

constructed within the Astronomy Precinct. The Board cannot adopt Dr. Kahakalau's position that her native Hawaiian values and native Hawaiian beliefs concerning Mauna Kea should prevail over any "outsider" opinion. Tr. 1/9/17 at 95:8-95:12.

925. Dr. Abad's opinion that the CDUA does not meet the criterion stated in 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") is based solely on her view that the CDUA does not meet HAR § 13-5-30(c)(4). Ex. B.08 (WDT Dr. Abad) at 20.

926. The reliable, probative, substantial, and credible evidence demonstrates that the TMT Project is compatible with the locality and surrounding areas and is appropriate to the physical conditions and capabilities of the area.

F. CRITERION SIX, HAR § 13-5-30(C)(6): "THE EXISTING PHYSICAL AND ENVIRONMENTAL ASPECTS OF THE LAND, SUCH AS NATURAL BEAUTY AND OPEN SPACE CHARACTERISTICS, WILL BE PRESERVED OR IMPROVED UPON, WHICHEVER IS APPLICABLE[.]"

927. The evidence presented demonstrates that the existing physical and environmental aspects of the land, such as natural beauty and open space characteristics, will be preserved or improved upon by the TMT Project. This criterion must be analyzed in the context of the purpose and goals of the resource subzone of the conservation district.

928. Visual or other impacts of a proposed project are site specific. In considering visual impacts here, the TMT Project provides information in the context of the preexisting conditions in the area proposed for a use. Ex. A-1/R-1 at 7-1 to 7-15.

929. The visual landscape in the summit area of Mauna Kea has already been substantially altered and impacted. Ex. A-1/R-1 at 7-1 to 7-2; WDT Hayes at 4-5. It will remain so with or without the TMT Project.

930. Because certain resources such as a clear night time viewing sky location are available only in particular places, limited alternatives for locating properties requiring those resources would outweigh visual or other impacts, even if such impacts are "obvious." The location for the TMT Project is dictated by the combination of natural resources that makes the Project's site uniquely ideal for astronomical observation. *See supra* at FOF Section II.F.

931. Even with some potential environmental or visual impacts to the Conservation District, the TMT Project incorporates appropriate measures and conditions to mitigate the project's adverse impacts. WDT Hayes at 7-22.

932. The TMT Project mitigation does appropriately consider measures designed to diminish although not eliminate altogether the impact of the project visually and in its effect on practices through its chosen location in Area E. Ex. A-1/R-1 at 4-26.

933. For visual impacts, "mitigation" is understood to require reducing adverse impacts, not

- eliminating them, which the TMT Project accomplishes here with its design. *See* Ex. C-6 (WDT Callies) at 8.
934. The mitigation measures discussed herein, including the location of the telescope, reduction of the dome to the smallest size physically possible, the finishing of the dome and supporting structure to reduce the visibility of the structures, and other measures, reduce the visual impacts for the TMT Project to the greatest extent feasible. WDT Hayes at 7-22.
935. Design of the TMT Project is consistent with (and in many aspects, improves upon) the design of the other existing telescopes within the Astronomy Precinct, which also includes various support buildings, roads and other facilities. Ex. A-1/R-1 at 4-30 to 4-31.
936. The size, dimensions and dome structure were conceived to minimize and enhance the natural beauty of the surrounding areas to the extent practicable. Ex. A-1/R-1 at 4-30.
937. Fluids such as gas, water, wastewater systems will be contained in underground tanks to minimize any possible contamination of the subsurface areas. Ex. A-1/R-1, App. D at D2.
938. The structural design considered ways to minimize visual impacts to optimize viewpoints around the facility. Ex. A-1/R-1 at 7-13.
939. Based on Petitioner's and Opposing Intervenor's interpretation of HAR 13-5-30(c)(6), no telescope could ever have been built on Mauna Kea, and nothing could be permissibly built on Conservation District land in the State of Hawai'i.
940. Such a reading would render "Astronomy facilities" in the Resource subzone meaningless.
941. The TMT Project will be consistent with and will preserve the existing physical and environmental aspects of the land directly and through the numerous mitigation commitments. The objective of the resource subzone is to ensure, with proper management, the sustainable use of the natural resources of those areas. HAR § 13-5-13.
942. This criterion focuses on the impacts of the proposed land use rather than the cumulative impacts of existing or past projects under other permits at the summit ridge area of Mauna Kea. (White) Tr. 10/20/16 at 70:23-71:2.
943. The TMT Project will be an astronomy facility under an approved management plan with an expressly permitted land use in the Resource subzone, so the type of use in this area has already been considered when allowing observatories to be utilized in this environment, so long as there is an approved management plan in place. (White) Tr. 10/20/16 at 61; (White) Tr. 10/24/16 at 17-18.
944. The TMT Project is not proposed to be built on a bare mountaintop. Rather, it is being added to an Astronomy Precinct, and to a visual landscape, that has already been substantially altered and is already populated by numerous observatories and other

