DRAFT ENVIRONMENTAL ASSESSMENT

Remote Office Building to Support the Daniel K. Inouye Solar Telescope Maui, Hawai‘i

February 2016

Prepared for:

National Science Foundation

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February 19, 2016

Public Notice of Availability
Draft Environmental Assessment for the
Remote Office Building to Support the Daniel K. Inouye Solar Telescope

Interested parties are hereby notified that a Draft Environmental Assessment (DEA) for the proposed Remote Office Building (ROB) on the Island of Maui, Hawai'i is available for public review and comment. The National Science Foundation (NSF) is the lead federal agency for the proposed Project and would fund construction of the ROB if approved. Consequently, this proposed action requires an environmental review pursuant to the Federal National Environmental Policy Act (NEPA) (40 CFR 1500-1508) and NSF's NEPA-implementing regulations (45 CFR 640).

The purpose of the proposed Project is to provide offsite offices and work areas for the scientists, post-doctoral researchers (permanent and guests), non-site operations personnel, and administrative staff that do not require daily access to the Daniel K. Inouye Solar Telescope (DKIST) facility or facility instrumentation. A facility of adequate size that is also conducive for daily work functions is needed to support such activities as administration, data analysis, sensor/systems repair, and laboratory testing.

In accordance with (NEPA) (40 CFR 1500-1508) and NSF's NEPA-implementing regulations (45 CFR 640), an Environmental Assessment (EA) has been prepared to assess the potential impacts of the proposed Project on the human and natural environment. This notice also serves as an invitation for public comment on the proposed Project and its potential impact on the quality of the human environment.

The Draft EA summarizes the purpose and need, alternatives, affected environment, and potential environmental consequences for the proposed Project. The Draft EA is available for comment and can be viewed and downloaded from the DKIST website at http://dkist.nso.edu/ROB, or viewed in hard copy at the following locations:

Makawao Public Library, 1159 Makawao Avenue, Makawao, Hawaii 96768
Kahului Public Library, 90 School Street, Kahului, Hawaii 96732

The comment period will end on March 19, 2016, 30 days from the initial notice publication date. Written comments on the Draft EA can be mailed, faxed, or emailed to the contact below. After review and consideration of the comments received on this Draft EA, NSF will either issue a FONSI/Decision Document or, if appropriate, issue a decision to go forward with an Environmental Impact Statement. Substantive comments will be addressed as appropriate in any final documents.

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LIST OF ACRONYMS

µg/m^3	Micrograms per cubic meter
AADT	Annual Average Daily Traffic
AAQS	Ambient Air Quality Standards
ARTC	Advanced Research and Technology Center
AURA	Association of Universities for Research in Astronomy
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DBEDT	Hawai‘i Department of Business, Economic Development and Tourism
DEM	County of Maui Department of Environmental Management
DHHC	County of Maui Department of Housing and Human Concerns
DKIST	Daniel K. Inouye Solar Telescope
DLNR	State of Hawai‘i Department of Land and Natural Resources
DOP	County of Maui Department of Planning
EA	Environmental Assessment
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
gpd	Gallons per day
HC&S	Hawaiian Commercial & Sugar Company
HO	Haleakalā High Altitude Observatories
HRS	Hawai‘i Revised Statutes
IARII	International Archaeological Research Institute, Inc.
IfA	Institute for Astronomy
kWh	Kilowatt-hours
LOS	Level of service
LUC	State of Hawai‘i Land Use Commission
mgd	Million gallons per day
mph	Miles per hour

MRTP	Maui Research and Technology Park
MW	Megawatt
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NSF	National Science Foundation
PM_{10}	Particulate matter up to 10 micrometers in size
$PM_{2.5}$	Particulate matter smaller than 2.5 micrometers in size
ROI	Region of Influence
SHPD	State Historic Preservation Division
SIHP	State Inventory of Historic Places
UH	University of Hawai‘i
USGS	United States Geological Survey
WTS	Water treatment system
WWII	World War II
WWRF	Wastewater reclamation facility

EXECUTIVE SUMMARY

Proposing Agency: National Science Foundation (NSF)

Location of Proposed Action:

- Pukalani, Aʻapueo, Ahupuaʻa, Makawao District, Maui, Hawaiʻi; TMK (2) 2-3-066:017.
- Kīhei, Maui Research and Technology Park District, Maui, Hawaiʻi TMK (2) 2-2-024:007

Project Summary: Environmental Assessment (EA) for the Implementation of a Remote Office Building on the island of Maui, Hawaiʻi, to Support the Daniel K. Inouye Solar Telescope (DKIST) Facility.

Legal Authority: National Environmental Policy Act (NEPA), Title 40 of the Code of Federal Regulations (CFR) Parts 1500-1508 and 45 CFR Part 640

Applicable Environmental Assessment Review Trigger: NSF is the lead federal agency and the decision-maker for this Project. The decision to be made is whether to fund the construction and operation of the proposed Project and at which alternative location on Maui. This action requires an environmental review pursuant to NEPA.

Agency Determination: After review and consideration of the comments received on this draft EA, NSF will either issue a Finding of No Significant Impact (FONSI)/ Decision Document or, if appropriate, issue a decision to go forward with an Environmental Impact Statement.

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ES.1 INTRODUCTION

NSF is proposing to build a remote office building[1] on the island of Maui, Hawai'i, to support the DKIST facility. The proposed remote office building (proposed Project) would be an offsite support building to the DKIST facility currently located at the University of Hawai'i Institute for Astronomy (UH IfA) Haleakalā High Altitude Observatories (HO) near the summit of Haleakalā, and would be located in an area more conducive to daily access and function. The proposed Project would consist of an instrument laboratory, electronics laboratory, workshop, and loading dock and would provide offices and work areas for scientists and post-doctoral researchers, non-site operations personnel, and administrative staff not required to work at the summit on a daily basis.

ES.1.1 Agencies Proposing the Action

NSF is the lead federal agency for the proposed Project and would fund the Project if approved. Consequently, this action requires an environmental review pursuant to NEPA (40 CFR 1500-1508) and NSF's NEPA-implementing regulations (45 CFR 640).

ES.1.2 Purpose and Need

The purpose of the proposed Project is to provide offices and work areas for the scientists, post-doctoral researchers (permanent and guests), non-site operations personnel, and administrative staff that do not require daily access to the DKIST facility or facility instrumentation. A facility of adequate size that is also conducive for daily work functions is needed to support such activities as administration, data analysis, sensor/systems repair, and laboratory testing.

ES.1.3 Project Location

The two locations considered for the proposed Project include:

- Lease Alternative (Kīhei property located at 535 Lipoa Parkway). The Kīhei property is currently developed with a parking lot and an approximately 12,200-square-foot building, and is located within the Maui Research and Technology Park District.

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1 This proposed action has also been referred to as a *remote operations building* in other planning documents. The wording was changed to clarify that the Daniel K. Inouye Solar Telescope will not be operated from the proposed new office building.

- Construction Alternative (Pukalani property located on the Kulamalu property). The Pukalani property is located on Lot 17 of the Kulamalu Commercial Subdivision within a business/commercial park, adjacent to the planned Kulamalu Affordable Apartments.

ES.2 PROPOSED ACTION AND ALTERNATIVES

The proposed Project would provide workspace for the scientists and post-doctoral researchers, non-site operations personnel, and administrative staff that do not require daily access to the DKIST observatory.

The proposed facility must include an approximately 12,000-square-foot area to accommodate all permanent and vising staff, an Information Science/Information Technology network room, an instrument laboratory and electronics laboratory, a workshop, and a loading dock. The proposed action may be achieved through full construction of the facility from the ground up (Construction Alternative), the lease and build-out of an existing facility (Lease Alternative), or the continued lease of an existing property (No-Action Alternative).

Whether the Construction, Lease, or No-Action Alternative is chosen, the facility must also be accessible, affordable, compatible for data line capability, consistent with current zoning and surrounding land uses, and available for use or a leasing period of at least 10 years.

The proposed Project would accommodate an average of 25 to 30 permanent and visiting staff daily with maximum capacity of 35, and a corresponding number of vehicle trips are anticipated. Facility vehicles include, but are not limited to, one flatbed truck, two vans, and two passenger vehicles, which would be used for remote scientific monitoring or for the DKIST facility and would be staged onsite in the parking lot when not in use. Other proposed operations at the workshop involve fabrication or repair of small parts for instrumentation or mechanisms. Broad-scale manufacturing is not proposed under the proposed action.

ES.2.1 Project Alternatives

Lease Alternative (Kīhei Property)

The Kīhei property was selected by NSF over six other options as the Lease Alternative, given its suitability to the proposed Project purpose and need with regard to location, existing facilities, and ease of conversion to design requirements through tenant improvement. The units available under the Lease Alternative property total approximately 12,200 square feet. The only renovations under the Lease Alternative would involve the installation of a rollup door for the loading dock. The Lease Alternative is currently built up with existing IT infrastructure and ample parking and is available for a long-term (greater than 10-year) lease.

Construction Alternative (Pukalani Property)

The Pukalani property is located in Kulamalu Lot 17 and is directly adjacent to the UH IfA facility in Pukalani, Maui. The Pukalani property is currently graded but undeveloped, and meets the proposed Project purpose and need and design requirements. Its location in Upcountry Maui and proximity to the UH IfA Advanced Technology Research Center (ATRC) is ideal for commuting and accessibility to ATRC resources.

The proposed Project team would be able to design and construct a remote office building to the optimal specifications to meet the proposed Project purpose and need, which would eliminate the need to negotiate lease options or availability in the future.

The proposed Construction Alternative would involve construction of a 35-foot, two-story facility with a surface area of 13,824 square feet. The proposed facility would include such features as an Americans with Disabilities Act-compliant access ramp, concrete patio, concrete sidewalk, loading dock, refuse enclosure, storm water infrastructure, and landscaping. Additionally, a parking lot with 44 parking spaces would be available along with the proposed construction. Access to the Construction Alternative would be provided by Ohiʻa Ku Street. As such, traffic control paint demarcation in the median of Ohiʻa Ku Street would be necessary.

No-Action Alternative

The No-Action Alternative is a 3,500-square-foot building located at 8 Kiopaʻa Street in Pukalani, Maui, which is currently being leased by the Association of Universities for Research in Astronomy (AURA). The No-Action Alternative would be to continue leasing this space. The No-Action

Alternative is able to accommodate a staff of no more than 15 people. Due to the size of the current office building, construction of a laboratory, loading dock, and additional storage space would not be feasible. A short-term lease of up to 3 years is the only leasing option available under the No-Action Alternative, which could potentially result in nonrenewal and displacement. Parking is also limited and is shared with neighboring businesses and retail establishments.

ES.3 SUMMARY OF IMPACTS

A summary of impact determinations for the proposed action Alternatives and the No-Action Alternative are provided on Table ES-1. Impacts are described by the level of intensity, categorized as major, moderate, minor, negligible, or no impact. Impacts are also quantifiable by the duration of the impact. A short-term impact is one that would only occur during build-out or construction. A long-term impact would continue into the operations of the facility.

No impacts were identified that might be moderate or major in intensity. Moreover, no mitigation was found that would be necessary to reduce impact levels to a minor or negligible level.

