970s or early 1980s at areas on Mauna Kea and the summit. (Flores) Tr. 1/30/17 at 34:10-36:5, 202:21-203:4; 232:18-233:24. The record is, however, devoid of any specific information about what those practices might be or where they have been conducted. See Ex. B-02a (Flores, WDT 2016), Ex. C-26 (Flores, WDT 2011), Tr. 1/20/17, 33-251. Here is his story:

"I am E. Kalani Flores, member of the Flores-Case 'Ohana, residing in Pu'ukapu, Waimea, Kohala Waho, Mokupuni o Hawai'i who is a Kanaka Maoli (also identified as a Native Hawaiian, *he hoa 'āina o Moku o Keawe, he 'ōiwi o ka pae 'āina Hawai'i*, an indigenous person of the archipelago of Hawai'i) and a descendent of native Hawaiians who inhabited the Hawaiian Islands prior to 1778 as established through my genealogical lineage of Hukiku and Keulua. I am a cultural practitioner with substantial interest in Mauna a Wākea (also referred to as Mauna Kea), who continues to exercise my traditional and customary Native Hawaiian cultural, spiritual, and religious practices and

who continues to engage in cultural practices, protocols, and ceremony gatherings connected to and on Mauna a Wākea. These traditional and customary Native Hawaiian practices, including pilgrimages to the top of Mauna a Wākea, pre- date 1892 as evidenced through 'ike kupuna, oral traditions, indigenous knowledge, ancestral insight, cultural sites, and several reports.¹

I have a B.A. degree in Hawaiian Studies from the University of Hawai'i at Hilo (UHH) along with a D.O.E Teaching Certification. I have been an educator for over 30 years with the Hawai'i State Department of Education and the University of Hawai'i systems. I am presently employed as a tenured Hawai'i Life Styles - Professor at Hawai'i Community College – Pāalamanui instructing Hawaiian Studies courses, including, but not limited to the subjects of Hawaiian language, cultural traditions, spirituality, ethnobotany, and history. I am also fluent in the Hawaiian language. In addition, I am also owner of a consulting firm, Mana'o'i'o, specializing in the field of Hawaiian Studies who has consulted on several projects and authored several Hawaiian cultural and historical research reports for Federal and State agencies as well as for private firms. I've served for over 30 years on commissions, committees, and boards that included the review of archaeological surveys, mitigation plans, technical reports, and other similar types of documents.² I have extensive experience and knowledge in the review and assessment of reports and documents. Consequently, based upon the legal standards covered in Hawai'i Rules of Evidence – Rule 702, I would be qualified as an expert witness through my knowledge, skills, experience, training, ancestral connections, and education in the subject matter pertaining to Hawaiian cultural traditions including the review and assessment of cultural reports and surveys." (footnotes omitted)

WDT of E. Kalani Flores; Ex. B.02a.

817. Flores acknowledged that the Astronomy Precinct was "substantially developed" and that he was able to continue these practices despite the development. (Flores) Tr. 1/30/17at 234:5-8; *see also* Ex. B.02a (WDT E.K. Flores) at 4.
818. Flores claimed throughout his testimony that the FEIS for the TMT Project was flawed in many ways, including failing to adequately address traditional and cultural practices and failing to address a sublease beyond 2033. *See generally*, Ex. B.02a (WDT E.K. Flores). Flores conceded that he and his family did not participate and file any objections to the FEIS. While Flores initially could not recall if he was consulted regarding the FEIS, he acknowledged receiving an email indicating that he was directly solicited for his input into the FEIS as part of the consultation process. Ex. A-131; (Flores) Tr. 1/30/17at 222:3-22. He was not certain if he provided a statement in response. When questioned about the content of the FEIS, Flores was unsure of the content, and admitted that he had no experience in preparing an FEIS, AIS, or CDUA, and was not an expert in land use, archaeology, or anthropology. (Flores) Tr. 1/30/17at 38-39, 124-52, 163-65, 205-06, 210, 212-13, 222-23, 232. Neither he, nor his family members, filed any objections to the FEIS. (Flores) Tr. 1/30/17at 210:19-23.
819. Flores has seen ahu on Mauna Kea that he believes are associated with traditional and customary native Hawaiian practices. (Flores) Tr. 1/30/17at 41:2-15. He is aware of

shrines on Mauna Kea, and his kupuna took pilgrimages to the mountain for various reasons. (Flores) Tr. 1/30/17at 45:10-46:6, 59:14-22.

820. Flores relayed that native Hawaiians conduct rituals and celebrations during solstices and equinoxes, during various times of the day and night. This depends upon the particular astronomical event, but he did not provide any evidence that he himself takes part in these activities. (Flores) Tr. 1/30/17at 113:19-114:5.
821. Flores's asserts that the TMT Project will adversely impact his pilgrimages because many of the ahu on the Northern Plateau are interconnected and TMT would be situated amongst these sites, "causing adverse disturbance and impacts between the grid of interconnected sites." Ex. B.02a (WDT E.K. Flores) at 13. The various and extensive archaeological and cultural studies for the TMT Project provide evidence to the contrary. There are no historic properties or ahu on the proposed 5-acre TMT Project site, and the TMT Project will not result in substantial adverse impacts to cultural, archaeological and historic properties on Mauna Kea. See Ex. A-5, Apps. D, E, G, H, I, J; Ex. C-12, C-14. Flores provided no evidence that certain ahu on other parts of Mauna Kea, used to navigate ascent and descent of the summit, are used in the same way today by practitioners. See (Rechtman) Tr. 12/20/16 at 185:18-186:4; Ex. A-122 at 3-20, 5-2, 6-53 – 6-75, 7- 47. Flores currently travels to the summit area by truck using the paved roads. (Flores) Tr. 1/30/17at 233:25-234:4.
822. Davin Vicente was called as a witness by MKAH. He is a Biology Lecturer at UH Hilo. Ex. B.09b (WDT Davin Vicente) at 1. Vicente testified that he is opposed to the TMT Project because it will cause irreparable damage to Mauna Kea and to native Hawaiian culture generally. Ex. B.09a (WDT Davin Vicente) at 1-2. Vicente acknowledged that telescopes already exist on Mauna Kea, which in his view, currently affect native Hawaiian cultural and religious practices. Tr. 1/25/17 at 194:14-21. Vicente testified that nothing short of placing the TMT Project on an existing telescope site would be acceptable to him. Tr. 1/25/17 at 198:21-199:9. He has no evidence regarding how the TMT Project will specifically cause "damage" to Mauna Kea. Vicente does not regularly conduct any cultural practices on Mauna Kea. Tr. 1/25/17 at 186:12-19.
823. Opposing Intervenor Dwight Vicente provided no direct testimony. His primary concern was with legal arguments over Hawai'i's statehood and sovereignty issues. Dwight Vicente did not present any evidence that he conducts any practices on Mauna Kea, including the TMT Project site.
824. Prof. Peter Mills was called as a witness by Petitioner Mauna Kea Anaina Hou to testify about historical information on native Hawaiian issues generally. In his words:
- "I am Peter Mills, full professor of anthropology at the University of Hawai'i at Hilo (UHH), where I have held a tenure track position since 1997. I received a B.A. degree (anthropology and psychology majors) from the University of Vermont in 1984, an M.A. (1987) from Washington State University in anthropology, and a Ph.D. (1996) in anthropology from the University of California at Berkeley. I have worked as an archaeologist in the Northeastern U.S., Northwest, American Southwest, Alaska, Hawai'i