- related facilities. Tr. 10/25/16 at 125, 154, 230; (White) Tr. 10/20/16 at 63, 94, 218-19. The addition of another observatory will not substantially alter the present physical characteristics of the surrounding area. (White) Tr. 10/20/16 at 73-74.
945. Petitioners and Opposing Intervenors have acknowledged the developed nature of the summit, and practitioners like Pisciotta have adapted their practices due to the development on the summit of Mauna Kea. Tr. 2/13/17 at 198:4-198:13.
946. The University envisions a future of sustainable and responsible astronomy on the summit of Mauna Kea. This includes the decommissioning and deconstruction of observatories, site recycling, and the siting of observatories in certain areas so as to minimize the effects of astronomy-related development. The University recognizes that future plans for Mauna Kea require balanced management to preserve, protect, and enhance the cultural and natural resources of Mauna Kea. WDT White at 10; (White) Tr. 10/20/16 at 59, 61-62.
947. The University's long-term goal is to eventually have fewer observatories in the summit region, while maintaining Mauna Kea's status as a world class center for education and research. This reduction in the number of telescopes will improve upon the physical and environmental aspects of the region by reducing the presence of the structures, physically and visually, from the most culturally sensitive sites on Mauna Kea. WDT White at 10; (White) Tr. 10/24/16 at 86-87. To that end, OMKM is in the process of evaluating CSO and Hoku Ke'a's filed notices of intent to decommission. Tr. 12/12/16 at 94:21-95:7, 97:9- 97:22.
948. As set forth above, the decision to locate the TMT Project on Mauna Kea was the result of an extensive worldwide study to evaluate potential locations. A unique combination of environmental factors indicated the summit area of Mauna Kea as the best location for the Project. Ex. C-2 (WDT Dr. Sanders) at 10.
949. A next generation large telescope like the TMT would not be appropriate to be placed on a redeveloped existing observatory site. Ex. A-48 at IX-37; Ex. A-3/R-3 at 3-32.
950. The TMT Observatory site location – in Area E on the Northern Plateau of Mauna Kea – was in part chosen to avoid more culturally and visually sensitive areas. The TMT Observatory will not be visible from the summit of Mauna Kea, from Lake Waiau, or from Pu'u Lili'noe. WDT Nagata at 9-10; Ex. A-48 at IX-37 – IX-39; Tr. 10/25/16 at 123; (White) Tr. 10/20/16 at 62-63.
951. The TMT Observatory will be visible within the Northern Plateau and from the northern ridge of Kūkahau'ula; however, other observatories are already visible from those locations. Because other astronomical facilities are already located on the northern ridge of Kūkahau'ula, views there are presently dominated by other astronomical facilities including Subaru, Keck, and the CFHT observatory. WDT White at 10-11; WDT Hayes at 16-17; Tr. 10/25/16 at 124.
952. Current observatories are visible from 43 percent of Hawai'i Island's area. The TMT Project will increase that slightly to 44.2 percent. The TMT Observatory itself will be

visible to approximately 15 percent of the Island's population, including from Waimea and along portions of Highway 250. The TMT Observatory will be visible among already visible existing observatories. WDT White at 11-12; WDT Hayes at 5-23; Tr. 10/25/16 at 120-21; Ex. A-3/R-3 at 3-80 to 3-103.