ES.3.1 Cumulative Effects

No major or moderate cumulative impacts were identified under either action Alternative. Negligible to minor cumulative impacts associated with past, present, and reasonably foreseeable future actions in the areas surrounding the proposed Project Alternatives would relate to the following resource areas:

- Aesthetics and Visual Resources (Construction Alternative)
- Biological Resources (Construction Alternative)
- Cultural Resources (Construction Alternative)
- Roadways and Traffic (Lease Alternative and Construction Alternative)
- Public Services and Utilities (Lease Alternative and Construction Alternative)
- Water Resources and Hydrology (Construction Alternative)
- Geology, Soils, and Topography (Construction Alternative)
- Air Quality (Lease Alternative and Construction Alternative)
- Noise (Lease Alternative and Construction Alternative)

Table ES-1 Summary of Project Impacts

Resource Area	**Lease Alternative (Kīhei Property)**	**Construction Alternative (Pukalani Property)**	**No-Action Alternative**
Land Use	No Impact	No Impact	No Impact
Aesthetics and Visual Resources	No Impact	*Construction:* Minor, adverse, direct and short-term impacts *Operations:* No Impact	No Impact
Biological Resources	No Impact	*Construction and Operations:* Negligible, adverse, direct, and short-term impacts	No Impact
Cultural Resources	No Impact	*Construction and Operations:* Negligible, adverse, direct, and long-term impacts	No Impact
Roadways and Traffic	*Construction*: Negligible, direct, adverse, and short term impacts. *Operations*: Negligible, direct, adverse, and long-term impacts	*Construction*: Minor, adverse, direct, and short-term impacts *Operations*: Negligible, adverse, direct, and long-term impacts	No Impact
Public Services and Utilities	*Construction and Operations*: Minor, direct, adverse, and long-term impacts	*Construction and Operations:* Minor, adverse, direct, and long-term impacts	No Impact
Water Resources and Hydrology	No Impact	*Construction:* Minor, adverse, direct, and long-term impacts *Operations:* No Impact	No Impact
Geology, Soils, and Topography	No Impact	*Construction and Operations:* Minor, adverse, direct, and short-term impacts with erosional controls	No Impact
Air Quality	*Construction and Operations:* Negligible to minor, adverse, direct, and short-term impacts	*Construction and Operations*: Minor, adverse, direct, localized, and long-term impacts	No Impact
Noise	*Construction*: Minor, adverse, direct, and short-term impacts *Operations:* No Impact	*Construction*: Minor, adverse, direct, and short-term impacts *Operations:* No Impact	No Impact
Socioeconomics and Environmental Justice	No Impact	No Impact	No Impact

ES.4 OTHER REQUIRED ANALYSES

NEPA requires an additional evaluation of the proposed Project's impacts on the relationship between local short-term uses of the environment and long-term productivity, irreversible or irretrievable commitment of resources, and unavoidable adverse impacts (40 CFR 1502.16).

ES.4.1 Relationship between Local Short-Term Uses of the Environment and Long-Term Productivity

Whether at the Kīhei property or the Pukalani property, impacts, if any, associated with the proposed Project would primarily occur during the construction phase. During operations, the two properties would function similarly to the surrounding properties and businesses. Impacts associated with the daily staffing and visitors, such as noise and traffic, would have a negligible effect on current conditions. This being said, operations at the remote office building would have positive long-term effects, including the facilitation of scientific research and education and recognition of the Hawai‘i scientific community in the field of astronomy, along with a modest addition to the local economy from retail purchases by staffers.

The primary impacts associated with the construction phase would occur from traffic air emissions and noise generated by construction equipment. Given that the Construction Alternative would require the construction of a new building and additional time for implementation, impacts associated with the Construction Alternative would be proportionally higher than those under the Lease Alternative. Roads surrounding each site would be shared by residences and schools. However, equipment deliveries would be scheduled around school drop-off and pickup hours and equipment used on consecutive days would be staged onsite to minimize traffic-related impacts. While there is potential for impacts to biological and cultural resources, particularly under the Construction Alternative, no sensitive or vulnerable resources were identified within parcel boundaries. Construction activities would neither use nor impact any sensitive environmental resource in a manner that would preclude the long-term value or productivity of that resource.

ES.4.2 Irreversible and Irretrievable Commitments of Resources

NEPA requires consideration of how the proposed Project might commit non-renewable resources to uses that would not be irreversible or irretrievable to future generations. Other than the use of petroleum, oils,

and fuels by equipment and vehicles, there would be no other irreversible or irretrievable commitment of resources associated with either the Lease Alternative or the Construction Alternative.

ES.4.3 Unavoidable Adverse Impacts

Although unavoidable adverse impacts were identified associated with both action Alternatives, no major adverse long- or short-term impacts were identified. Adverse impacts associated with air emissions could be offset with erosion controls and scheduling of construction deliveries and mobilization around high traffic times could minimize adverse traffic impacts.

ES.4.4 Agency Consultation and Public Involvement

A literature review and archaeological inventory survey performed on the Pukalani property on October 12, 2015, was submitted to the State Historic Preservation Office (SHPO). On December 24, 2015, SHPO concurred that there was No Effect and recommended that no further work be required pursuant to Section 106 of the National Historic Preservation Act.

1.0 INTRODUCTION

The National Science Foundation (NSF) is proposing to build a remote office building[2] on the island of Maui, Hawai'i, to support the Daniel K. Inouye Solar Telescope (DKIST) facility. Although the DKIST facility is located at the University of Hawai'i Institute for Astronomy (UH IfA) Haleakalā High Altitude Observatories (HO) near the summit of Haleakalā, Maui, the proposed facility would not be part of the DKIST facility on the summit; rather, it would be an offsite support building situated at a location more conducive for day-to-day access and function. The proposed remote office building, referred to herein as the "proposed Project," would provide offices and work areas for scientists and post-doctoral researchers, non-site operations personnel, and administrative staff not required to work at the summit on a daily basis, as well as an instrument laboratory, electronics laboratory, workshop, and loading dock.

1.1 BACKGROUND

NSF completed a Final Environmental Impact Statement in July 2009 for the Advanced Technology Solar Telescope facility, which was subsequently renamed the "Daniel K. Inouye Solar Telescope" facility. A Record of Decision authorizing the construction and operations of the facility was issued in December 2009. Consideration of a separate remote operations facility ("the proposed Project") was documented during the environmental review process; however, the specific operational requirements and necessity for proximity to the DKIST facility, office space considerations, and level of technical support, among other issues, were too uncertain at that time for an adequate level of planning or analysis. The DKIST Project team has leased office space in Pukalani since 2010 to accommodate basic administrative and office work space needs. The space needed, however, is well beyond that which can be accommodated by the current leased space.

NSF and the Association of Universities for Research in Astronomy (AURA), its awardee via a Cooperative Agreement, have since better

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2 This proposed action has also been referred to as a *remote operations building* in other planning documents. The wording was changed to clarify that the Daniel K. Inouye Solar Telescope will not be operated from the proposed new office building.

defined its needs to adequately support the DKIST mission, as outlined in the Final Environmental Impact Statement (NSF 2009a; 2009b).

1.2 IDENTIFICATION OF AGENCIES PROPOSING THE ACTION

NSF is the lead federal agency for the proposed Project and because, if approved, funding would come from NSF, this action requires an environmental review pursuant to the National Environmental Policy Act ([NEPA]; Title 40 of the Code of Federal Regulations [CFR] Parts 1500-1508) and NSF's NEPA-implementing regulations (45 CFR 640). Because there are no state funding, resources, or discretionary approvals required, an Environmental Assessment (EA) is not required under State of Hawai'i Chapter 343 pursuant to Hawai'i Revised Statutes (HRS) Section 3435.

1.3 PURPOSE AND NEED

The purpose of the proposed Project is to provide a remote support facility with offices and work areas for the scientists and post-doctoral researchers (permanent and guests), non-site operations personnel, and administrative staff that do not require daily access to the DKIST facility or instrumentation. These day-to-day activities, administration, scientific monitoring, and research require a facility of adequate size to accommodate the staff needed to perform these functions—one that is accessible to staff and entities or institutions working with DKIST, and one that is in a physical environment conducive for daily work functions. Additionally, staff benefit from the convenience of community resources that an office environment provides as well as the benefit of better accessibility to the UH IfA staff and resources at the IfA Advanced Research and Technology Center (ARTC) facility on Maui.

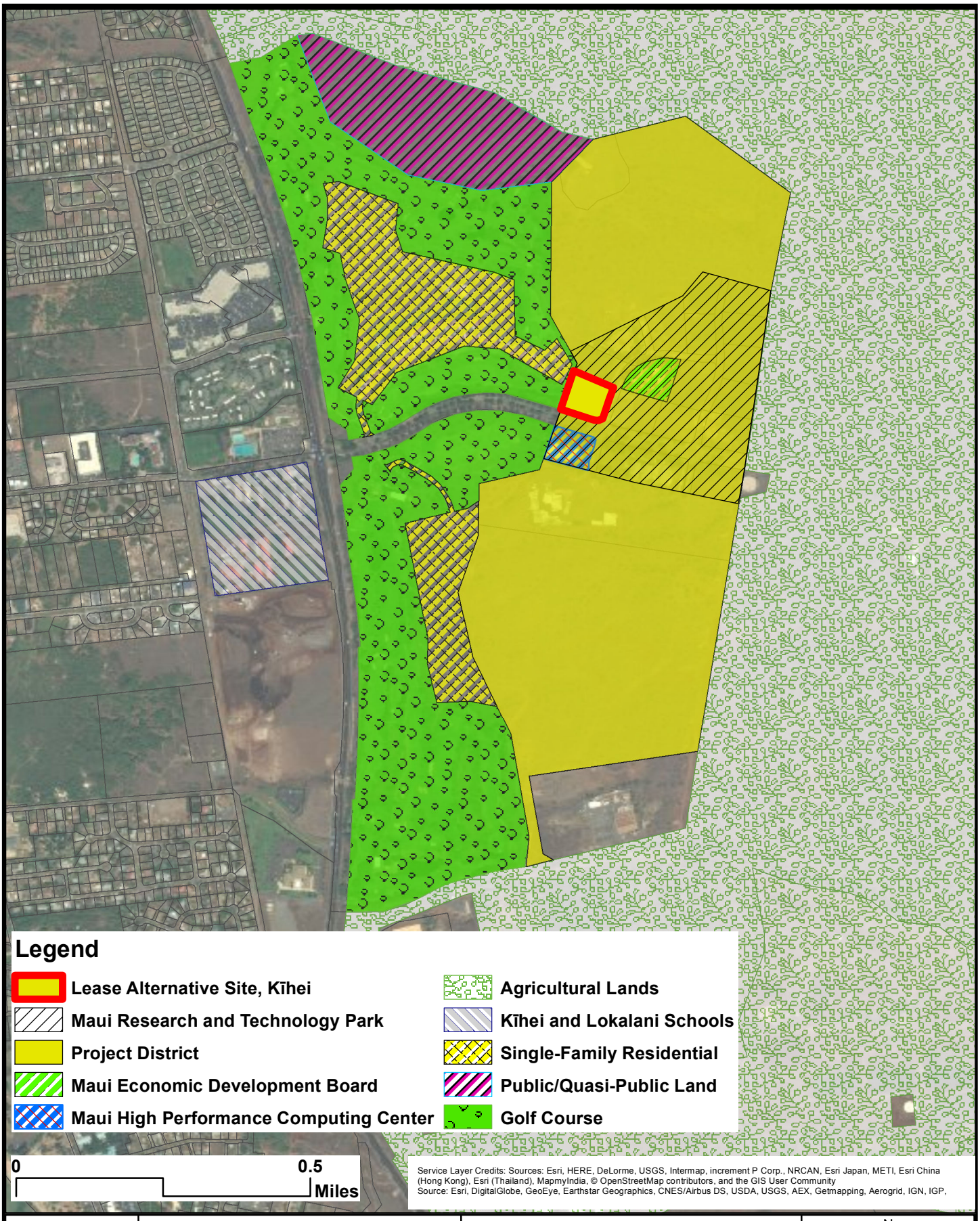
1.4 PROPOSED PROJECT LOCATION

Two locations are being considered for the proposed Project:

- 535 Lipoa Parkway in Kīhei; and
- Lot 17 on the Kulamalu property in Pukalani.