and Easter Island. My professional experience has included archaeological positions held with the federal government, state government, private consulting firms, and not-for-profit research organizations. From 1988 to 1990, I was the assistant state archaeologist for the Commonwealth of Massachusetts, conducting review and compliance work for the Massachusetts Historical Commission (State Historic Preservation Office). In 1990, I began working in Hawai'i with the Bishop Museum's Applied Archaeology Group (ARG), and I worked on additional consulting projects in Hawai'i from 1991-1993 with Biosystems Analysis, Inc. and Scientific Consulting Service, Inc. while conducting my dissertation research on Kaua'i. For the last 19 years, my research has focused primarily on the archaeology of the Hawaiian Islands, and I served as president of the Society for Hawaiian Archaeology from 2010-2012. I have taught college courses in Cultural Resource Management almost every year since 1997, and I was a governor's appointee to the Hawai'i Historic Places Review board from 2004-2008. I am also director of the University of Hawai'i Hilo's Heritage Management M.A. program that began in 2015. One of my major research projects is the examination of stone tool exchange patterns in the Hawaiian Islands, and from 2004-2006, I conducted a geological and archaeological study of the Mauna Kea Adze Quarry as part of the overall project. I am a qualified archaeologist who meets the standards of the Secretary of the Interior (36 CFR Part 61), and Hawai'i's Administrative Rules covering professional qualifications for principal investigators on archaeological projects in Hawai'i (HR 13-281-8)."

WDT of Peter Mills, Ph.D.; Ex. B.12a.

He is not a native Hawaiian practitioner and has no prior practice experience personally on Mauna Kea. He participated in the EIS process with a comment letter that was fully considered in the approval process for the FEIS. Ex. A-4/R-4 at 343. His testimony about viewplanes does not rise to the level of a personal cultural or traditional practice.

825. Petitioner Ching testified that he participates in cultural practices related to the use of Lake Waiau and other water sources and cultural sites in and around the summit area of Mauna Kea. These practices include performance of traditional astronomy, cosmology, navigation, continuing burial practices, performing solstice and equinox ceremonies, and conducting temple worship around the Mauna Kea summit, Ice Age Natural Area Reserve, and Science Reserve. Ex. B.19a (WDT Ching) at 12-13. Since 2002, Ching has participated in a group (Huaka'i I Na 'Aina Mauna) that hikes ancient trails that traverse certain areas on Mauna Kea. *Id.* Ching testified that, although he hikes ancient trails on Mauna Kea, none of the ancient trails go to the summit of Mauna Kea. Tr. 1/26/17 at 150:11-13. Ching did not establish that any of his cultural practices at the Mauna Kea Summit area that are connected to a firmly rooted traditional or customary native Hawaiian practice dating back to 1892. Ching also did not establish that he performs any historical or traditional native Hawaiian practice at the TMT Project site. No evidence was presented that his practices would be substantially impacted or prevented by the TMT Project.
826. Prof. Fujikane also testified that the group Huaka'i I Na Aina Mauna, led by Ching, has walked the ancient trails of Kaneikawaiole from Waiau down to the springs of Houkokane, Waihuakane, and Lilinoe, Pōhakuloa at Pu'u Ke'eke where the other springs

Waiki'i, Anaohiku, and Kipahe'ewai are said to have spread out from Mauna Kea to Hualalai, 'Umikoa-Ka'ula from Pu'u Lili'noe to Pu'u Makaanaka, and across the Northern Plateau. Ex. B.13a (WDT Prof. Fujikane) at 1. The CDUA makes it clear that none of these trails are near the proposed TMT Project site or the access roadway. Ex. A-1/R-1 at 3-5.

- i. Opposing Intervenor Fergerstrom is a native Hawaiian practitioner whose cultural practices include ho'oponopono and lele, as well as utilizing a "bridge" of light from Mauna Kea to Haleakalā. Tr. 1/23/17 at 200:7-204:11, 213:8-18. Fergerstrom believes that the entire MKSR is "wao akua" and that no astronomy should occur in that region. Fergerstrom further testified that, on occasion, he is the one who should decide who gets to travel up Mauna Kea, not the State or University. Tr. 1/23/17 at 215:10-218:19, 233:4-234. Fergerstrom believes that development of the TMT Project will injure him, although he did not explain how he would be injured. Tr. 1/23/17 at 196:6-197:13. Fergerstrom fully participated in the CIA and EIS process in approximately 2010. His comments and concerns were fully noted, responded to and considered as part of the EIS process. Ex. A-5/R-5, App. D at 140, 184. Fergerstrom is a member of Temple of Lono. As a representative for the Temple of Lono, he was consulted during the various cultural review processes of the CIA, EIS, and AIS. Ex. A-4/R-4 at 153-162; Tr. 1/23/17 at 244:4-245:4. No challenge to that EIS process and its approval was ever made by Fergerstrom. His positions and views were fully considered and part of the record. There is no evidence demonstrating that his practices would be interfered with in any significant way by construction at the TMT Project site or otherwise.

827. Narissa P. Spies was called as a witness for Petitioner KAHEA. She is the current president of the 'Ilima SACNAS chapter at the University of Hawai'i at Mānoa, part of the national SACNAS (Society for the Advancement of Chicanos and Native Americans in Science), an organization made up of minorities in science. Here is her story:

"I have been directly involved in scientific research and academia for the better part of a decade, and how that system operates in Hawai'i. While dynamic, the makeup of these institutions is predominantly comprised of individuals that do not have a connection to the local culture. The responsibility of learning about cultural connection falls upon the individual, and while many embrace the unique traditions of Hawai'i, there are those that remain within the confines of their own cultures. Science itself has its own culture. As scientists are trained to be objective, and to remove cultural biases that can affect the outcome of our experiments. The longer I practice science, the more I realize that it is not possible to remove all objectivity from our studies. Our inherent culture and biases will affect how we view a system, and even how we ask the questions that we seek to answer. Years of academic training to become a scientist has lead to pride and even arrogance in many academic fields. It is quite prevalent in science, and I have had to reconcile my own scientific principles with my Native Hawaiian culture. I cannot separate the two because they are both a part of who I am as a person. I often feel that I walk a fine line between my culture and science, but there is overlap between the two. I do not think of myself as being better than another group because of their beliefs.

Unfortunately, that is not the norm in the culture of science, and in my opinion it has contributed to the disconnect between cultures surrounding the TMT.

I've written my reasons for declining the TMT THINK scholarship money in the Civil Beat article. Afterward what I dealt with was a huge amount of backlash from certain groups of the scientific community. I've lost friends over this. They don't have the same cultural connection that I have to the environment, so I was accused of being anti-science when that could not be further from the truth. There were weeks when I woke up dreading what I would find in my inbox, or who I would run in to in public that would say something negative towards me. It affected me emotionally, and I felt hurt by both sides of my community. There were scientists condemning me for standing up for what amounted to religious superstition in their eyes, as well as members of the Native Hawaiian community that just saw me as a scientist, and demonized all fields of science.