953. The TMT EIS incorporates a number of techniques to evaluate the existing visual resources and the potential impacts of the TMT Project, including reviewing community plans, view plans within the viewshed of the TMT Project, silhouette analysis, and photo simulations. Tr. 10/25/16 at 119.
954. The TMT EIS (Ex. A-3/R-3 at vol. 1, p. 3-91) contains a photograph of Mauna Kea taken from Waimea that approximates the "naked eye" view of the existing observatories. Because of their color and shape, these are clearly man-made structures along the summit ridge, but appear as tiny bumps because of the distance.
955. At vol. 1, p. 3-91 to 3-99, the TMT FEIS has a number of "binocular view" photo-simulations of the summit of Mauna Kea, showing what it would look like with the TMT Observatory having various surface coatings, from Waimea, Honoka'a, and Waikoloa. Even with the extreme magnification in the "binocular view", the TMT Observatory appears as just one additional observatory in a cluster of observatories. At 180' in height, it is larger than the existing observatories, but not dramatically larger. (Gemini—151', Subaru—141', CFHT—125', Keck I and II (111') (FEIS, Ex. A-3/R-3, vol. 1, p. 3-81.) It does not significantly affect either the overall natural beauty or open space qualities of the Mauna Kea summit, compared to the existing conditions, even in the "binocular" view.
956. Waimea, Honoka'a, and Waikoloa views are representative of the major populated areas and connecting highways from which the TMT Observatory would be visible. *Id.*, Fig. 3-8.
957. No "naked eye" photo-simulations of the TMT Observatory from populated areas were prepared because it would be "not discernable" in a naked eye view. EIS, Ex. A-5, vol. 3, Appendix "M", at p. 31. Given this statement, and given the evidence of the "binocular views", the TMT Observatory would not affect the existing views of Mauna Kea from the major populated areas from which it will be visible, or the highways between those populated areas. It would be another tiny bump near the summit. It would not affect either the open space or natural beauty characteristics of the summit area for people viewing them from distant populated areas.
958. Apart from the distant views from populated areas, the TMT Observatory will be visible at some points to summit visitors. Because of terrain, the TMT Observatory would not be visible to people approaching the summit until they reached the summit area itself. *Id.*, vol. 1, Fig. 3-8, p. 3-87. Almost all of those visitors use the summit access road, Ex. A-12, Public Access Plan, at p. 3-1 to 3-15, and will see several large observatories in the foreground before TMT Observatory comes into view.
959. About 25% of those who go to the summit are observatory staff. Another 45% of visitors

come on commercial tours which often include stargazing. Ex. A-12, at 3-5, 3-7. Another 30% come in independent vehicles. These are usually tourists. *Id.* at 3-8. Some of the commercial visitors and other tourists come, at least in part, to see the observatories. Ex. A-7 at 52. The number of Hawaiian cultural practitioners is not separately tracked; their vehicles would be counted with the "independent" group. *Id.* at 3-16.

960. If it were not for the summit access road, which was built to foster the use of the summit for astronomy, only a few hardy hikers and horseback riders would ever enjoy close-hand views of the summit area. About 600 hikers per year are seen on trails or the road leading to the summit, although not all of these are actually hiking to the summit. *Id.* at 3-14.
961. Visual simulations in the EIS and used in the CDUA depict what the TMT Observatory would look like during most of the day. View studies show the TMT Observatory will not block views of Haleakalā, the setting sun, the shadow of Mauna Kea, the Southern Cross constellation from the northern ridge of Kūkahau‘ula, or views from the summit of Pu‘u Poli‘ahu. Tr. 10/25/16 at 122-24; Ex. A-109.
962. The TMT Observatory will not be visible from Kūkahau‘ula, Lake Waiau, and Pu‘u Līlīnoe, which are the three traditional cultural properties designated by SHPD within the summit area. Tr. 10/25/16 at 123.
963. Prof. Fujikane, a witness for KAHEA, testified that locating the TMT Project in Area E should not be considered mitigation since native Hawaiian practitioners conduct ceremonies and look at viewplanes from all over the mountain, not just from these specific sites. WDT Prof. Fujikane at 4. Other than her testimony, Prof. Fujikane did not offer any other evidence in support of her generalized statement that the TMT Project will have a substantial negative impact on traditional or historic cultural practices.
964. From points on the access road north of the existing observatories, a viewer can look north toward Haleakalā, with no large observatories in the field of view, because the existing observatories are behind the viewer. The landscape is not entirely natural because of the pads and roads of the SMA. Ex. A-3/R-3, Fig. 3-23, p. 3-100. If the TMT Observatory is built, it will be in this field of view, although it will not block views of Haleakalā from the summit ridge. If, after the TMT is built, someone seeks a view of Haleakalā from near the Mauna Kea summit, but does not want to see any observatories, the person could drive a short distance down the access road, and then walk a short distance to get north of the TMT Observatory. The person could also use a jeep road that goes to Area F. *Id.*, Fig. 2-3.
965. Although the TMT Project will add a visual impact to the Northern Plateau, numerous measures, involving both its location and its design, have been incorporated into the Project to minimize and integrate its visual impacts to the greatest extent feasible:
 - a. The TMT Observatory will be sited at a lower elevation than other observatories; therefore, it will not affect viewplanes vertically from the summit ridge areas. WDT White at 11; WDT Hayes at 13-14, 17-19; Tr. 10/25/16 at 122-23.