The Kīhei property is located at the intersection of Lipoa Parkway and North Holopono Street (Figure 1-1). The property is located within the Maui Research and Technology Park (MRTP) District, which is bordered by the Waipu'ilani Gulch to the north and the Keokea Gulch to the south

(Chris Hart & Partners, Inc. 2013). The specific site is currently developed with a parking lot and an approximately 12,200-square-foot building. Other developments in the vicinity of the Kīhei property include a mix of commercial, corporate, restaurant, research, and high-tech industrial facilities. Both Kīhei Elementary School and Lokelani Intermediate School are located less than 0.5 mile southwest of the Kīhei property. Access to the Kīhei property is provided by Piʻilani Highway and Lipoa Parkway (Figure 1-2; Google Earth Pro 2015).



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KĪHEI
LAND USE MAP

MAUI COUNTY, HI

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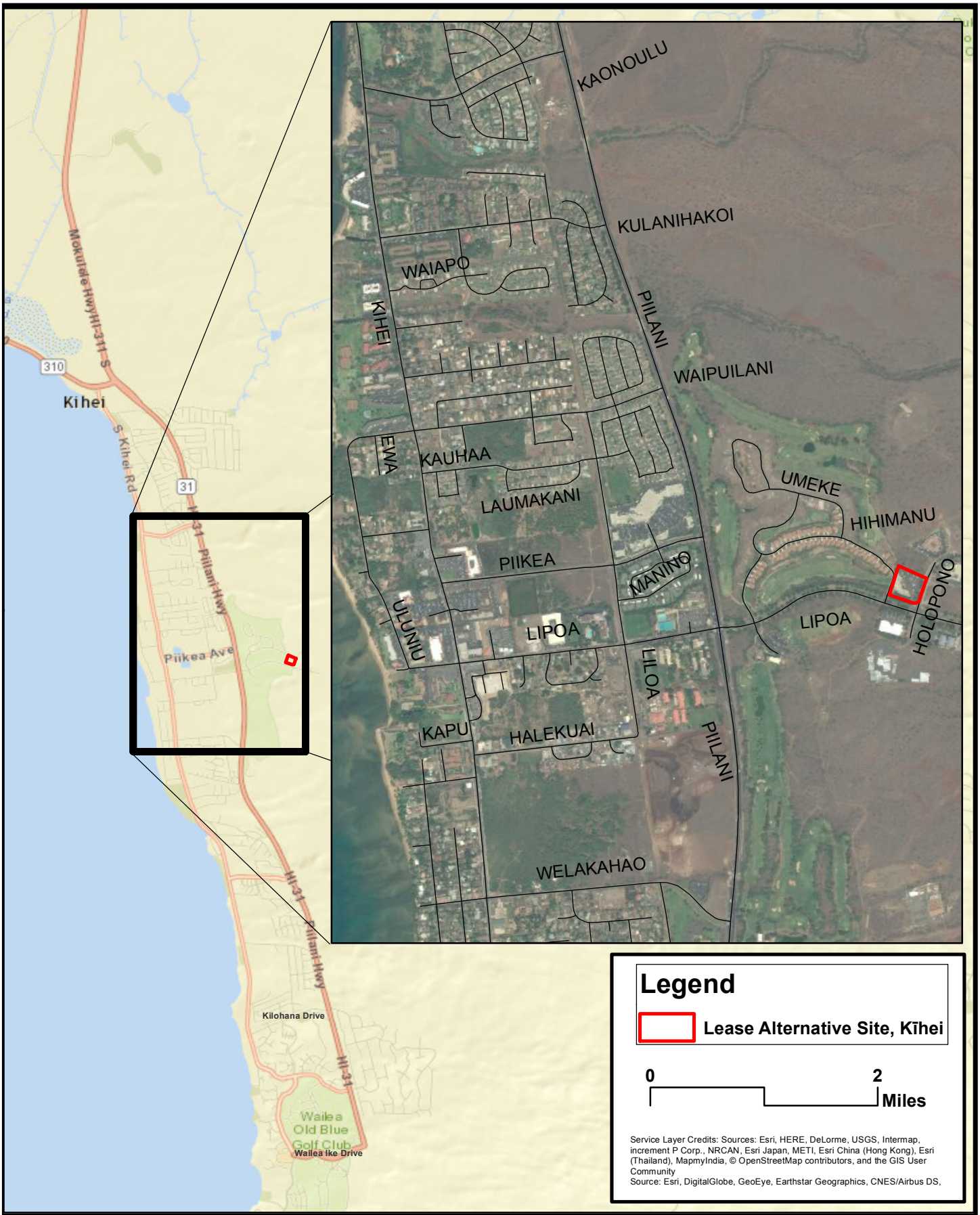
Figure 1-1



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KĪHEI
ROADS AND HIGHWAYS

MAUI COUNTY, HI

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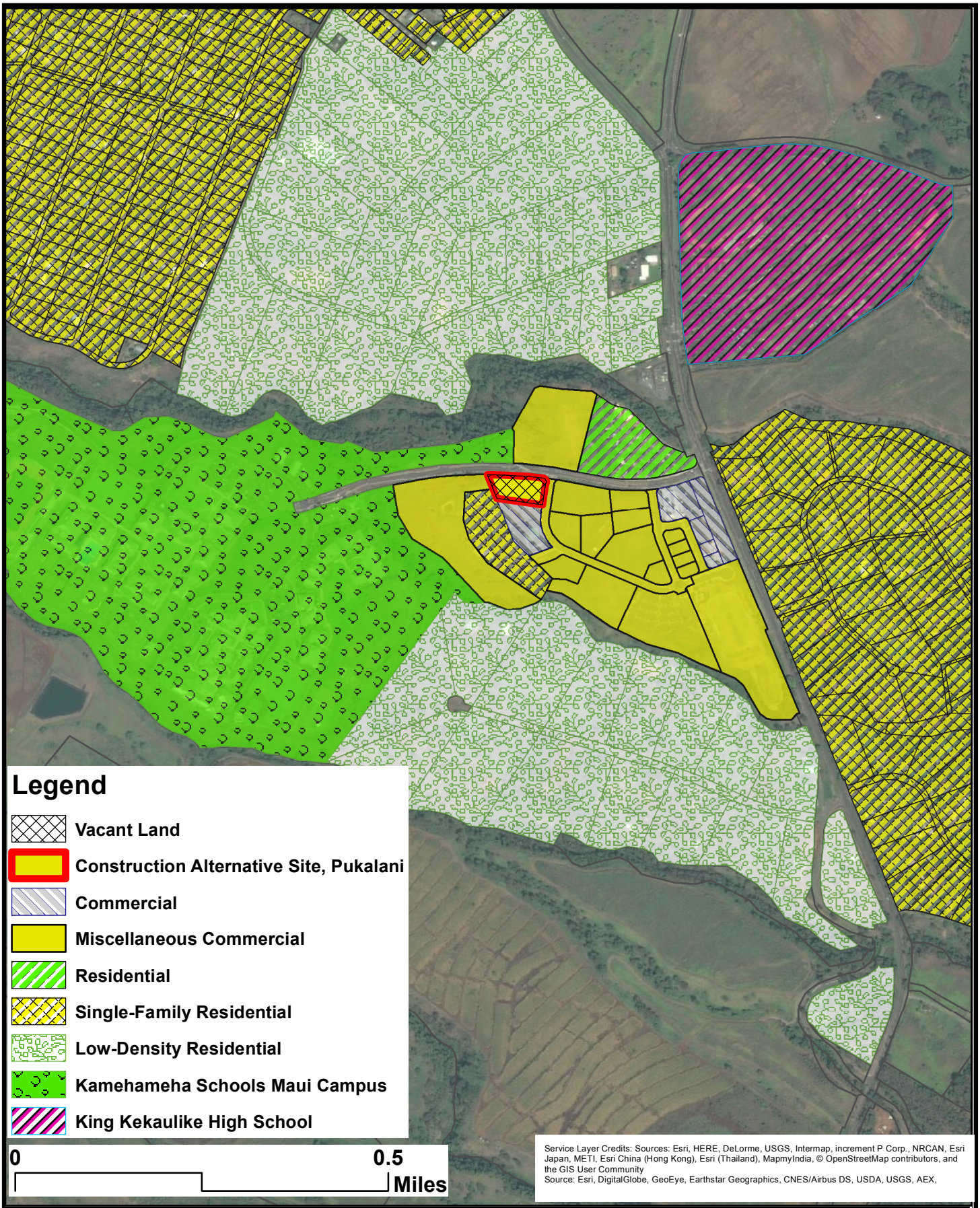
Figure 1-2

The Pukalani property is located on Lot 17 of the Kulamalu Commercial Subdivision property within a business/commercial park (County of Maui Department of Planning [DOP] 1996; County of Maui 2015a; see Figure 1-3). This lot is currently vacant and is bordered by A‘apueo Parkway to the north, Ohi‘a Ku Street to the east, a residential subdivision property to the west, and the UH IfA ARTC to the south. The proposed Project site is adjacent to the location of Kulamalu Affordable Apartments, a Maui County committed development (County of Maui DOP 2014). Access to the proposed Project site is provided by Kula Highway via A‘apueo Parkway and Ohi‘a Ku Street (Figure 1-4; Google Earth Pro 2015). To preserve the option of potentially building the proposed Project at this location, NSF purchased this lot. If, at the end of NSF’s environmental review, NSF rejects this Alternative, the lot would be sold or considered for other purposes.