The TMT highlighted publicly that there is a divide between the different cultures in Hawai'i. I'm the former vice president, and current president of the 'Ilima SACNAS chapter at the University of Hawai'i at Mānoa. We are part of a national SACNAS (Society for the Advancement of Chicanos and Native Americans in Science) organization that is made up of minorities in science. Our chapter goal has been to bridge that divide between the culture and science, and that starts by being open about the type of work we do, and engaging the community in our science. I feel as though this has been something that has been lacking in the astronomy community. Their efforts, though appreciated in an educational sense, feel disingenuous and obligatory. It's as though they are fulfilling some kind of task in order to get something that they want. This certainly isn't the case for all those involved in astronomy in Hawai'i. However, the perception among Native Hawaiian groups is that it's an attempt to appease the locals so that scientists can continue to do as they please on Mauna Kea. Even those within the SACNAS community who support astronomy are bothered by the current culture in their field."

WDT of Narissa P. Spies; B.52a.

She considers herself an embodiment of the principle that culture and science can coexist. Tr. 01/12/17 at 150:21-151:14; Ex. B.52a (Spies WDT). She performs no cultural practices at the Mauna Kea summit ridge area or the TMT Project site location in Area E. She recognizes a cultural divide, but the construction of the TMT Project would not otherwise halt any traditional or cultural practice at the proposed site location. Spies testified that there are native Hawaiians who support the TMT Project, including native Hawaiian scientists. Tr. 01/12/17 at 186:21- 187:7.

828. Prof. Osorio testified that he is not a cultural practitioner, has never been to the summit of Mauna Kea, and has not observed the telescopes. Tr. 01/12/17 at 28:12-19, 41:13-42:4, 140:19-141:10. For him, the TMT Project would violate native Hawaiian cultural practices; however, he had no knowledge or evidence that anyone practiced any traditional or cultural acts in the location of the TMT Project. He had no direct evidence as to how the TMT Project would result in significant adverse impacts to any protected historical traditional practice. Tr. 01/12/17 at 25:20-26:10, 27:15-24.

829. Petitioner Case of the Flores Case ‘Ohana testified to viewplane issues from Kamuela. Case testified that Mo‘oinanea believes that the existing observatories are blocking her (and other divine beings’) views and areas that they used to occupy. Ex. B.21a (WDT Case) at 3. Case testified that her hula, chants and prayers are connected to the entire mountain of Mauna Kea, including the Northern Plateau, and that construction of the TMT Project would affect her and her cultural practices physically and spiritually. Ex. B.21a (WDT Case) at 4. Case’s practices at the top of Mauna Kea began around 2010. Tr., 1/11/17 at 228:2-20.
830. Teale has been a long-time member of Mauna Kea Anaina Hou, one of the Petitioners in this proceeding. Ex. B.15a (WDT Teale) at 1. While she is a native Hawaiian, she presented no evidence that any cultural practice of hers would be prevented by construction of the TMT Project on the Area E site.
831. Both Spies and Prof. Fujikane acknowledged that there are native Hawaiians who support the TMT Project. Tr. 1/11/17 at 61:18-61:22; Tr. 01/12/17 at 186:21-187:7.
832. Spies also testified that there are fields where science and culture coexist, such as the fields of ecology and evolution, geology, and hydrology, because none of these involve building large structures in sacred spaces. Tr. 01/12/17 at 154:20-155:4. There are other sciences that co-exist quite well on Mauna Kea. Spies participated in a project on Mauna Kea looking at ‘ōhi‘a trees. Tr. 01/12/17 at 174:12-21. Science and culture have historically co-existed and need to be incorporated together. Tr. 01/12/17 at 164:24-166:11. Hawaiians are among the first scientists; for example, Hawaiians were experts in aquaculture. Tr. 01/12/17 at 167:9-18.
833. Construction impacts of the TMT Project would only impact practitioners during construction and only if they are on the Northern Plateau. (Baybayan) Tr. 11/02/16 at 96:8-96:22.
834. Certain Petitioners, including Pisciotta, argued that the TMT Project will obstruct the viewplanes used in Polohiwa ceremonies and those connected to the path of the sun, solstice, and equinox. Tr. 2/13/17 at 106:7-106:10, 107:12-107:18, 198:18-198:24. However, this testimony contradicts Pisciotta’s previous statements that her ceremonies relating to the celestial equator are located near where the Subaru and Keck observatories are located. Tr. 2/13/17 at 104:5-105:17. Moreover, Pisciotta’s conclusion that the TMT Project will obstruct traditional viewplanes ignores her testimony that she has already adjusted her practices because existing telescopes block traditional viewplanes. Tr. 2/13/17 at 91:22-93:5.
835. Prof. Fujikane also testified that while standing on the Northern Plateau, the viewplane facing the summit already includes the existing observatories. Tr. 1/11/17 at 79:18-80:3.
836. The TMT Observatory will not be visible from Pu‘u Wēkiu. WDT Hayes at 15-17; Tr. 10/25/16 at 123:9-15; Ex. C-18. It will not obstruct any viewplanes from Pu‘u Wēkiu, and will not interfere with any practices involving viewplanes to or from Pu‘u Wēkiu.
837. Since 2000, some cultural practices involving Mauna Kea have been conducted from

locations not at Mauna Kea, such as from the pu'u of Waimea by Case (Tr. 1/11/17 at 225:1-226:24) and by W. Freitas from his aunt's farm in Waimea (Tr. 3/2/17 at 267:17-268:12). Nobriga has been able to continue to worship his god, Lono, and to conduct his spiritual practices since the observatories were built on Mauna Kea, despite his claim that the observatories are a form of persecution to him (Tr. 3/1/17 at 73-75:24).

838. Since the year 2000 and up to the present, the reliable probative evidence shows that those cultural and/or spiritual practices can continue to be conducted with the existing astronomy facilities and those activities will not be prevented by the TMT Observatory which will be located 600 ft. below the summit ridge.
839. Therefore, the reliable, substantial and credible evidence demonstrates that the TMT Project will not result in any substantial adverse impact on the cultural practices of the community or State or native Hawaiian traditional and customary practices on Mauna Kea. Ex. A-3/R-3 at 3-37.

iv. Visual and Aesthetic Resources

840. The FEIS reflects extensive consultation with cultural practitioners as well as input from public meetings to determine the impact on viewplanes. (White) Tr. 10/20/16 at 94:21-95:9; Exs. A-3/R-3, A-4/R-4, and A-5/R-5.
841. There are currently 11 observatories on Mauna Kea within the Astronomy Precinct. Some of these existing observatories are visible from locations around the island such as Hilo, Honoka'a, and Waimea. Considering all existing observatories together, at least one observatory is visible from roughly 43 percent of the island's land area. The existing development on Mauna Kea does not block or obstruct any of the identified views in the County of Hawai'i General Plan or the South Kohala Development Plan. The existing observatories are, however, visible within the viewplanes from Hilo, Waimea, and the summit. WDT Hayes at 4-5; Ex. A-3/R-3 at 3- 80 to 3-81; Ex. A-36.
842. The TMT Observatory will not substantially affect scenic vistas and viewplanes identified in the Hawai'i County General Plan or the South Kohala Development Plan. The TMT Observatory will not be visible in the view of Mauna Kea from Pāhoa-Kea'au, Volcano-Kea'au Roads, and various Puna subdivisions or from locations where Hilo Bay is visible with Mauna Kea in the background. Although the TMT Observatory may be visible in the view of Mauna Kea from portions of the South Kohala district and the area around Waimea, it will not block or substantially obstruct the views and viewplanes of the mountain. Ex. A-3/R-3 at 3-84 to 3-85.
843. According to a viewshed analysis conducted pursuant to Chapter 343 of the Hawai'i Revised Statutes, the TMT Observatory will be visible from roughly 14 percent of the island area. From nearly all this area, existing observatories are currently visible. According to 2000 U.S. Census data, approximately 15.4 percent of Hawai'i Island's population, or 23,000 people, live within the viewshed of the TMT Observatory. Others, including visitors and island residents who reside outside the viewshed, will be able to see the TMT Observatory when they travel through and visit locations within the