- b. The TMT Observatory has been designed to have the lowest focal ratio possible, resulting in the shortest telescope possible to accommodate a mirror of its size. The dome has been designed to fit closely around the telescope, reducing the dome size. While the 30-meter mirror is larger than the mirrors of other observatories, the TMT Observatory's dome height is barely taller than existing observatories like Gemini and Subaru, the mirrors of which are 10 and 8 meters in diameter, respectively. WDT White at 11; WDT Hayes at 19; Tr. 10/25/16 at 124-25; Ex. A-3/R-3 at 3-101; Ex. A-1/R-1 at 7-13; Ex. C-23.
 - c. The TMT Observatory dome finish has been designed to minimize the Observatory's visibility. Although operationally and from a cost perspective it would have been preferable to color the dome white, the dome will have a reflective aluminum-like coating, which view studies show will be the least visible alternative. WDT White at 11; WDT Hayes at 20; Ex. A-3/R-3 at 3-103; Ex. A-1/R-1 at 7-13; Tr. 10/25/16 at 125.
 - d. The TMT Observatory's support facilities will be relatively small and low to the ground, and will use materials and natural colors designed to blend with the surrounding landscape. WDT White at 11; WDT Hayes at 20-21; Ex. A-1/R-1 at 7-13.
 - e. Additional mitigation measures will be employed that will improve upon the existing physical and environmental aspects of the land. The TMT Access Way will be rendered less visible by shading the pavement in various areas to blend in with its surroundings. The existing utility pull boxes in certain locations will be camouflaged to reduce their visibility. The former jeep trail up Pu'u Poli'ahu, which was cut in 1964, will be restored to its natural state. Following completion of construction of the TMT Observatory, the Batch Plant Staging Area, which has been used for several prior observatory construction projects, will be partially re-naturalized. WDT White at 7; WDT Hayes at 22, 30-31.
966. For those wanting to access the Northern Plateau, improving the road is a benefit and advantage and improves upon the existing physical characteristics of the area. Tr. 01/04/17 at 80:13-20.
967. Hansen testified that, in his opinion, the CDUA does not meet criterion 6 because the development of the TMT Project will "dig into the mountain, move rocks and alter substrate." Ex. B.10a (WDT Hansen) at 2. The mere fact that a project will require excavation does not automatically disqualify a project from approval under HAR § 13-5-30(c). Since allowable uses in the Resource subzone specifically include "mining and extraction of any ... natural resource..." Hansen's position is contradicted by regulations governing the conservation district. HAR § 13-5-24(c); R-6.
968. Criterion Six provides that "the existing physical and environmental aspects of the land such as natural beauty and open space characteristics, will be preserved or improved upon, whichever is applicable." This requires the Board to decide what area is the proper unit of analysis to consider as "the land" whose characteristics must be "preserved or

improved upon." Also, when considering the natural beauty and open space characteristics, "the land" must be analyzed with respect to the major vantage points from which people will experience it. The major vantage points are those from distant populated areas, and those of visitors to the summit.

