
Type III. New Conventional Optical/IR Telescope

The second priority for siting proposed conventional optical/IR telescopes will be at a new site within the Astronomy Precinct, and only if a suitable summit ridge site cannot be utilized for redevelopment. In the event there is no existing site available, there is an area to the north of the summit ridge that could potentially support a new conventional optical/IR telescope. Infrastructure expansion issues are a potential concern for any new facility that is not accessible from existing roadways. The north shield has not been thoroughly tested for seeing conditions, and a future site for facility development in this area would be contingent on positive findings from seeing analysis.

The proposed site for a new conventional optical/IR telescope is shown in Figure IX-16 and a perspective view is shown in Figure IX-20. The selection of this new site within the Astronomy Precinct generally satisfies the specific siting criteria, including:

1. Minimal impact on existing facilities. A facility proposed at a location to the north of the summit ridge will not cause obscuration for any existing telescopes on the mountain.
2. Minimum impact of Wēkiu bug habitat. The area to the north slope is outside of the known Wēkiu bug habitat with no pu‘u or cinder cone surface geology.
3. Avoidance of archaeological sites. There are no existing archaeological features in the north slope portion of the Astronomy Precinct. The new facility will be set back at least 200 feet from the clustered group of shrines found outside the Precinct boundary further to the north (toward Honoka‘a and Waimea). This setback distance is 10 times the minimum setback distance required by the Hawai‘i Island Burial Council for development near existing burials.
4. Minimum visual impact from significant cultural areas. Telescope sites on the north slope would be visible from archaeological sites when looking toward the summit, but would not obstruct the visual connections between the major pu‘u and these shrine complexes. By locating a new conventional optical/IR telescope site off the summit cinder cones, this will mitigate further diminishment of the integrity of the summit ridge as an historic property.
5. Avoid or minimize views from Waimea, Honoka‘a or Hilo. This location is not a prominent site such as the ridges or pu‘u. The existing topography of the north slope shields views of new facilities from Hilo. A new telescope at this location would be visible from the Waimea and Honoka‘a communities.
6. Close to roads and existing infrastructure. The proposed site for the conventional telescope was selected near to the existing roadways to minimize the amount of disturbance to the natural terrain. Utilities and communications service to the new site will be extended along the existing roadway routes to minimize disturbance.



The proposed site for a conventional optical/IR telescope satisfies the selection criteria. A perspective view of the new conventional optical/IR telescope on the north slope is shown in Figure IX-20. In order for visual impact to be minimized, the enclosure for this new telescope should be colored to match the surrounding lava/ash terrain. Further, if a new observatory is proposing to develop a mirror with an aperture of greater than 10 m., a partial buried strategy must be applied to diminish the visual impact of these facilities. These requirements are specified in the proposed Design Guidelines.

Type IV. Next Generation Large Telescope Site

A single large optical/IR telescope may be proposed for Mauna Kea in the 20-year life of this plan. A ground-based telescope with a mirror of 25 to 50 m. in diameter is being considered by the astronomy community, which would complement the planned Next Generation Space Telescope. This facility would be the largest telescope in the world, and is currently called the Next Generation Large Telescope (NGLT).

The large scale of this instrument makes the visual impact considerations very important in the facility siting and design. The NGLT would not be appropriately located at Mauna Kea's summit ridge, due to the major earthwork requirements that would disturb Wēkiu bug habitat and the visibility of a large telescope placed atop the ridge. In addition, telescope engineers have indicated that wind forces acting on the structure are expected to be severe and problematic. To minimize potential obscuration of existing observatories, the potential site for this facility must also be located in an area that is distant from the prominent topography at the summit ridge and nearby *pu'u*.

A location that would minimize its visibility and reduce wind shear forces, and minimize potential obscuration impacts, would be on the slope to the northwest of the summit ridge. The proposed location of the telescope will take advantage of a northerly extension of the summit ridge to entirely block views of the new facility from Hilo, and partially block views from Honoka'a. Figure IX-16 shows the proposed location for the NGLT, which is located between the SMA service roadway and a jeep road that was built decades ago for preliminary testing of viewing conditions to the northwest of the summit ridge. The presence of the existing roadways will help minimize potential site disturbance for the infrastructure extension to this site.

Strict design guidelines will dictate the size and color of the NGLT. The preliminary design concept proposed for the NGLT employs a unique sliding dome mirror enclosure with a sub-grade foundation, as shown in Figure IX-21. The lower half of this observatory will be built below grade to minimize the apparent height and mass of the facility. The facility shown in the concept has a 30-m. mirror, with a dome shaped and colored to simulate a small *pu'u* to blend well with the surrounding landscape.



Proposed Next Generation Large Telescope (NGLT)

The siting criteria for locating proposed new facilities were applied in selecting the site for the NGLT, discussed as follows:

1. Minimal impact on existing facilities. The observation function of the existing telescopes on the mountain would not be affected by new facilities located to the north or northwest of the summit ridge. The proposed location of the NGLT in the center of the SMA expansion area could potentially obscure some antennas in the SMA expansion. These potential obscuration effects can be minimized or eliminated by cooperative planning for these two facilities.
2. Minimum impact of Wēkiu bug habitat. The proposed site is outside of the Wēkiu bug habitat.
3. Avoidance of archaeological sites. The closest archaeological feature to the proposed NGLT site is a shrine located approximately 1,200 ft. to the east. For reference, this distance is 60 times the minimum setback distance required by the Hawai'i Island Burial Council for development proposed near existing burials.
4. Minimum visual impact from significant cultural areas. The siting of the NGLT respects views from the pu'u and archaeological sites. The NGLT is located to the northwest of the summit ridge, which does not interfere with the visual connections between the major pu'u and the shrine complexes.
5. Avoid or minimize views from Waimea, Honoka'a or Hilo. The existing topography shield views of the NGLT from Hilo, however, the facility will be partially visible from Waimea and Honoka'a. The proposed design guidelines for the NGLT will minimize the visual impact of the facility, as discussed previously.
6. Close to roads and existing infrastructure. The NGLT site is close to the existing SMA service roadway, which will minimize the amount of disturbance to the natural terrain. Utilities and communications service to the NGLT site will be extended along the existing roadway routes to minimize disturbance.

To mitigate the visual impact of the telescope, requirements will be imposed to color the telescope enclosure to blend into the surrounding site. The technology for coloring telescope enclosures has yet to be applied in practice, however, this technology is presently being considered by telescope engineers. This design measure will serve to significantly diminish the visual impact of the telescope from both on-mountain and off-mountain locations. Coloring of the telescope enclosure and other strategies are included in the Design Guidelines.