- viewshed. WDT Hayes at 5-6; Tr. 10/25/16 at 119:7-121:25.
844. The determination of which viewsheds to use for that analysis took into account input from the community, including at seven public meetings around the State. Certain individuals and groups who are now Petitioners in this contested case received those documents and/or attended the meetings. No input was received suggesting other/additional methods be employed to evaluate the visual impact of the Project. WDT Hayes at 3.
845. The TMT Observatory will not be visible from the summit of Mauna Kea (Pu‘u Wēkiu) or Lake Waiau, where the majority of visitors to the summit region, including native Hawaiian cultural practitioners, spend their time. The TMT Observatory will also not be visible from Pu‘u Lilīnoe. WDT Hayes at 7, 15-17; Tr. 10/25/16 at 123:5-25; *see also* Ex. C-18 for distances from cultural practice areas to TMT Observatory site.
846. The TMT Observatory will be visible from other locations within the summit region, primarily the Northern Plateau and the northern ridge of Kūkahau‘ula where the Subaru, Keck I and II, IRTF, and CFHT observatories are located. The TMT Observatory will add a new visual element in the landscape that will be visible from viewpoints along the northern ridge of Kūkahau‘ula and by people as they travel within the northern portion of the summit region. WDT Hayes at 16-17.
847. Currently, views from the northern ridge of Kūkahau‘ula are already dominated by views of observatories, including the Subaru, Keck, IRTF, and CFHT observatories, which are located on this ridge. The majority of visitors to the summit region visit the Kūkahau‘ula summit (Pu‘u Wēkiu), not the northern ridge of Kūkahau‘ula. In addition, taking into account the TMT Observatory’s lower elevation and its size and height, it will not block the view of Maui or Haleakalā from the northern summit ridge area. WDT Hayes at 15-17; Tr. 10/25/16 at 123:5-124:23.
848. The Northern Plateau is not an open space with no telescope structures on it; SMA roads and facilities are already on the Northern Plateau. (White) Tr. 10/20/16 at 63:18-25. The open space characteristic of the Northern Plateau will still be preserved after the construction of the TMT Observatory since the observatory will take up five of the 2,000 acres. Tr. 12/12/16 at 163:21-164:5.
849. While the TMT Observatory will be a new visual element among the existing observatories within the views of Mauna Kea (for approximately 14 percent of the island area, and visible to approximately 15.4 percent of the population, the great majority of whom already can see one or more observatories), it will not substantially obstruct or block existing views of Mauna Kea from around the island of Hawai‘i. WDT Hayes at 21; Tr. 10/25/16 at 119:7-123:24; Ex. A-3/R-3 at 3-80 to 3-104.
850. The TMT Observatory will not block the views of Haleakalā, the setting sun, the shadow of Mauna Kea, or the Southern Cross constellation from the northern ridge of Kūkahau‘ula. Tr. 10/25/16 at 124:3-23; Ex. A-109; Ex. C-19; *see also* Ex. A-36.
851. The TMT FEIS considered and analyzed the viewplanes from the perspective of a

Hawai'i religious practitioner. Tr. 11/15/16 at 15:21-22:7. Consultation on viewplanes with religious practitioners was taken in part from the CIA and also contained in comment letters and responses. Tr. 11/15/16 at 28:8-11.

852. While several of the Petitioners participated in the public consultation and information processes to develop the CMP, the CIA, the CRMP for the TMT Project from 2008 through 2011, at no time prior to this contested case hearing did Petitioners and Opposing Intervenors contend that the TMT Observatory would impede views from the summit of Pu'u Poli'ahu. *See* Ex. A-5/R-5, App. D; Ex. A-9 at 4-1 to 4-7, App. A; Ex. A-11 at 6-1 to 6-23, App. F; Ex. A-74; Ex. A-75; Ex. A-79; Ex. A-81; Ex. A-86; Ex. A-87; Ex. A-91; Ex. A-94, Ex. A-95; Ex. A-99; Ex. A-100; Ex. A-101, Ex. A-103; Ex. A-104; Ex. A-105.
853. Based on the evidence presented, the TMT Observatory will be outside of the viewplane of observers viewing the setting sun from the summit of Pu'u Poli'ahu. Tr. 10/25/16 at 124:3-24; Ex. A-110. The summit area is farther south from the TMT Project site and is not directly in the line of sight at the highest sun setting point on June 21, or the summer solstice. The TMT Observatory will add a visual element below and to the right side of the view of Haleakalā from Pu'u Poli'ahu, but it will not greatly interfere with that view. Tr. 10/25/16 at 124:3-24; Ex. A-110; Ex. C-19.
854. In particular, views to the west which Petitioners and certain Opposing Intervenors now contend are unobstructed are already impacted by existing observatories including Subaru, SMA, JCMT, CSO, UKIRT, and the University 0.6-Meter Telescope. Views to the north, which Petitioners and certain Opposing Intervenors contend are unobstructed, are already obstructed by observatories including both Keck I and Keck II, IRFT, CFHT, Gemini, and the University 2.2-Meter Telescope. *See* Tr. 2/13/17 at 140:21-141:2.
855. The solstice ceremonies referenced are modern in nature and there is no evidence that solstice ceremonies at the summit of Mauna Kea are a traditional and customary practice. Dr. Coleman testified that there were no "sightline" or solstice/equinox ceremonies, and with the exception of the treatment of piko in Lake Waiau, and no cultural practices were conducted on the summit of Mauna Kea prior to the construction of the access road. This is due to the fact that it is too difficult to reach the summit by foot through the rough lava terrain and altitude, and there are sites at lower elevations that are actually preferable for such ceremonies. The construction of the access road contributed to the modern cultural practices at the summit of Mauna Kea. Ex. C-17 (WDT Dr. Coleman) at 2; Tr. 1/5/17 at 155:2-156:4, 167:19-169:9.
856. The TMT Project has already implemented, and is committed to implementing, several mitigation measures intended to address the visibility of the TMT Observatory, including: (1) locating the TMT Observatory in Area E, which is north of and below the summit of Mauna Kea, to avoid a more visible location such as the summit ridge or on a pu'u; (2) designing the telescope to be as short as possible given its focal length to allow for the smallest dome feasible; (3) covering the dome enclosure with an aluminum-like coating that will reflect the sky and reduces the visibility of the observatory during most of the day; (4) designing the support building to be small and low relative to the size of the dome and telescope; and (5) making the support building lava-colored to blend with its

surroundings. WDT Hayes at 18-21; Tr. 10/25/16 at 124:3-25:17, 126:5-127:12, 208:10-209:15; Ex. C-3.