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PUKALANI LAND USE MAP

MAUI COUNTY, HI

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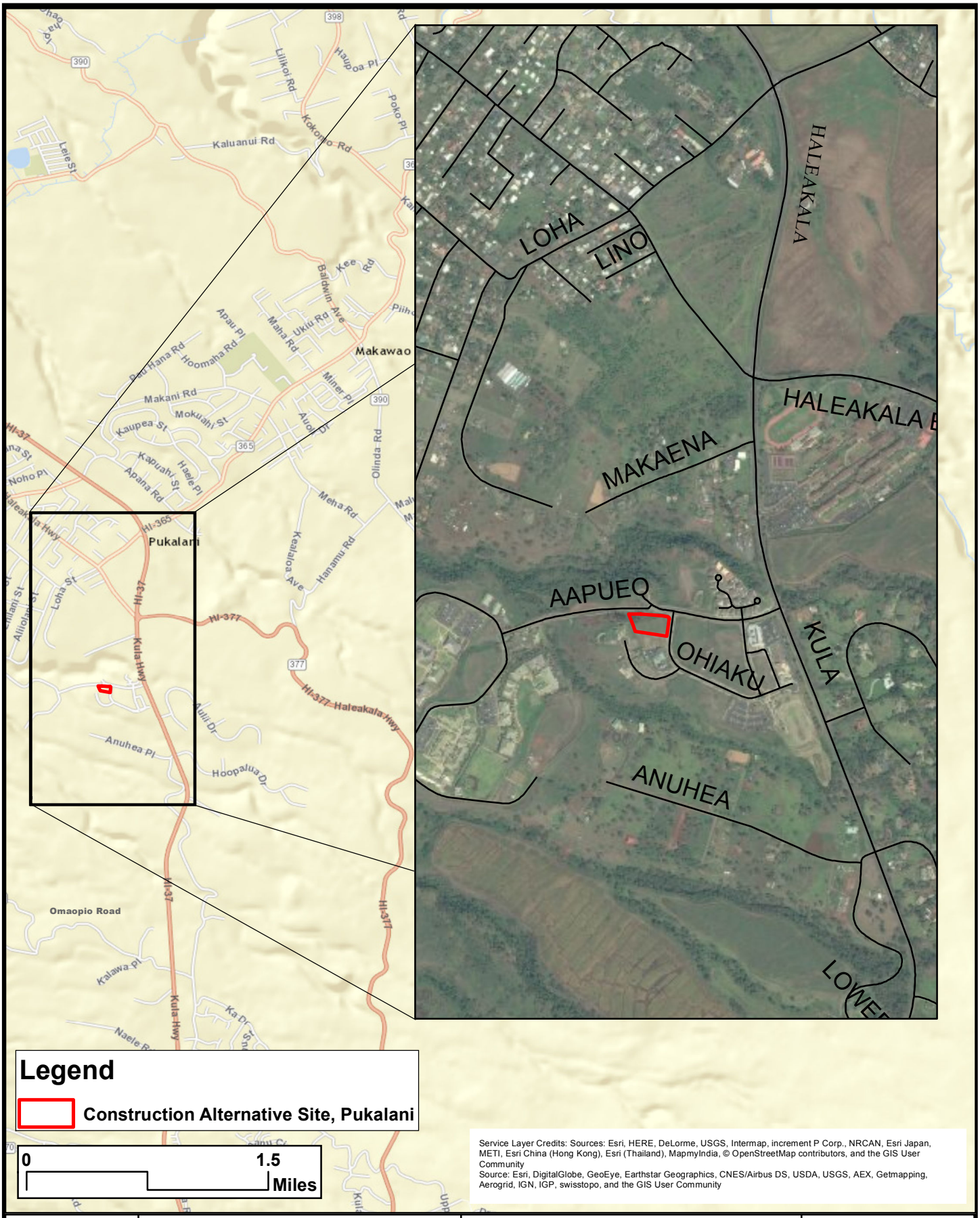
Figure 1-3



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PUKALANI
ROADS AND HIGHWAYS

MAUI COUNTY, HI

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Figure 1-4

1.5 LAND USE CONFORMITY

The Kīhei property lies within the Kīhei Research and Technology Park District. The Kīhei property itself and the properties immediately north, east, and south are currently designated as "Project District" in the Kīhei-Makena Community Plan Map and "Urban" in the State Land Use Map. Single-family residential properties and a golf course bound the Kīhei property to the west. Public/quasi-public and agricultural lands are located approximately 0.33 mile north of the Kīhei property, and undeveloped agricultural land is located less than 0.25 mile east of the Kīhei property. Operations at the Kīhei property would be consistent with current land uses in the area (Chris Hart & Partners, Inc. 2013).

The Pukalani property is located within the Maui County Urban Growth Boundary and the Kulamalu Town Center Subdivision, also known as the Kulamalu Commercial Subdivision (County of Maui DOP 2014). The site is situated on graded, undeveloped land designated as "Business/ Commercial" by the Makawao-Pukalani-Kula Community Plan and "Country Town Business" uses by Maui County zoning (County of Maui DOP 1996; County of Maui 2015a). Operations at the proposed Project site would be consistent with current Maui County land use designations. Other land uses within the Kulamalu Project area include parks, schools, businesses, cultural, multi-family residential, single-family residential, and public/quasi-public (County of Maui DOP 1996; County of Maui 2015a).

2.0 DESCRIPTION OF THE PROPOSED ACTIONS AND ALTERNATIVES

2.1 PROPOSED PROJECT DESCRIPTION

NSF proposes to establish a remote office building that meets the proposed Project purpose and need in a location accessible to the summit of Haleakalā and to the UH IfA facility in Pukalani, Maui, Hawai‘i.

2.1.1 Facility Design Consideration

The proposed Project would provide work space for the scientists and post-doctoral researchers, non-site operations personnel, and administrative staff that do not require daily access to the DKIST observatory site. Additionally, the proposed Project would support specialized functions including hosting a remote control room for instrument functions, data processing and preparation for data transfer to the National Solar Observatory Data Center in Boulder, Colorado, and providing a platform for future remote project needs.

Whether the proposed facility would be leased and built out or constructed from the ground up, to meet the purpose and need of the proposed Project, the proposed facility must include a minimum 12,000-square-foot area to support the following:

- Staff (scientific, data information, engineering, and business and administrative);
- Information Science/Information Technology Network Room;
- Instrument Laboratory;
- Electronics Laboratory;
- Workshop; and
- Loading Dock.

2.1.2 Geographic Consideration

Properties were considered across Maui, including existing facilities available for lease or purchase and properties suitable for development. The following criteria were considered in determining whether a property is geographically feasible and reasonable:

- Adequate facility size is available to accommodate necessary office, administrative, remote scientific monitoring, and research; a space

available for build-out to meet these functions; or a property of adequate size to construct such a facility.

- Access to data lines sufficient to support large data transfers.
- Proximity of the proposed Project site to staff and entities with which DKIST facility personnel have scientific connectivity (namely UH IfA).
- Consistency of use with current zoning and surrounding land uses.
- Availability of the facility or property for a minimum of 10 years.
- Affordability pertaining to both cost to lease or purchase as well as the cost associated with the necessary build-out of the space.

2.1.3 Operations

In addition to use by the facility director, office manager, and administrative staff, the proposed Project would be used daily by a mix of staff including resident astronomers, instrument scientists, associated astronomers, research associates, instrument technicians, and observing associates. The proposed Project would utilize a mix of individual and shared office spaces. On average, 25 to 30 permanent and visiting staff would use the facility daily with a maximum staffing of 35 persons. In addition to staff and visitor vehicles, it is anticipated that several facility vehicles used for remote scientific monitoring or for the DKIST facility would be staged in the parking lot of the proposed Project site when not in use. These would include, but not be limited to, one flatbed truck, two vans, and two passenger vehicles. It is anticipated that the workshop would be used as-needed to fabricate or repair small parts for instrumentation or mechanisms. Broad-scale hardware manufacturing is not anticipated.

2.2 LEASE ALTERNATIVE (KĪHEI PROPERTY)

2.2.1 Proposed Build-Out Activities

NSF preliminarily identified five pre-existing, leasable structures and one lease-to-own new construction property with the potential to fulfill the proposed Project purpose and need. Each of the pre-existing sites was visited and reviewed for suitability with regard to location, existing facilities, and ease of conversion to design requirements through tenant improvement. The Kīhei property located at 535 Lipoa Parkway is the only site found to meet both the proposed Project purpose and need and the design requirements. This property is part of the MRTP, built in 1990.

Units available for lease could be combined to total 12,200 square feet. This space includes existing IT infrastructure and would allow for a full build-out to meet both the proposed Project purpose and need and the design requirements, and it is available for a long-term (greater than 10-year) lease. The only external improvement proposed is the installation of a rollup door for the loading dock. Otherwise no external renovations, improvements, or expansions of the building would be employed. Ample parking is available and no additional permitting would be needed.

2.2.2 Schedule

The Lease Alternative would allow a build-out as necessary and become operational within a shorter timeframe than the Construction Alternative. The estimated build-out schedule would occur over a 6- to 9-month period. Under this Alternative, leasing terms would be negotiated in spring 2016 and construction completed by the end of 2016.

2.3 CONSTRUCTION ALTERNATIVE (PUKALANI PROPERTY)

2.3.1 Proposed Construction Activities

NSF identified a parcel of property available for acquisition directly adjacent to the UH IfA facility in Pukalani, Maui. This property, Kulamalu Lot 17, was previously evaluated pursuant to HRS Chapter 343 review standards for a similar construction and function by IfA. However, IfA's plans were revised in 2007 and construction (of the ATRC) was redesigned and downsized to utilize only Lot 15. The undeveloped, but graded Lot 17 property adjacent to the ATRC was found to be ideally suited to meet the proposed Project purpose and need and design requirements. It is situated in the "Upcountry" region that offers a reasonable commute for staff to reach the summit facility if necessary and it would allow optimal access to the UH IfA ATRC resources.

This Alternative would allow the proposed Project team to design and construct to the optimal specifications and would avoid the need to renegotiate lease options or availability in years to come.

This Alternative includes a 13,824-square-foot facility completely contained within the Lot 17 footprint. The two-story facility would be 35 feet above ground level. Access to the site would be from Ohiʻa Ku Street. The only improvements to Ohiʻa Ku Street would be traffic control painting in the median.

Forty-four parking spaces would be available on the southern side of the building and would connect directly with the UH IfA parking lot to the west. Exterior features would include the following:

- Americans with Disabilities Act-compliant access ramp on the southeastern side of the building;
- Concrete patio on the northern side of the building;
- Concrete sidewalk along the western and southern sides of the building;
- A loading dock;
- A refuse enclosure;
- Storm water infrastructure; and
- Landscaping.

Engineering plans and profiles would be reviewed and approved by Maui County and all necessary permits for construction, including grading and dewatering permits, would be obtained prior to construction activities. The facility and a proposed design would result in 0.89 acre of disturbed land and therefore would be exempt from requiring a National Pollutant Discharge Elimination System (NPDES) permit for construction.

2.3.2 Schedule

Under the Construction Alternative, construction would occur over a 12- to 15-month period and would be completed by spring 2017. The facility would be operational in summer 2017.

2.4 NO-ACTION ALTERNATIVE

AURA currently leases 3,500-square-feet of space in Pukalani located at 8 Kiopa'a Street. The No-Action Alternative would be to continue leasing this space.

The current office space can accommodate a maximum of 15 staff, and the size does not allow for build-out of a laboratory, loading dock, or storage space. The current office space is leased on a short-term basis and would have to be renegotiated every 2 to 3 years, leaving open the possibility of non-renewal and subsequent displacement. Limited parking stalls for the existing office space are shared with several retail and business establishments.

2.5 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

Eleven preliminary sites on Maui were considered, including properties in Kahului, Kīhei, Wailuku, and Pukalani. Properties included existing facilities available for lease or purchase and properties suitable for development. Of these preliminary sites, nine did not meet the proposed Project criteria, as summarized in Section 2.1.2, Geographic Consideration, or were otherwise found to be less desirable in meeting the proposed Project purpose and need, compared to those sites carried forward in this analysis. Table A in Appendix A summarizes the types of facilities or properties, a comparative consideration as relevant to the proposed Project purpose and need, and a justification for why each was either carried forward or not.

Ultimately, three Alternative actions were identified through the process: the Lease Alternative, the Construction Alternative, and the No-Action Alternative. These were carried forward with the sites that best met the proposed Project purpose and need. These are defined above and analyzed in Sections 3.0 and 4.0, below.