969. The appropriate unit of analysis for Criterion Six could be either the Astronomy Precinct, the 525 acre area designated by the UH for astronomy facilities, or more holistically, the unit of analysis could be the entire MKSR of about 11,288 acres. Using either unit of analysis as "the land" to be considered, the result is the same: existing open space and natural beauty characteristics are preserved.
970. The Astronomy Precinct is an appropriate unit of analysis because it is a specific area designated for astronomical use in the 2000 Master Plan, and contains almost all of the existing telescope facilities. It also contains the summit ridge, which is the most visible area and also culturally significant. It is, therefore, like the HO site that was analyzed in *Kilakila 'O Haleakalā v. Bd. Of Land and Natural Resources*, 138 Hawai'i 383, 406-407, 382 P.3d 195, 218-219 (2016): an area specifically designated for astronomical use, in which astronomical facilities had historically been placed. Although the Astronomy Precinct is larger than the HO site, the existing facilities on Mauna Kea are also much larger and much more spread out than those on Haleakalā.
971. The MKSR could also be an appropriate unit of analysis. Petitioners and Opposing Intervenors have repeatedly emphasized the importance of the mountain as a whole. The MKSR contains the entire area leased to the UH and set aside by Executive Order specifically for astronomical facilities and related buffers.
972. It would not be appropriate to use a smaller unit than the Astronomy Precinct, such as the actual TMT site, or the immediately surrounding area, to analyze the effect on natural beauty or open space characteristics. If one chooses a sufficiently small area, any significant building will reduce its open space characteristics. This interpretation would make any new building impossible and be an absurd interpretation of a set of rules that explicitly allow astronomical facilities as a potential use.
973. Any area chosen to analyze the effect of TMT on natural beauty or open space must include the summit ridge. This is the most visually prominent area and the destination of most visitors.
974. No credible evidence shows that either the TMT site, the immediate vicinity, or Northern Plateau, were considered particularly important areas of open space or natural beauty in themselves, apart from the broader summit region, prior to the TMT project becoming a public issue. None of the credible testimony supports the concept that the TMT site or its immediate vicinity, rather than some broader area including the summit, should be the appropriate unit in analyzing the effects on open space or natural beauty. The Northern Plateau contains some shrines, but the band of shrines goes around the mountain and is more dense to the northeast and east of the summit, not to the northwest where TMT is located. (Nees, Tr. 12/05/16 at 68:17-21, 115:7-19.)

975. From the populated areas on Hawai'i Island, the TMT Project will not affect the current natural beauty or open space characteristics of either the Astronomy Precinct or the MKSR.
976. Visitors to the summit using the summit access road will see several other very large telescope structures before they even see the TMT Observatory. From most viewpoints on the summit ridge, if the TMT is visible, other large telescopes are also visible. People seeking a view of Haleakalā without seeing any observatories will still be able to get this view if the TMT Project is built.
977. The TMT Project will not meaningfully reduce the existing open space or natural beauty aspects of either the MKSR or the Astronomy Precinct for visitors to the summit area. The existing open space and natural beauty aspects of this area are the cinder cones and expanses of bare lava, interspersed with large observatories. This basic setting will remain after construction of the TMT Project. The overall visual experience of the visitor will be the same. Like the ATST reviewed by the court in *Kilakila*, because of the existing buildings, the effect on views of the TMT will not be significant. 138 Hawai'i at 403, 382 P.2d at 215.

The TMT dome and attached support building will occupy less than 1.5 acre. Ex. A-3/R-3 at p. 2-15 to p. 2-17. This is less than 0.3% of the Astronomy Precinct and less than .0015% of the MKSR. This further demonstrates that the basic aspects of the land will not be changed.

978. Placed in context with existing observatories and the minimal or nonexistent obstruction of existing views from the summit ridge region, the visual impact of the TMT Observatory will be less than significant. Therefore, when viewed from the perspective of the summit region, which already includes astronomy facilities, the physical and environmental aspects of Mauna Kea will be preserved by the TMT Project, and, in some respects, will be improved upon. WDT White at 7-8, 11-12; Ex. A-3/R-3 at 3-230 – 3-232; HAR § 13-5-30(c)(6).
979. The reliable, probative, substantial, and credible evidence demonstrates that the TMT Project satisfies Criterion Six.
- G. HAR § 13-5-30(C)(7), CRITERION SEVEN: "SUBDIVISION OF LAND WILL NOT BE UTILIZED TO INCREASE THE INTENSITY OF LAND USES IN THE CONSERVATION DISTRICT..."
980. HAR § 13-5-2 defines a "subdivision" as a "division of a parcel of land into more than one parcel." The TMT Project does not utilize a subdivision of land to increase the intensity of land uses in the conservation district.
981. To subdivide land in the conservation district requires an application to subdivide a parcel pursuant to the conservation district rules. HAR § 13-5-22(b)(P-10) applies in the Protective subzone; the same clause is carried forward in the other subzones. HAR §§ 13-5-23(a), -24(a), -25(a).