857. In addition to residents within the TMT viewshed, the TMT Observatory will be visible to other island residents and visitors when they travel within the TMT viewshed, including travel along roads and stops at various viewpoints. The TMT Project's visual impact is perceived by some to be significant. In the context of the existing observatories, and the fact that the TMT Observatory will not block or substantially obstruct the identified views and viewplanes of Mauna Kea which is the applicable significance criterion in HAR § 11-200-12, the Project's visual impact will be less than significant. WDT Hayes at 21; Tr. 10/25/16 at 119:7-124:23; Ex. A-3/R-3 at 3-80 to 3-104.
858. Dr. Kahakalau testified that the TMT project will be a visible eyesore because it will add another monument to Americanism, to capitalism, and to expansion at all costs without any care and any concern about the people who live on the island and their values and traditions. Tr. 1/9/17 at 123:14-124:3.
859. C. Freitas testified that the Manitowoc 2250 crane that will be used for construction of the TMT Project will impede viewplanes during construction activities (approximately 7 years). Tr. 2/21/17 at 117:25-118:13. The crane will be a temporary impediment, and therefore does not constitute a substantial adverse impact on the visual resources of Mauna Kea.
860. The TMT Project will add a visual element to the summit of Mauna Kea, but it will be one such element among many. The incremental increase in cumulative visual impact due to the TMT Project will be less than significant. Therefore, the TMT Project will not have a substantial adverse impact on the visual resources of Mauna Kea. WDT Hayes at 21-23.

v. Hydrology and Water Resources

861. Tom Nance, a witness called by UHH, has substantial education and experience in the field of hydrology and water resources. Here is his story:

"I am president of Tom Nance Water Resource Engineering which is located at 560 N. Nimitz Highway, Suite 213, Honolulu, Hawai'i 96817. My company specializes in water resource development, well and water system design, and most aspects of hydrologic analyses. I received my B.S. in Mechanical Engineering from Stanford University in 1966 and a B.S. in Economics from Claremont Men's College in 1966. I received a master of science in Civil Engineering with a specialty in hydrology from Stanford University in 1970. Since receiving my masters, I have done graduate work in physical oceanography at the University of Hawai'i and also graduate work in hydrology at the University of California at Berkeley. I have been working in the field of hydrology and water resource engineering for 44 years. The first 17 years of my career in the field of hydrology and water resource engineering were spent with Belt Collins & Associates. My curriculum vitae was submitted as Exhibit A-43.

I started my own company in 1989. I have been qualified as an expert in hydrology and water resource engineering on a number of occasions. I reviewed the sections on water,

wastewater, and drainage of the Final Environmental Impact Statement ("FEIS") for the Thirty Meter Telescope ("TMT") Project. See Exhibits A-3 & A-5 (FEIS Vols. 1 & 3). Previously, I did work on the Keck Outrigger Telescopes project which involved research and water sampling of Lake Waiau and the perched springs which supply the Pohakuloa Training Area ("PTA"). I have also reviewed and discussed with Don Thomas the results of his geophysical work and test borehole at PTA.

...it is my opinion that the TMT Project will have no significant or adverse impact on water resources."

WDT of Tom Nance, page 1; UHH Witness Statement 10.

862. The TMT Project will cause minimal surface runoff, and the impacts of such runoff will not be significant. Paved areas and buildings are impervious surfaces that prevent rainwater from percolating directly into the subsurface. The TMT Project will create approximately 1.3 acres of new impervious surfaces at the TMT Observatory site (about 0.5 hectares) and portions of the Access Way (about 0.8 acres), including the dome and support building. The parking areas will not be paved and will remain pervious, allowing water to percolate naturally. WDT Nance at 2; (Nagata) Tr. 12/13/16 at 98:5-14.
863. The impact due to new impervious surfaces will be limited by the high permeability of the surrounding ground surface and the area downslope of the TMT Observatory and Access Way. The existing landforms attest to the high permeability of the area: there are no developed water channels or evidence of overland water flow. As such, the impact associated with localized runoff from new impervious surfaces created by the Project will not be significant. Runoff will dissipate via percolation into surrounding highly permeable areas. WDT Nance at 2; (Nagata) Tr. 12/13/16 at 98:5-14; Tr. 10/25/16 at 203:9-25; Ex. C-35; Ex. C-36.
864. Lake Waiau, which is located within Pu'u Waiau, is one of the highest alpine lakes in the United States. The lake is about 300 feet in diameter, reaches approximately 7.5 feet in depth at full capacity, and sits at an elevation of 13,020 feet on the southern flank of Mauna Kea. The lake's water is derived primarily from snow melt and precipitation within its watershed. Due to the topography of Pu'u Waiau, only surface runoff from within the crater rim, an area of about 30-35 acres, can enter the lake. WDT Nance at 2-3; (Nagata) Tr. 12/13/16 at 98:15-23, 104:15-24; Ex. A-108.
865. The TMT Observatory will be on the opposite flank of Mauna Kea from Lake Waiau and will not be in the lake's tributary watershed. In the event that surface runoff during an extreme storm event were to flow off the TMT Project site, it would move in an opposite direction from the lake. This path of potential runoff is depicted in Ex. A-108. It is not physically possible for such surface runoff to flow to and over the Pu'u Waiau crater rim to enter the lake. WDT Nance at 2; (Nagata) Tr. 12/13/16 at 98:5-99:5, 105:4-5, 107:20-110:8; Ex. C-35; Ex. C-36.
866. The TMT Project's Batch Plant Staging area, roughly 3,000 feet upslope of Lake Waiau, is also not located in the lake's watershed. Lake Waiau is approximately 3,000 feet south

of the Batch Plant and 285 feet lower in elevation. Contamination from the TMT Project site is not possible for several reasons. First, Lake Waiau sits in the central depression of Pu'u Waiau, one of a number of eruptive vents near the summit of Mauna Kea. It is surrounded by the ridges of the pu'u which define an enclosed area of approximately 32 acres. This topographic enclosure makes it physically impossible for surface runoff from other areas to reach the lake, even areas at higher elevation such as the Batch Plant. The only water that can enter the lake as surface flow is direct precipitation on the two-acre lake itself and runoff from the surrounding and enclosing 30-acre sloped area which comprises the interior of the pu'u crater area. Second, the subsurface volcanic intrusives (dikes) which created Pu'u Waiau form an impermeable base that enables Lake Waiau to be a perennial water feature. If it had a more permeable base, accumulated rainfall runoff on the 32-acre interior area of the pu'u would simply drain downward and no perennial water feature would exist. The near-vertical and impermeable intrusives complete Lake Waiau's hydrologic isolation. Perched subsurface water from upslope areas, possibly including local runoff from the Batch Plant percolating downward, would be prevented from entering the lake because of these barriers. WDT Nance at 3; Ex. A-108; (Nagata) Tr. 12/13/16 at 98:15-100:5, 108:13-112:13, 123:8-24, 170:3-22.