3.0 AFFECTED ENVIRONMENT

This section provides an overview of the baseline physical, biological, cultural, and social conditions that occur within the study areas, as defined in Section 1.4, Proposed Project Location. Each resource section includes a discussion of the existing conditions related to the Lease Alternative site, located in Kīhei, and the Construction Alternative site, located in Pukalani.

3.1 LAND USE

The land use discussion considers current zoning and land use designations at both the Kīhei and Pukalani properties and surrounding properties as established by the Maui County DOP.

3.1.1 Lease Alternative (Kīhei Property)

The Kīhei property is within an established 12,200-square-foot building built in 1990 as part of the MRTP. Figure 1-1 portrays the land uses on and surrounding the Kīhei property. This property is designated as "Project District" in the Kīhei-Makena Community Plan Map, and zoned as a "State Urban District" by the State of Hawai'i Land Use Commission (State of Hawai'i LUC 2015). The properties immediately surrounding the Kīhei property to the north, east, and south are also designated as Project District within the MRTP and are primarily used for high-tech/industrial purposes, including such businesses as the Maui Economic Development Board and the Maui High Performance Computing Center (Chris Hart & Partners, Inc. 2013). Single-family residential homes and a golf course are currently developed immediately west of the Kīhei property. Undeveloped agricultural lands are located less than 0.25 mile from the Kīhei property to the east, and land designated for public/quasi-public uses is located approximately 0.33 mile northwest of the Kīhei property. Both Kīhei Elementary School and Lokelani Intermediate School are located less than 0.5 mile southwest of the Kīhei property (Chris Hart & Partners, Inc. 2013).

3.1.2 Construction Alternative (Pukalani Property)

The Pukalani property is currently vacant land designated as "Business/Commercial" by the Makawao-Pukalani-Kula Community Plan and "Country Town Business" uses by Maui County zoning (Figure 1-3). The Pukalani property is also zoned as a "State Urban District" by

the State of Hawai‘i LUC (2015). According to the Maui County General Plan, urban developments include housing, businesses, commercial services, shopping, and civic activities. Maui County General Plan policies encourage improvements of underutilized urban lots within the Urban Growth District. The Plan also encourages new construction within the State Urban District to have sustainable designs and discourages projects that impede inter-connectivity between existing communities (County of Maui 2010).

The Pukalani property is immediately surrounded by other commercial, miscellaneous commercial, residential, and single-family residential properties (County of Maui DOP 1996; County of Maui 2015a). Other existing land uses near this location include low-density residential homes south of the gulch that forms the southern border of the Kulamalu Commercial Subdivision Property. The Kamehameha Schools Maui Campus (K through Grade 12) includes Kamehameha Elementary School, Kamehameha Middle School, and Kamehameha High School, and is located approximately 0.25 mile west of the Pukalani property (Kamehameha Schools 2015). King Kekaulike High School (Grades 9 through 12) is located approximately 0.25 mile northeast of the Pukalani property (Google Earth Pro 2016).

3.3 AESTHETICS AND VISUAL RESOURCES

This section identifies aesthetic resources, scenic corridors, and open space resources within both the Kīhei and Pukalani properties.

3.3.1 Lease Alternative (Kīhei Property)

The Kīhei-Makena Community Plan calls for the preservation of the view from Kīhei-Makena to Upcountry and Central Maui, the mauka (mountain) view from Pi‘ilani Highway, and the mountains and surrounding agriculture to the greatest extent possible (County of Maui 1998). The Kīhei property is currently developed and is immediately surrounded by other commercial and technology/industrial buildings, residential properties, and a golf course. Scenic resources that may be visible from the Kīhei property include the mountain of Haleakalā, the Pacific Ocean, the island of Kaho‘olawe, and undeveloped agricultural lands located less than 0.25 mile from the Kīhei property (Chris Hart & Partners, Inc. 2010).

3.3.2 Construction Alternative (Pukalani Property)

The only scenic resource designated in the Makawao-Pukalani-Kula Community Plan is Haleakalā; however, other noteworthy but non-designated scenic resources or viewsheds that are visible from the Pukalani property include the Pacific Ocean, the islands of Kahoʻolawe and Lanai, the West Maui Mountains, the slopes of Haleakalā, and Maui's central isthmus. The property is immediately surrounded by modern office and commercial properties and housing. The Pukalani property is not located within a scenic corridor. Open space resources in the vicinity of this proposed Project area include Haleakalā National Park (about 6.7 miles to the southeast, line-of-sight) and the agricultural lands that are distributed throughout rural and suburban development (County of Maui Department of Housing and Human Concerns [DHHC] 2014).

3.4 BIOLOGICAL RESOURCES

The biological resources discussion considers threatened and endangered species of flora and fauna within the vicinity of the proposed Project area.

3.4.1 Lease Alternative (Kīhei Property)

A total of 14 plant species were identified near the Kīhei property. Ninety-five percent of the plant cover on the property consists of Kiawe (*Prosopia pallida*) and buffelgrass (*Cenchrus ciliaris*). Of the 14 plant species identified near the Kīhei property, only the ʻilima (*Sida fallax*) and ʻuhaloa (*Waltheria indica*) are indigenous to Hawaiʻi, and both are very common to the Hawaiian Islands. Surveys of this area were not performed during winter or spring months, so there is potential that other annual non-native species of plants grow in this area during winter and spring. No state or federally listed plants have been identified on the Kīhei property and no rare plant communities or special habitats were identified in this location (Chris Hart & Partners, Inc. 2010).

Three species of non-native mammals are common near the Kīhei property, including cattle (*Bos taurus*), axis deer (*Axis axis*), and cats (*Felis catus*). Cattle can be observed throughout the entire area surrounding the Kīhei property, especially during the wet season. Other mammals that may be observed on the Kīhei property include rats (*Rattus* spp.), mice (*Mus musculus*), mongoose (*Herpestes javanicus*), and pigs (*Sus scropha*); all are non-native. The only native Hawaiian mammal is the state and federally listed as endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*). Although no evidence of the Hawaiian hoary bat was identified

near the Kīhei property, onsite vegetation may provide suitable roosting habitat for this species.

A diverse array of non-native birds can be found near the Kīhei property; however, no native forest birds occur in the vicinity of the property. No state or federally listed endangered or threatened animal species have been identified on the Kīhei property; however, the threatened Newell's shearwater (*Puffinus auricularis newelli*) and the endangered Hawaiian petrel (*Pterodroma phaeopygia sandwichensis*) are two species of seabirds known to occur within the mountains of Maui (Chris Hart & Partners, Inc. 2010).

3.4.2 Construction Alternative (Pukalani Property)

A botanical and faunal survey of the Pukalani property was performed by Starr Environmental in October 2015 (Appendix B). Survey results showed that the Pukalani property is located on relatively flat land that has been highly disturbed by grading and filling that occurred in 2005. The vegetation onsite is almost completely non-native with the exception of a single kou tree (*Cordia sebestena*). The onsite vegetation is characteristic of a mixture of non-native trees, shrub grass, and vine species that are common to the areas surrounding Pukalani. There are no federally listed plants, other special-status plants, or sensitive habitats at the proposed Project site. The kou tree was the only native plant observed onsite and it appears to have been planted. Kou trees can be found throughout Hawai'i and are of no special conservation concern (Starr Environmental 2015).

No native or non-native mammals were observed onsite. However, those mammals otherwise likely to occur in surrounding areas include axis deer, mongoose, rats, mice, cats, and various bat species. The state and federally listed Hawaiian hoary bat is the only native mammal known to occur in the area. Although evidence of this species was not observed during the faunal survey, onsite vegetation may provide suitable roosting habitat.

Only a few bird species were identified at the Pukalani property during the faunal survey, likely due to the abundance of glycine vine on the site, which is unsuitable habitat for many birds. The only native bird species identified during faunal surveys were two Pacific golden-plovers (*Pluvialis fulva*). Non-native birds observed onsite included the barn owl (*Tyto alba*), house finches (*Carpodacus mexicanus*), chestnut munia (*Lonchura articapilla*), Japanese white-eye (*Zosterops japonicus*), and a flock of pigeons (*Columba livia*). The state and federally endangered nēnē (*Branta sandvicensis*) was not identified at the Pukalani property; however, this

species is known to occur in surrounding areas and has the potential to utilize the proposed Project site for nesting and foraging.

A number of insects were identified onsite; however, the only native insect observed was the green darner dragonfly (*Anax junius*). Neither the endangered Blackburn's sphinx moth (*Manduca blackburni*) nor tree tobacco (*Nicotiana glauca*), which serves as suitable habitat for the moth species, was observed on the Pukalani property (Starr Environmental 2015).

3.5 CULTURAL RESOURCES

The cultural resources description includes historic, prehistoric, cultural, and archaeological resources that have been discovered in the vicinity of the Kīhei and Pukalani properties.

3.5.1 Lease Alternative (Kīhei Property)

The Kīhei property is located within a "barren zone," an intermediary zone located between upland forests and the coastline that has historically been transitory and intermittently occupied. The area surrounding the Kīhei property was previously used for agricultural purposes and grazing for approximately 150 years. Significant settlements of Hawaiian populations were not present at the Kīhei property prior to ranching. An inventory survey in 2006–2008 of 338 acres within the MRTP area yielded only a small number of historic artifacts, a majority of which related to World War II (WWII) training exercises. This is most likely due to the area's status as a barren zone. Five historic sites were discovered within the area surveyed:

- Site 50-50-10-6239: WWII barricade or gun placement;
- Site 50-50-10-6240: WWII gun placement or observation area;
- Site 50-50-10-6241: Traditional historic boundary wall;
- Site 50-50-10-6587: WWII barricade or gun placement; and
- Site 50-50-10-6588: Traditional markers – locators.

3.5.2 Construction Alternative (Pukalani Property)

International Archaeological Research Institute, Inc. (IARII) performed an archaeological assessment at the Pukalani property in November 2015 (Appendix C). Results of the archeological assessment indicated that no

traditional Hawaiian or historic cultural deposits or features are present onsite. According to survey results, the Pukalani property was historically used for ranching and pineapple cultivation. However, currently the property has been heavily graded and trenches were excavated for utility installation purposes. Soil surveys revealed that fill was present at least 65 centimeters below the surface, which indicated that the topography of the property had been significantly modified by construction-related activities. As a result, it is unlikely that traditional or Hawaiian historic properties exist at the Pukalani property (IARII 2015).

The Maui Office, State Historic Preservation Division (SHPD) identified a significant historic archaeological site (State Inventory of Historic Places [SIHP] 50-50-10-5173) about 200 meters south of the Pukalani property. This site is on the edge of the tributary arm of Kaluapulani Gulch and consists of 25 features identified as historic Chinese burials and associated burning episodes, including the following historic artifacts (County of Maui DHHC 2014):

- Eight burials in wooden coffins and seven in pit features;
- Water-worn grave markers;
- Five associated burning episodes;
- Four unexcavated pit features; and
- One disturbed animal burial.

Other historic properties within the commercial subdivision include a rock mound with an associated fire vestige dated between A.D. 1540-1660 (SIHP 50-50-10-5469) and an irrigation or drainage ditch (SIHP 50-50-10-5470) (County of Maui DHHC 2014).

There have been a number of other historic SIHP sites located within the greater Kulamalu development, further away from the Pukalani property. Table 3-1 lists SIHP sites within 0.65 mile of the Pukalani property.

Table 3-1 SIHP Sites within 0.65 Mile of the Pukalani Property

Site Number	Site Description
50-50-10-1061	Series of rock shelters and 191 (or more) petroglyphs over a 500-meter area in a gulch
50-50-10-1062	Petroglyph
50-50-10-2701	Heiau (ancient Hawaiian temple)
50-50-10-2920	32 petroglyphs over a 20-meter section of cliff facing

50-50-10-4179	Petroglyph of a sailing canoe (0.32 x 0.28 meters)
50-50-10-4180	Boundary wall
50-50-10-4181	2x rock alignments and 2x terraces (subsequently determined as either historic or modern and re-evaluated as insignificant)

Source: IARII 2015

3.6 ROADWAYS AND TRAFFIC

The roadways and traffic section discusses the characteristics of current roadways, highways, and intersections surrounding both the Kīhei and Pukalani sites. Roadway and highway characteristics discussed in this section include road orientation, posted speed limits, number of lanes, and signalized and unsignalized intersections.

3.6.1 Lease Alternative (Kīhei Property)

As shown on Figure 1-2, the Kīhei property is located at the intersection of Lipoa Parkway and North Holopono Street. Piʻilani Highway (State Route 31) is the primary arterial road providing access to the Kīhei property. Piʻilani Highway is a 4-lane highway between Mokuele Highway and North Kilohana Drive, and a 2-lane highway further south between Kilohana Drive and Wailea Ike Drive. Near the Kīhei property, Piʻilani Highway forms signalized intersections at Piʻikea Avenue and Lipoa Parkway/Lipoa Street. Piʻilani Highway forms unsignalized intersections at Kaonulu Street, Kulanihakoi Street, East Waipuilani Road, East Welakahao Road, and Old Welakahao Road. The posted speed limit on Piʻilani Highway is 40 miles per hour (mph).

Near the Kīhei property, east-west traffic circulation is provided by Lipoa Parkway/Lipoa Street, and north-south traffic circulation is provided by Piʻilani Highway, South Kīhei Road, and Liloa Drive (Chris Hart & Partners, Inc. 2013).

Annual Average Daily Traffic (AADT) is defined as "the average of 24 hour counts collected every day in a year" (Hawaiʻi Department of Business, Economic Development and Tourism [DBEDT] 2013). On Piʻilani Highway near Lipoa Parkway, AADT counts were 31,500 in 2012 and 33,000 in 2013 (Hawaiʻi DBEDT 2013). As part of the most recent Maui County General Plan Update, completed in 2010, a traffic study was done, which included 2030 projections. Using the Highway Capacity Manual methodology and standards (Transportation Research Board 2000), level of service (LOS) was determined for transportation facilities including

intersections and roadways across the island of Maui. The LOS uses a rating system, A through F (best to worst), to define such service measures as speed and travel time, maneuverability, traffic congestion and interruptions, and general convenience. Table 3-2 shows 2030 projections of traffic volumes and LOS at Piʻilani Highway and Lipoa Street/Lipoa Parkway.

Table 3-2 2030 Traffic Volume and Level of Service Projections at Piʻilani Highway and Lipoa Street/Lipoa Parkway

	Volume North/East	Volume South/West	LOS North/East	LOS South/West
AM	1167	1489	E	F
PM	1548	1288	F	F

LOS E: Represents operations at or near capacity, an unstable level.
LOS F: Represents forced or breakdown flow.

Source: Fehr & Peers 2007; Transportation Research Board 2000.

3.6.2 Construction Alternative (Pukalani Property)

As shown on Figure 1-4, Kula Highway (State Route 37) is the nearest arterial road providing access to the Pukalani property. Kula Highway is a 2-lane highway originating at the junction of Haleakalā Highway and Haleakalā By-Pass, and is located approximately 0.20 mile east of the Pukalani property. The posted speed limit on Kula Highway is 45 mph. Kula Highway helps connect Pukalani to Kahului in the northwest. Piʻilani Highway and Haleakalā Highway (State Route 377) also intersect Kula Highway, which allows transport from eastern Maui to other nearby regions of the county (County of Maui DHHC 2014). Access to the subject property is provided by Kula Highway via Aʻapueo Parkway and Ohiʻa Ku Street (Google Earth Pro 2015). Average daily traffic volumes on Kula Highway were measured as part of the 2030 General Plan Update to be around 12,000 trips per day (Fehr & Peers 2007). Table 3-3 shows 2030 projections of traffic volumes and LOS at Kula Highway and Omaopio Road, 2 miles from the Pukalani property.

Table 3-3 2030 Traffic Volume and Level of Service Projections at Kula Highway and Omaopio Road

	Volume North/East	Volume South/West	LOS North/East	LOS South/West
AM	760	700	C	B
PM	663	591	B	A

LOS A: Describes completely free-flow conditions.

LOS B: Also indicates free flow, although the presence of other vehicles becomes noticeable.
LOS C: The influence of traffic density on operations becomes marked. The ability to maneuver within the traffic stream is clearly affected by other vehicles.

Source: Fehr & Peers 2007; Transportation Research Board 2000.

3.7 PUBLIC SERVICES AND UTILITIES

The public service and utilities section includes a consideration of the utilities that serve both the Kīhei and Pukalani areas. Utility services discussed in this section include solid waste, potable water and water treatment, wastewater, storm water, power, and electricity.

3.7.1 Lease Alternative (Kīhei Property)

Water

The County of Maui, Department of Water Supply, provides domestic water, sewer, and fire flow services to the county. The Department of Water Supply owns and operates six water treatment systems (WTSs) in the county including Kamole Weir, Piʻiholo, Olinda, Lahaina, Mahinahina, and ʻĪao (County of Maui 2015c).

The ʻĪao WTS is the primary WTS for Kīhei. The Kīhei property primarily receives its water from the ʻĪao Aquifer, which has a sustainable yield of approximately 20 million gallons per day (mgd) (United States Geological Survey [USGS] 2013). Water from the ʻĪao Aquifer/Waikapu Ditch that is not treated naturally by filtration through lava rocks is sent to the ʻĪao WTS for treatment (Maui Now 2015). The current ʻĪao WTS contains a 3.0-million-gallon tank that produces approximately 1.7 mgd of treated water. The ʻĪao WTS is currently operating at capacity and plans are in place to increase the production capacity to 3.2 mgd by 2017 (County of Maui Department of Water Supply 2015).

Wastewater

Wastewater services are provided by the County of Maui Department of Environmental Management (DEM), Wastewater Reclamation Division. The Wastewater Reclamation Division operates five wastewater reclamation facilities (WWRFs) in Maui County (County of Maui DEM 2013):

- Kaunakakai WWRF – Molokaʻi;
- Lanai WWRF – Lanai; and
- Lahaina WWRF, Wailuku-Kahului WWRF, and Kīhei WWRF – Maui.

Maui County currently recycles approximately 5 billion gallons of wastewater per year (County of Maui DEM 2015). The Kīhei WWRF serves the area surrounding the Kīhei property. It currently reclaims between 1.6 and 2.0 mgd and has a peak dry weather capacity of 8 mgd. Remaining treated effluent is discharged into underground injection wells (Hawaiʻi Water Environment Association 2015).

Storm Water

The Hawaiʻi Department of Transportation is responsible for storm water management in the Maui District. Maui District operates a Municipal Separate Storm Sewer System with storm drains located along the state-owned roadways in Kahului. All storm water from Maui District is discharged into the Pacific Ocean. Maui has also implemented the Maui District Storm Water Management Program to ensure that businesses and residents reduce the amount of pollution being discharged into storm drains and local water bodies (Hawaiʻi Department of Transportation 2015).

Power and Electricity

Maui Electric Company (Maui Electric) provides power and electricity to the entire island of Maui. Maui Electric plants generate energy from oil and are located in Maʻalaea, Kahului, Lanai, Molokaʻi and Hana. Hawaiian Commercial & Sugar Company (HC&S) is an independent power producer for Maui Electric and generates oil from a variety of sources including hydro, coal, recycled oil, and oil. Together, the Maui Electric plants and HC&S have the capacity to generate approximately 290.1 megawatts (MW) of energy (Hawaiian Electric Company 2013).

Solid Waste

Solid waste from the Kīhei region is transported to Maui Demolition and Construction Landfill located on North Kīhei Road (County of Maui 2015b); however, as of 2015, operators of this landfill are seeking a solid waste management renewal permit from the Hawai‘i State Department of Health and there is a possibility that this landfill will close by 2016 (The Maui News 2015). The nominal operating disposal rate at Maui Demolition and Construction Landfill is limited to 400 tons of waste per day and the maximum amount of waste accepted is 1,200 tons per day (Hawai‘i State Department of Health 2015a). Central Maui Landfill, which processes approximately 550 tons of waste per day on average, also serves the Kīhei area. Central Maui Landfill is expected to reach capacity by 2026 (Gershman, Brickner & Bratton, Inc. 2012). Kīhei Recycling Center and Kīhei Compost provide recycling and composting services in the region, respectively (County of Maui Environmental Protection and Sustainability Division 2015).

3.7.2 Construction Alternative (Pukalani Property)

Water

Kamole Weir is the primary WTS serving the area surrounding the Pukalani property and is the largest WTS on Maui (County of Maui 2015c). Kamole Weir has a capacity of 7 mgd (Munekiyo & Hiraga, Inc. 2005) and an average daily production of approximately 3.6 mgd (County of Maui 2015c). The treatment facility storage tank is located 1,120 feet above mean sea level and is made up of four booster pumps that have the ability to move water to a 4,500-foot elevation (County of Maui 2015c).

Kamole Weir receives its water from Wailoa Irrigation Ditch, the main source of water servicing the area around the Pukalani property (County of Maui 2015c). Wailoa Irrigation Ditch has a capacity of 195 mgd and an average daily flow of 170 mgd (Water Resource Associates 2003). Wailoa Irrigation Ditch is also a part of the East Maui Irrigation System, which is made up of 74 miles of ditches, tunnels, pipes, and flumes that have the capacity to transport 435 mgd. The average delivery of the East Maui Irrigation system is 165 mgd (Water Resource Associates 2003).

Wastewater

Hawai‘i Water Service Company’s Pukalani Wastewater Plant, located on Liholani Street, provides wastewater services for the Pukalani District. The Pukalani Wastewater Plant treats 200,000 gallons of wastewater per

day (Hawai‘i Water Service Company 2015) and has the capacity to accommodate 160 gallons of wastewater per minute (230,000 gallons per day [gpd]) (Scranton Gillette Communications 2015).

Storm Water

As stated for the Lease Alternative, the Hawai‘i Department of Transportation is responsible for storm water management in the Maui District. This baseline setting is the same for the Construction Alternative site.

Power and Electricity

As stated for the Lease Alternative, Maui Electric provides power and electricity to the entire island of Maui. This baseline setting is the same for the Construction Alternative site.

Solid Waste

Solid waste from the Upcountry region near the Pukalani property is transported to Central Landfill – Refuse and Recycling Center located at Pulehu Road and Hansen Road in Pu‘unene, Maui. As previously stated, Central Maui Landfill processes approximately 550 tons of waste per day and is expected to reach capacity by 2026 (Gershman, Brickner & Bratton, Inc. 2012). Disposal of construction waste material may be provided by the privately owned Maui Demolition and Construction Landfill, with a waste limit of 1,200 tons per day, upon agreement (County of Maui DHHC 2014).