867. In accordance with CMP Management Action FLU-7, a zero-discharge wastewater system will be installed at the TMT Observatory. A zero-discharge system means there will be no discharge of any wastewater from the TMT Observatory, including domestic wastewater and mirror washing wastewater, in the summit region. Instead, all wastewater will be collected and transported off the mountain for proper treatment and disposal. Given that no wastewater from the TMT Observatory will be released into the environment at the summit, there is no reasonable prospect of adverse impact on groundwater, and wastewater will not be an environmental issue for the TMT Project. WDT Nance at 3-4; Ex. A-9 at 6-6 to 6-7, 7-57 to 7-58; (Nagata) Tr. 12/13/16 at 99:6-19.
868. The occurrence of groundwater beneath the summit area is what is referred to in Hawai'i as "high-level," which means that the groundwater is impounded by subsurface geologic structures, such as intrusive dikes, which act to compartmentalize the groundwater. Although groundwater is the primary source of drinking water in Hawai'i, there are no wells extracting groundwater near the summit. The nearest wells are located approximately 12 miles away in Waiki'i Ranch along Saddle Road. Ground elevation at these wells is 4,260 feet above mean sea level and the static water level is about 1,280 feet above mean sea level. The TMT Project's use of a zero-discharge wastewater system means that wastewater will not be released from the TMT Project into the environment and therefore will not percolate into the groundwater at a depth below the TMT Observatory. WDT Nance at 4; (Nagata) Tr. 12/13/16 at 110:9-114:16.
869. The composition of Mauna Kea consists of very porous lavas that naturally treat and filter water percolating downward. Any discharge on the summit would be naturally treated and filtered through thousands of feet of the porous lavas, thereby removing any contamination in that discharge by the time it reaches groundwater. Therefore, contamination of groundwater is very unlikely. The effectiveness of this natural filtering phenomenon is evidenced by the Kahalu'u Shaft and the Kealakehe Wastewater Treatment Plant in Kona on Hawai'i Island. The horizontal tunnel from which water is

derived from the Kahalu‘u Shaft sits approximately 800 to 1400 feet below the more than 30 residences that are upgradient of the Shaft. Ex. A-44. Wastewater from these homes is disposed of in cesspools and septic system leach fields. As the wastewater percolates downward through the unsaturated lavas to finally reach the basal lens below, a natural treatment process occurs such that there is no evidence of wastewater contamination in the drinking water pumped from the basal lens by the Kahalu‘u Shaft. The Kealakehe Wastewater Treatment Plant secondarily treats effluent by pumping it into a pit that is approximately 3,750 feet inland of Honokohau Harbor. Testing and various occasions at the harbor indicates that this trickling effect works and that there are no definable adverse impacts occurring from what people may think is an otherwise alarming way of discharging effluent. Tr. 12/13/17 at 114:20-116:24; Ex. C-37. As such, for the TMT Project sitting atop porous lavas at over 10,000 feet above the existing water lens, there is no reasonable prospect of the TMT Project adversely impacting groundwater. WDT Nance at 4-5; (Nagata) Tr. 12/13/16 at 99:20-103:6, 113:9-116:24; Ex. A-44.

870. The primary watershed recharge areas for Mauna Kea occur at lower elevations where it rains, and not in alpine deserts, where precipitation is minimal. It is extremely unlikely that any spill would be large enough to have any impact on the drinking water for Hawai‘i County. The main threats to Mauna Kea’s aquifer occur at lower elevations in areas of heavier population and use. Ex. A-24 at 48.
871. Petitioners and Opposing Intervenors expressed generalized "concerns" about water issues, including runoff, Lake Waiau, and groundwater. Pisciotta testified to her fear or belief that the TMT Project will impact Lake Waiau, but presented no data to support the contention that the TMT Project site will in any manner impact or contaminate the snow, ice, or water. Tr. 2/13/17 at 192:11-192:22, 194:7-12.
872. KAHEA presented Kanahale to argue that the water sources on Mauna Kea would be negatively impacted. Kanahale is educated in the field of Hawaiian Studies, and her background and experience is in matters relating to Hawaiian culture and traditions. Ex. B-11.b. She testified as to native Hawaiian knowledge of the water resources on Mauna Kea, as demonstrated through chants that have been passed down through the generations. Ex. B-11.a at 2-3; Tr. 1/24/17 at 141:11-20. Kanahale recited various chants indicating the native Hawaiian understanding of the water resources and hydrology cycles of Mauna Kea. Ex. B-11.a at 2-3; Tr. 1/24/17 at 141:24-147:13. She believes that Mauna Kea plays an integral role in the hydrology cycles on the mountain, and on Hawai‘i Island as a whole, due to its ability to collect clouds and mist, which recharge the aquifer. Tr. 1/24/17 at 144:12-146:16, 150:6-12, 163:1-164:1. Kanahale testified that further building on Mauna Kea should not be allowed in order to prevent damage to the water resources. Ex. B-11.a at 3; Tr. 1/24/17 at 147:10-13.
873. Kanahale’s testimony is based on her personal beliefs and interpretation of traditional Hawaiian chants, which, she admits are subject to different interpretations. Tr. 1/24/17 at 170:3-16, 185:8-23, 196:8-21. Her anecdotal evidence is not supported by any scientific data or research.
874. Teale testified that placing a "5,000-gallon hazardous chemical storage tank directly

- above" the "healing waters of Mauna Kea" which "are sourced deep within the mountain" is harmful to practitioners, and that construction of the TMT Project could cause harm to waters and plants in the area. B.15.a (WDT Teale) at 2. Teale did not provide any scientific or empirical evidence to support these concerns or fears, and her opinions on these issues are speculative. B.15.a (WDT Teale) at 2-3.
875. Tajon expressed his unsupported opinion that the TMT Project would negatively impact the spring water that feeds his farm. The basis of Tajon's beliefs are taken from his reading of traditional native Hawaiian stories regarding Mauna Kea. Tr. 2/27/17 at 39:18-39:24.
876. Michael Lee claimed that the water resources used for cultural practices would be affected by the TMT Project. *See* Tr. 1/23/17 40:13-25. Lee is not an expert in land use and has never been qualified as an expert in land use in any proceeding. Tr. 1/23/17 at 24:21-25:17, 27:15-23, 31:10- 33:8, 103:4-105:16. Notwithstanding his objections to the proposed TMT Project and speculative allegations that there must be spills by the observatories, Lee testified that the waters "have always been clean," even despite the presence of the existing observatories. Tr. 1/23/17 at 31:10-13.
877. Petitioner Ward testified to her concerns regarding hydrology and existing plant and animals species in the area; however, she is not a hydrologist, botanist, entomologist, archaeologist, land use expert, or an attorney. She did not provide any credible evidence to support her concerns. Tr. 1/31/17 at 24:20-28:3, 44:3-9, 84:7-88:6, 106:7-21, 116:17-117:7, 131:13-133:12.
878. Susan Rosier, appearing on behalf of C. Freitas, referred to alleged oil leaks occurring during pre-construction activities for the TMT Project. Ex. S-17a; Tr. 2/16/17 at 223:22-248:19; Tr. 2/21/17 at 32:22-72:21. Rosier was a mechanic assistant for over 33 years. In the late 1980's and 1990's, along with her husband, Alan Freitas, and Henry Akima, she moved all the heavy equipment for union shops on Maui. WDT of Susan Rosier, page 1. She feels that mechanical malfunctions may lead to oil leaks from heavy machinery used during construction of the TMT Project, and that the possibility of such leaks is heightened by the harsh conditions present on Mauna Kea (increasing the likelihood of hose malfunctions, etc.). *Id.*
879. Opposing Intervenor C. Freitas also testified that TMT Project will negatively impact the aquifer, based on the possibility of oil leaks on Mauna Kea. She testified as to past leaks at the CSO site in 2009, as well as her own personal observations of leaks on Mauna Kea in 2015. Ex. S-2a at 1-2; Tr. 2/21/17 at 78:18-84:3.
880. The 2009 oil leak was properly remedied and there is no evidence of any resulting impact to the water resources on Mauna Kea. Ex. S-18d. With regards to the alleged 2015 oil leaks, Dr. Sanders testified that some observed fluid leaks were likely moisture from condensation. (Dr. Sanders) Tr. 1/3/17 at 23:14-25:16. He further testified that all of the alleged leaks were addressed appropriately. *Id.* A protocol requires an oil drip pan be placed next to each piece of machinery to catch leaking fluids. *Id.* Any oil that spattered to the ground was removed by removing the material, dirt, and rocks around the drip pan.