3.8 WATER RESOURCES AND HYDROLOGY

The water resources and hydrology section describes sources of groundwater and surface water on each of the proposed Project properties, existing hydrologic flow across the sites, and water quality.

3.8.1 Lease Alternative (Kīhei Property)

On average, Kīhei receives the lowest levels of rainfall on Maui, making it one of the driest regions in the Hawaiian Islands. Annual rainfall near the Kīhei property ranges between 10 and 15 inches (Chris Hart & Partners, Inc. 2013). Kīhei is a served by the Wailuku system, and this region receives its water primarily from the ‘Īao Aquifer, a groundwater source located under the West Maui Mountains (County of Maui 2015d). The ‘Īao

Aquifer is 24.7 square miles, and has a sustainable yield of approximately 20 mgd. Unfortunately, over-pumping of this aquifer has resulted in significant declines in water levels compared to predevelopment water levels (USGS 2013). Water from the ʻĪao Aquifer is naturally filtered and disinfected by lava rocks or is sent to the ʻĪao WTS for treatment, which is currently operating at its capacity of 1.7 mgd (County of Maui 2015d).

The greater MRTP is located between the Waipuʻilani Gulch to the north and Keokea Gulch to the South. These gulches act as major drainage ways for the Kīhei property. Storm water flows through the Kīhei property area in an east-west direction. Storm water runoff drains through the Elleair Golf Course (located immediately west of the Kīhei property) to culverts located underneath Piʻilani Highway, through various drainage facilities, and then eventually into the Pacific Ocean (Chris Hart & Partners, Inc. 2013).

3.8.2 Construction Alternative (Pukalani Property)

Near the Pukalani property in Upcountry Maui, rainfall averages between 40 and 60 inches, typically between the months of October and April (County of Maui DHHC 2014). The main source of water servicing the proposed Project property is surface water runoff from the Makawao-Haiku system, which is conveyed through the Wailoa Irrigation Ditch (County of Maui DHHC 2014). Wailoa Ditch has a storage capacity of approximately 195 million gallons and an average daily flow of 170 mgd (Water Resource Associates 2003). Water from the Wailoa Ditch is treated at the Kamole Weir WTS, which has an average daily production of approximately 3.6 mgd. The water bodies nearest the Pukalani property include Kalialinui Gulch south of the site and Kaluapali Gulch north of the site. There are no groundwater or surface water sources located directly on the Pukalani property (County of Maui DHHC 2014).

Pukalani is located within the Makawao Aquifer System, which encompasses a number of drainage basins and intermittent streams in Makawao, Pukalani, and Kula. Drainage at the Pukalani property typically flows in a northwesterly direction toward Lot 17 due to the topography of graded land and streets, and is eventually funneled through underground drainage systems located beneath Aʻapueo Parkway and Ohiʻa Ku Street (Malama Environmental 2010).The surface drainage area in Pukalani has been significantly augmented by the construction of ditches created to supply water to sugar cane agriculture. These ditches make up much of the drainage network near the Pukalani property (State of Hawaiʻi Department of Land and Natural Resources [DLNR] 2013).

3.9 GEOLOGY, SOILS, AND TOPOGRAPHY

This section discusses the characteristics, composition, and origin of the geology and soil resources on and surrounding both the Kīhei and Pukalani properties. Topography and seismic character of both locations are also discussed.

3.9.1 Lease Alternative (Kīhei Property)

Due to the uneven distribution of bedrock below shallow sediment sequences, the topography at the Kīhei property is considered flat with slight undulations. The Kīhei property is characteristic of shallow, ephemeral drainage depressions, and low, mounded rounds and hillocks that formed as a result of weathered basalt outcrops (Chris Hart & Partners 2013).

The soil near the Kīhei property is classified as Waiakoa extremely stony, silty clay loam, 7 to 15 percent slopes (WID2). WID2 refers to the Natural Resources Conservation Service designated soil map unit of the Soil Survey Geographic Database (ArcGIS 2015). This soil is characteristic of medium runoff and has a severe level of erosion hazard, which is typically used for pasture and wildlife habitat. Approximately 50 percent of the surface area in the area near the Kīhei property has experienced erosion, and approximately 3 to 15 percent of the surface is covered by stones (Chris Hart & Partners, Inc. 2013).

The island of Maui is considered a Seismic Design Category D_1. This seismic category is characteristic of regions likely to experience very strong shaking that has the potential to result in "negligible damage to buildings of good design and construction; slight-to-moderate damage in well-built ordinary structures; and considerable damage in poorly built structures" (Federal Emergency Management Agency [FEMA] 2015).

3.9.2 Construction Alternative (Pukalani Property)

The Pukalani property is located approximately 1,746 feet above mean sea level near Ohiʻa Ku Street and Aʻapueo Parkway (County of Maui DHHC 2014). Given its vicinity to Haleakalā, the topography of Upcountry Maui, near the Pukalani property, is characterized as being mountainous with rolling hills (Hawaiʻi Tourism Authority 2015). The Pukalani property is also located approximately 16 miles from the summit of Haleakalā (Google Earth Pro 2015). Haleakalā is considered an active volcano but only erupts every 200 to 500 years (USGS 2010). The last eruption at Haleakalā occurred sometime in the 18th century (Encyclopedia Britannica

2015). The topography on Lot 17 has been graded over time and is at a slightly higher elevation than Aʻapueo Parkway to the north and the neighboring housing area to the west.

The Makawao-Pukalani-Kula region is home to various botanical gardens, ranches, and farms due to the fertile soil that is found there (Hawaiʻi Tourism Authority 2015). Two types of soil are found on the Pukalani property. These include Keahua cobbly silty clay loam, 15 to 25 percent slopes (soil map unit KnaD); and Keahua cobbly silty clay, 7 to 15 percent slopes (soil map unit KnhC). The soil classification KnaD is characteristic of medium runoff and has a moderate level of erosion hazard. Some portions of this soil are not considered cobbly and there are a few steep areas. KnhC soils are characteristic of slow-to-medium runoff and have a slight-to-moderate level of erosion hazard. Some portions of this soil are 20 to 40 inches deep over soft, weathered basic indigenous rock (County of Maui DHHC 2014).

Like the Lease Alternative, the Pukalani property location is also located in Maui County, which is considered Seismic Design Category D_1 and has the potential to experience very strong shaking from seismic activity and could result in "negligible damage to buildings of good design and construction; slight-to-moderate damage in well-built ordinary structures; and considerable damage in poorly built structures" (FEMA 2015).

3.10 AIR QUALITY

This section discusses the quality of the air near the proposed Project properties, the main sources of emissions, and whether the proposed Project area is in attainment of the National Ambient Air Quality Standards (AAQS) established under the Clean Air Act.

Emissions in Maui County as a whole are often quickly dispersed due to the high trade winds (Hawaii State Department of Health, Clean Air Branch 2015). There are 14 monitoring stations in the entire state, three of which are on the island of Maui. The air monitoring stations on Maui include Kīhei, Kahului, and Paia (Hawaiʻi State Department of Health 2015b). Based on 2012 data from these monitoring stations, the entire state was found in attainment of the National AAQS established under the Clean Air Act. Hawaiʻi also enforces and is in attainment of the Hawaiʻi AAQS. The air pollutants regulated under Hawaiʻi and National AAQS include carbon monoxide, lead, nitrogen dioxide, particulate matter up to 10 micrometers in size (PM_{10}), particulate matter smaller than 2.5 micrometers in size ($PM_{2.5}$), ozone, sulfur dioxide, and hydrogen dioxide

(Hawai‘i State Department of Health 2015). $PM_{2.5}$, fine particulate matter, is the primary constituent monitored in Hawai‘i, given that it is characteristic of toxic organic compounds and heavy metals. Fine particulates are lighter, travel farther, and stay in the air longer than larger particulates, such as $PM_{10.}$ Fine particulates have the ability to be inhaled more easily and can also pass through smaller airways, which may result in adverse health effects (Air Info Now 2015). Hawai‘i currently adopts federal standards for $PM_{2.5}$; there are no separate limits for $PM_{2.5}$ under the Hawai‘i AAQS. The current Federal Primary Standards for $PM_{2.5}$ 24-hour block average and $PM_{2.5}$ annual average are 35 micrograms per cubic meter (µg/m^3) and 15 µg/m^3, respectively (Hawai‘i State Department of Health 2015). For example, Table 3-4 shows air quality in Maui on one specific day, October 1, 2015.

Table 3-4 Air Quality on Maui

Station	Date and Time	$PM_{2.5}$ µg/m^3	Wind Speed (mph)	Wind Direction (degrees)
Kahului	10/1/2015, 9:00am	3.0	2.6	338
Kīhei	10/1/2015, 9:00am	12.0	4.6	22
Paia	10/1/2015, 9:00am	1.0	4.1	66

Key:
$PM_{2.5}$ = fine particulate matter
µg/m^3 = micrograms per cubic meter
mph = miles per hour
Source: Hawai‘i State Department of Health 2015b.

3.10.1 Lease Alternative (Kīhei Property)

Air quality in Kīhei is considered high. Near the Kīhei property, the main sources of emissions and air pollution are from agricultural operations and automobile traffic on nearby roadways. Particulate matter, carbon monoxide, and nitrogen oxides make up the majority of air emissions in the area near the Kīhei property. Volcanic emissions from the island of Hawai‘i and emissions from power plants located several miles away also affect air quality in Kīhei at times; however, these emissions levels are typically low once they reach Kīhei (Chris Hart & Partners, Inc. 2013).

3.10.2 Construction Alternative (Pukalani Property)

Air quality in Pukalani is also considered high. Exhaust from automobiles and nearby roadways is the main source of air pollutants in the vicinity of

the Pukalani property, and there are no point sources of airborne emissions. Agricultural dust and sulfur particulates from volcanic eruptions on the island of Hawai‘i may occasionally affect air quality near the Pukalani property; however, these changes in air quality are typically minor (State of Hawai‘i DLNR 2013).

3.11 NOISE

This section describes current noise levels and the main sources of noise generation in the vicinity of the two proposed Project properties.

3.11.1 Lease Alternative (Kīhei Property)

The Kīhei property is situated near single-family residential properties, a golf course, and various small commercial and high-tech/industrial businesses. Therefore, although the property is primarily used for high-tech/industrial purposes, noise levels are typically characteristic of business and commercial uses as opposed to higher noise levels of industrial operations. The majority of the noise at the Kīhei property is generated by natural conditions and traffic on Pi‘ilani Highway and other nearby roads (Chris Hart & Partners, Inc. 2010).

3.11.2 Construction Alternative (Pukalani Property)

Noise levels in the vicinity of the Pukalani property are characteristic of residential and small-scale commercial lots. There are no significant fixed noise generators in the vicinity of the property. The main sources of noise in this proposed Project area are primarily generated by natural conditions, such as wind, and nearby traffic (County of Maui DHHC 2014).

3.12 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

This section discusses the demographics and the main drivers of economy in the proposed Project areas. This section also includes a discussion of environmental justice, which describes the distribution of minorities, Native Hawaiians, children, and schools in the vicinity of the properties.

Based on 2014 estimates, the population of Maui County is approximately 163,019, and has experienced relatively strong growth since 2010. In 2010, the population of Maui County was approximately 154,834, which is equal to a growth rate of approximately 5.3 percent (U.S. Census Bureau 2015).