The amount of material was very small and fit in a Ziploc bag. *Id.* at 25:11-16. Dr. Sanders' testimony established that the alleged 2015 oil leaks were limited in nature and addressed thoroughly.

881. Opposing Intervenor C. Freitas offered her own personal opinion that oil leaks will negatively impact the aquifer. This opinion was based on C. Freitas's personal beliefs. Tr. 2/21/17 at 155:1-5.
882. Opposing Intervenor W. Freitas claimed that chemicals from Mauna Kea were leaching into the water source at Kiholo Bay; however, he admitted to not seeing a study confirming the identity of the aquifer feeding Kiholo Bay. He acknowledged that his claim of contamination came only from his own "logic." Tr. 3/2/17 at 254:20-258:15, 278:3-279:25.
883. Furthermore, after review of Figure 1 of the Commission on Water Resource Management, DLNR's *A Study of the Ground-Water Conditions in North and South Kona and South Kohala Districts, Island of Hawai'i, 1991-2002* (Sept. 2003), W. Freitas acknowledged that Kiholo Bay is fed from the Kiholo aquifer, whose boundaries are not within the areas associated with aquifers below Mauna Kea. Tr. 03/02/17 at 254:12-258:15; Ex. A-156.
884. N. Ho opposes development on Mauna Kea. He conceded that the TMT Project's use of a zero-discharge wastewater system mitigates the impacts related to cesspools at the summit. Tr. 2/22/17 at 134:2-22. Nonetheless, his position is that mitigation should occur beyond the requirements of the current law. Tr. 2/22/17 at 136:7-9.
885. Opposing Intervenor Camara testified to his belief that Mauna Kea holds an important water resource, but was unable to answer specific questions about Mauna Kea's hydrology. He admitted that he was not a hydrologist, and that there is not enough information about the Mauna Kea aquifer. He briefly reviewed the hydrology section of the FEIS for the TMT project and did not review the testimony of Nance. He was unaware of any existing water sources at the TMT Project site. Tr. 3/1/17 at 127:20-130:4, 134:16-18, 140:19-141:17, 191:16- 192:2.
886. Opposing Intervenor Kanaele testified that the TMT Project would degrade the water supply, but did not provide any credible or scientific evidence to support that assertion. Kanaele presented no prior experience or knowledge of hydrology that would enable him to opine on the effect of the TMT Project on water resources. Tr. 3/1/17 at 222:19-224:21.
887. UH Hilo witnesses established through reliable, probative, substantial, and credible evidence, including but not limited to the testimonies of Nance and Hayes, that Petitioners' and Opposing Intervenor's concerns about water issues are highly speculative and lack scientific basis or are otherwise not credible evidence.
888. The reliable, probative, substantial, and credible evidence demonstrates that the TMT Project will not have a substantial adverse impact on the water resources and hydrology of Mauna Kea, including Lake Waiau and the groundwater underlying Mauna Kea.

vi. Hazardous Waste, Solid Waste, and Wastewater

889. Like other existing observatories, the TMT Observatory will utilize vehicle and generator fuel, alcohols used for optics and general cleaning, liquid adhesives for optics bonding, various metals used for coating deposition materials, lubricants, hydraulic fluid, glycol coolants, and small quantities of acids, paints, and solvents. No mercury will be used by or at the Observatory, and no hazardous waste is anticipated to be generated at the TMT Observatory. Ex. A-1/R-1 at 2-29 to 2-30; WDT Hayes at 23; Tr. 10/25/16 at 126:5-8.
890. The TMT Observatory will store all hazardous materials in a secondary containment area that will be inspected daily for leaks. Fuel storage and piping will also be double-walled and will be equipped with leak monitors. Therefore, the chance of a spill entering the surrounding environment is negligible. Ex. A-1/R-1 at 2-30; WDT Hayes at 23-24.
891. Like many of the other observatories, mirror washing will be the primary maintenance activity associated with the TMT Observatory. Mirror washing wastewater is not a hazardous waste. However, the TMT Observatory has been designed to ensure that the possibility of mirror wash wastewater entering the surrounding environment will be negligible. Ex. A-1/R-1 at 2-31; WDT Hayes at 24.
892. The TMT Observatory design includes a separate mirror laboratory for mirror washing. The laboratory is designed to collect waste from the mirror washing and coating area floor drain and laboratory sinks into double contained piping. The piping will drain by gravity to a holding tank. The tank will either be double walled or will be placed in a concrete basin. The tank will be sized to accommodate at least one week's worth of normal use. Each point of exit from the mirror stripping area will have a trench drain that will drain to the storage tank. All exposed concrete in areas of chemical use will have a chemical resistant coating applied. Ex. A-1/R-1 at 2-31; WDT Hayes at 24.
893. A leak detection system will be installed and will monitor the double contained pipes and tank. A level control system will monitor the tank and will be equipped with an overflow alarm in the event that the level in the tank reaches 90 percent capacity. The waste collected from the mirror washing process will be collected, removed, and transported off site for treatment and disposal. It is estimated that such removal will occur approximately once a month (more often if needed), and the likelihood of an accident is slight. To minimize the potential for an accidental spill while wastes are in transit down the mountain to the proper disposal site, no tank or containers being transported will be filled to the top. To further ensure the safe transport and disposal of hazardous waste, the Observatory will utilize only Environmental Protection Agency-permitted and licensed contractors to transport hazardous wastes. Ex. A-1/R-1 at 2-30 to 2-31; WDT Hayes at 24-25; (Dr. Sanders) Tr. 1/3/17 at 75:21-76:9.
894. In compliance with existing regulations and requirements, TIO will develop and implement a SPRP. Both the SPRP and the engineering measures (such as double-walled pipes) will protect against the release of chemicals or fuel to the environment. The SPRP will require inspections to ensure that systems are working properly, no leaks are occurring, and any necessary maintenance measures are taken. The SPRP will also spell

out protocols for proper handling, storage, use, and disposal of liquid and solid materials and wastes. Ex. A-1/R-1 at 2-30; WDT Hayes at 25.

895. As a result of the TMT Project's design plus implementation of the plans, programs, and built-in safeguards detailed in the TMT FEIS, all of which were designed to comply with applicable rules and requirements, the TMT Project's impact related to hazardous materials and hazardous waste will be negligible. The possibility of an accidental release to the environment of any hazardous materials or waste is extremely remote. WDT Hayes at 25; Ex. A-1/R-1 at 2-30.
896. The TMT Project will provide the training, equipment, and procedures for proper waste handling and disposal. The TMT Project will have a person on-site to monitor compliance. (Dr. Sanders) Tr. 1/3/17 at 196:12-197:19; 203:1-204:23. The TMT Project will: (1) collect all solid waste in secured and covered storage containers and truck it down the mountain for proper disposal at an off-site disposal facility; (2) implement a Materials Storage/Waste Management Plan, a component of which will be the SPRP; and (3) implement a Waste Minimization Plan that includes an annual audit to identify waste produced by the Project and how that waste could be reduced, reused, or recycled, among other mitigation measures. These measures will be implemented during both construction and operational phases of the TMT Project. Ex. A-1/R-1 at 2-28 to 2-30; WDT Hayes at 25-26.
897. Several components of the Waste Management Plan will address the construction phase specifically, including the following requirements: (1) repacking large shipments of construction materials prior to transporting them to Mauna Kea so that only essential packing material is used for final transportation to the construction site, thus reducing the amount of waste generated at the construction site; (2) securing to the ground outdoor trash receptacles with attached lids, thus ensuring that the receptacles, their lids, and their contents will not be blown away; (3) storing hazardous materials, fuel, and waste in designated areas in containers suitable and appropriate for such storage; and (4) covering construction materials with heavy tarps and steel cables anchored to the ground to hold materials down. WDT Hayes at 26. Disposal of packing materials will be in accordance with rules and regulations. (Dr. Sanders) Tr. 1/3/17 at 203-04.
898. The TMT Project will use three 5,000-gallon tanks—one for water storage, one for domestic waste storage, and one double-walled for chemical waste storage. It will also have two 25,000-gallon tanks containing fire-suppression water and above-ground 5,000-gallon tank for storing diesel fuel to power the emergency generator. Those tanks will not have a substantial impact on the natural environment. Page 3 to 5 of Ex. B to Ex. A-1/R-1; Tr. 12/6/16 at 175:1-21.
899. Mandatory compliance with existing regulations and requirements will ensure that the TMT Project will not result in a significant impact to the environment due to its solid and hazardous waste management. The implementation of the identified mitigation measures, such as the Waste Minimization Plan, will further reduce the Project's potential impacts. WDT Hayes at 26.

900. Petitioner Ward sits on the advisory OMKM Environment Committee, and testified that she did not have any concerns regarding the above-ground storage of liquids at TMT, but that her concerns were more focused on the transport of those liquids to and from the TMT Project site. Ward acknowledged that she was unaware of any previous spills on Mauna Kea resulting from vehicles overturning en route to the MKSR. Tr. 1/31/17 at 32:6-35:25, 41:3-24, 62:6-10.
901. Dr. Kahakalau, a witness for the Opposing Intervenors Flores-Case 'Ohana, testified that because telescopes are cleaned with highly toxic chemicals, there are all kinds of pollution that are possible if an accident occurs. Tr. 1/9/17 at 124:15-18. Dr. Kahakalau did not provide any evidence to substantiate either that telescopes are cleaned with highly toxic chemicals or the general assertion that all kinds of pollution are possible if an accident occurred.
902. Marti Townsend, appearing on behalf of KAHEA, is a graduate of the University of Hawai'i William S. Richardson School of Law with a Certificate in Environmental Law. In her words: "My professional career has focused on improving implementation of Hawai'i's environmental legal protections and educating Hawai'i's communities about those environmental protections. I served as staff for KAHEA: The Hawaiian-Environmental Alliance from 2005 to 2012; from 2007 through 2011, I was the Program Director; from 2011-2012 I was the interim Executive Director. Currently, I serve on KAHEA's Board of Directors in a volunteer capacity.

KAHEA has been working with local communities to protect the unique natural and cultural resources of Mauna Kea since 2001. KAHEA is a community-based organization working to improve the quality of life for Hawai'i's people and future generations through the revitalization and protection of Hawai'i's unique natural and cultural resources. We advocate for the proper stewardship of our resources and for social responsibility by promoting cultural understanding and environmental justice."

WDT of Marti Townsend, Esq.; Ex. B.03a.

Townsend believes the impact analysis and mitigation measures in the FEIS and CDUA are inadequate. Tr. 1/10/17 at 41:1-21, 50:24-51:3, 67:10-72:2, 75:2-76:2. She acknowledged that she would oppose the TMT Project even if there was minimal impact. Tr. 1/10/17 at 84:10-85:23. She never formally challenged the FEIS for the TMT Project within the appropriate legal challenge time. Tr. 1/10/17 at 136:5-20. Townsend further acknowledged that she has never been designated as a land use expert in any proceeding, and that she was not a scientist, botanist, hydrologist, entomologist, or geologist. Tr. 1/10/17 at 80:25-81:16, 136:21- 137:11.

903. Based on the above factual findings, the TMT Project will not cause substantial adverse impact to existing natural resources within the surrounding area, community, or region.

- E. CRITERION FIVE, HAR § 13-5-30(C)(5): "THE PROPOSED LAND USE, INCLUDING BUILDINGS, STRUCTURES, AND FACILITIES, SHALL BE COMPATIBLE WITH THE LOCALITY AND SURROUNDING AREAS, APPROPRIATE TO THE PHYSICAL CONDITIONS AND CAPABILITIES OF THE SPECIFIC PARCEL OR PARCELS[.]"
904. Astronomy facilities in the locality of the TMT Project are expressly permitted uses under HAR § 13-5-24.
905. The Astronomy Precinct is the site of many existing astronomical observatories so the TMT Project will be compatible with existing land uses. WDT White at 9-10; (White) Tr. 10/20/16 at 63:18-24, 94, 218:17-220:2; 10/24/16 at 22:11-23.
906. The TMT Project will be located on an approximately five-acre site within the Astronomy Precinct of the MKSR, which is a clearly defined, highly specialized area set aside specifically for astronomical facilities, and was first leased to the University of Hawai'i in 1968 for this express purpose. Ex. A-1/R-1, App. A at A-3.
907. The proposed location of the TMT Observatory is in relatively close proximity to the eleven other previously developed facilities for astronomy within the Astronomy Precinct, which is the only area now designated for astronomical facilities on Mauna Kea. Ex. A-31 at 3.
908. From most vantage points within the Astronomy Precinct where the TMT Project will be visible, other astronomy facilities are already visible. Ex. C-18.
909. The TMT Project will not be visible from the culturally sensitive areas of the summit of Kūkahau'ula, Lake Waiau, Pu'u Līlīnoe, and Pu'u Wēkiu. WDT Hayes at 7-8; Ex. A-36 at 2; Tr. 10/25/16 at 13:5-18.
910. The TMT Project should be assessed in the physical context within which it is proposed to be built. The Astronomy Precinct encompasses 525 acres, and the MKSR covers 11,288 acres. Ex. A-9 at 3-1. Combined, the TMT Observatory and Access Way will result in the disturbance of approximately 8.7 acres, including 2.5 acres that were previously disturbed. Ex. A- 3 at S-6. The Project proposes disturbance of only 6.2 acres of previously undisturbed land. Ex. A-9 at 3-26. New disturbance for the TMT Project represents less than 1.2% of the 525-acre Astronomy Precinct, and only about 1/20th of 1% of the MKSR.
911. The summit of Mauna Kea and other parts of Mauna Kea are substantially developed. There are 13 telescopes and related roads, structures, and buildings on the summit of Mauna Kea along with the food service and dormitory facility for 500 people and the Visitor's Center at the approximately 9,000-foot elevation, as well as other parking facilities, roadways, and trails. Tr. 12/16/16 at 41:18-41:25.
912. The TMT Observatory dome will also be coated with a reflective aluminum-like finish which reflects the colors of the sky and ground, helping the dome to blend in with the surrounding setting. Ex. C-3. Furthermore, because the TMT Observatory will be