The population of Kīhei in 2010 was 20,881 (U.S. Census Bureau 2015). In 2010, the population of Pukalani was 7,574, which was 15 percent larger than Kula and 7 percent larger than Makawao (County of Maui DHHC 2014).

Between the 2009 and 2013, approximately 10.6 percent of the population in Maui County was below poverty level (U.S. Census Bureau 2015). The "minority" population, defined by the U.S. Census Bureau as the population with a racial background other than Non-Hispanic White, made up 68.7 percent of the population of Maui County in 2014 (State of Hawai'i DBEDT 2015). Native Hawaiians and other Pacific Islanders make up 10.7 percent of the racial mix in Maui County. In the county, persons under 5 years of age represent 6.2 percent of the population, persons under 18 represent 22.3 percent of the population, and persons 65 years and over represent 15.1 percent of the population (U.S. Census Bureau 2015).

Tourism is the primary driver of the economy in Maui County and generates more than 80 percent of the economic activity. On average, tourism generates approximately $3 billion in visitor spending each year and provides approximately 75 percent of all private sector jobs in the county. While there have been significant declines in the agricultural industry in Maui over the years, it still remains one of the major economic drivers in the county as a whole, as it does in Kīhei and Pukalani. As of 2010, pineapple, sugar, and seed corn were Maui's leading crops (County of Maui 2010). With the phasing out of pineapple and sugar, it is anticipated that the Maui economy will depend heavily on tourism and diversified agriculture. Under those circumstances, we anticipate that the preservation of the natural environment will continue to be important.

3.12.1 Lease Alternative (Kīhei Property)

The demographics and economic drivers in Kīhei are the same as those described in Section 3.12 above. In Kīhei, both Kīhei Elementary School (Pre-K to Grade 5) (Kīhei Elementary School 2015) and Lokelani Intermediate School (Grades 6 to 8) (Public School Review 2015) are located less than 0.5 mile southwest of the Kīhei property (Google Earth Pro 2015).

3.12.2 Construction Alternative (Pukalani Property)

The demographics and economic drivers in Pukalani are the same as those described in Section 3.12 above. The Kamehameha Schools Maui Campus (K to Grade 12) includes Kamehameha Elementary School, Kamehameha

Middle High School, and Kamehameha High School, and is located within 0.25 mile of the Pukalani property (Kamehameha Schools 2015). King Kekaulike High School (Grades 9 to 12) is also located within 0.25 mile of the Pukalani property (Google Earth Pro 2016).

4.0 ENVIRONMENTAL CONSEQUENCES

This section evaluates the potential direct and indirect environmental impacts of the Lease Alternative, Construction Alternative, and No-Action Alternative for the proposed Project. This section goes on to consider the potential cumulative effects that might occur when the effects of the proposed Project are added to the past, present, and reasonably foreseeable impacts in the Region of Influence (ROI) of each Alternative.

The context and intensity of potential impacts are determined based on the Council on Environmental Quality (CEQ) regulations, 40 CFR 1508.27. Context generally refers to the setting, whether beneficial or adverse, short-term or long-term, and direct or indirect. Intensity then refers to the severity and duration of the impact. Impact intensity is categorized as either major, moderate, minor, negligible, or no impact. These intensities are defined at the beginning of each resource section and each of the qualifiers is identified in the subsequent analysis. Mitigation is identified when it can reduce an impact level from major or is found to be otherwise environmentally preferable to employ.

Cumulative impacts are defined by the CEQ NEPA-implementing regulations (40 CFR 1508.7) as the incremental environmental impacts of a proposed action "when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions." Impacts to each resource were considered together with the impacts from other past, present, and reasonably foreseeable future activities within the same or connected geographic footprint as exists for each Alternative. This includes the area near where renovation or construction and ultimate operations would occur for each Alternative as well as access routes and other locations connected to the considered activities. Likewise, temporally, activities are considered that might take place within the same timeframe as the renovation or construction and ultimate operations of the proposed Project, which is generally defined as 50 years.

Past projects, ongoing projects, and reasonably foreseeable projects and activities in close proximity to either of the Alternative locations in Kīhei or Pukalani were reviewed for their potential to contribute to cumulative impacts when added to those identified in the proposed Project analysis. Specifically, cumulative activities identified in close proximity to the Lease Alternative would include the development of Maui Park Plaza, which has been completed and is considered a past activity that contributes to the current setting. Other ongoing and future projects occurring in the

area would include the development of Nu‘u Aina Estates, Hokulani Golf Estates, and MRTP, Phase 1, Increment 1.

In the area of the Construction Alternative, much of the development within the Kulamalu Commercial Subdivision property has been completed and the current setting of the proposed Project site under this Alternative has been established. These past activities include Kulamalu Village Lot 4-A-4, Longs Drugs at Kulamalu Village Lot 5, and Kamehameha Schools Maui Campus. Continued development of the Kulamalu Affordable Housing development across A‘apueo Parkway is also considered.

Finally, other activities were considered for both Alternative sites. These activities, such as traffic along local roadways, school activities, and operations that are less well defined, but certainly have the potential to contribute cumulatively to identified potential impacts for the proposed Project Alternatives, are specifically identified in the analysis.

4.1 LAND USE

This impact analysis focuses on the potential for either action Alternative or the No-Action Alternative to affect land use, either beneficially or adversely, directly or indirectly—in other words, measures that may change the use of or develop the land; require approvals or confirmation of compliance to adopted laws, regulations, or plans; or change or hinder activities on that land. Cumulative effects are also evaluated which consider the potential effects of these Alternatives when added to other past, present, and reasonably foreseeable future activities within the same ROI.

Impacts are described by the level of intensity, categorized as major, moderate, minor, negligible, or no impact. For this analysis, these terms are defined as follows:

- A major impact would result in a noticeable change in land use; the change would be measurable and result in a severely adverse or highly beneficial impact.
- A moderate impact would result in a measurable change in land use.
- A minor impact would result in a change in land use, but would be small, localized, and of little consequence.
- A negligible impact would result in a minimal change in land use, or a minimal change so small it would not be measurable or perceivable.

- No impact means the proposed Project would result in no change in land use.

Impacts are also quantifiable by the duration of the impact. A short-term impact is one that would occur only during build-out or construction. A long-term impact would continue into the operations of the facility.

4.1.1 Lease Alternative (Kīhei Property)

The Kīhei property is located within the MRTP on land zoned as State Urban District by the State of Hawai‘i LUC and designated as Project District on the Kīhei-Makena Community Plan Map. Land uses at the Lease Alternative location would be consistent with the above-referenced State and County of Maui Planning documents. Operations would be similar in nature to the other high-tech and industrial businesses that surround the site. Single-family residential homes and a golf course lie outside of the MRTP and would not be impacted by operations at the Lease Alternative location. Based on these factors, there would be no direct or indirect impact on current land uses.

4.1.2 Construction Alternative (Pukalani Property)

The proposed land uses at the Pukalani property conform to all the current zoning and land use designations established by the County of Maui and the State of Hawai‘i as discussed in Section 3.2.1. The Pukalani property is also within the Urban Growth District and is currently located on a graded, but unimproved vacant lot. Maui County General Plan policies encourage the improvement of underutilized urban lots within the Urban Growth District; therefore, the Construction Alternative would align with the General Plan goals and policies. Operations at the Construction Alternative location would be consistent with surrounding commercial and business land uses. Based on these factors, there would be no direct or indirect impact on current land uses.

4.1.3 No-Action Alternative

Under the No-Action Alternative, AURA would continue to lease the current Project office space located at 8 Kiopa‘a Street in Makawao, Maui. There would be no construction or change in operations under this Alternative and land use under the No-Action Alternative would conform to the Maui County General Plan and Makawao-Pukalani-Kula Community Plan. As such, there would be no impact under the No-Action Alternative.

4.1.4 Cumulative Effects

Because the proposed Project would have no impact on land use under either the Lease Alternative or the Construction Alternative, by definition there would be no contribution to or potential for a cumulative effect on land use.

4.2 AESTHETICS AND VISUAL RESOURCES

This impact analysis focuses on the potential for either action Alternative or the No-Action Alternative to affect aesthetics and/or visual resources, either beneficially or adversely, directly or indirectly—in other words, it analyzes whether the proposed activities would result in changes in the viewshed to or from each Project area, the landscape, or otherwise impair the visual quality of the region. Cumulative effects are also evaluated, which consider the potential effects of these Alternatives when added to other past, present, and reasonably foreseeable future activities within the same ROI.

The intensity of the impact to views was assessed and categorized as major, moderate, minor, negligible, or no impact, as defined below.

- A major impact would result in a substantial change to the visual quality of the landscape in the region. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.
- A moderate impact would impact the visual quality of the landscape; this impact would be readily detectable, be localized, and have consequences at the regional level. Mitigation measures would be necessary to offset adverse impacts and would likely be successful.
- A minor impact would result in a detectable change to the visual quality of the landscape; this change would be localized, small, and of little consequence to the observer.
- A negligible impact would either not impact the visual quality of the landscape, or changes would be so slight that there would be no measurable or perceptible consequence to the observer.
- No impact means the proposed Project would result in no change to the visual character, viewshed, or landscape.

Impacts are also quantifiable by the duration of the impact. A short-term impact is one that would occur only during build-out or construction. A long-term impact would continue into the operations of the facility.

4.2.1 Lease Alternative (Kīhei Property)

The Kīhei property is currently developed and surrounded by other commercial and high-tech and industrial buildings. Proposed modifications to the existing building would be primarily internal and not likely to alter the current visibility or scenic character of these resources. The one exception would be the installation of a receiving dock bay within the existing facility layout. As such, there would be no direct or indirect impact on the aesthetics and visual resources.

4.2.2 Construction Alternative (Pukalani Property)

The Construction Alternative would include construction of a two-story building measuring 35 feet in height that would be surrounded by other commercial buildings and residential properties that are similar in structure. The facility design would be consistent with surrounding development and would need to be approved by Maui County Planning Department prior to construction. However, these activities would be detectable, would be localized, contained to the Project site, and would be short-term. Because this would be consistent with recent and past construction in the area and because construction would be temporary (approximately 12 to 15 months in duration), this impact would be considered to be minor, adverse, direct, and short-term. Furthermore, because the character and use of the facility would align with surrounding land uses and viewsheds, no impact on aesthetics or visual resources would be anticipated during operations.

4.2.3 No-Action Alternative

No further construction or alterations to the current facility would be proposed under the No-Action Alternative; therefore, there would be no direct or indirect impact on aesthetics or visual resources.

4.2.4 Cumulative Effects

Because the proposed Lease Alternative would have no impact on aesthetics or visual resources, by definition there would be no contribution to or potential for a cumulative effect on this resource.

The Construction Alternative would have a potential short-term, adverse, minor impact as a result of construction vehicles and equipment onsite during the projected 12- to 15-month construction timeframe. The presence of construction activities could contribute to a cumulative effect on the local aesthetics, but would be consistent with other activities that

have occurred or will occur in the Makawao-Pukalani-Kula Community Planning area. For example, other improvements in the area, including the Kulamalu Housing Development, might have similar construction activities occurring at the same time. These construction activities would be visible from nearby residences and commercial operations. These activities would be detectable; however, because they would be localized, contained, and short in duration, the cumulative effect on visual resources would be considered minor.

4.3 BIOLOGICAL RESOURCES

The methods used to determine whether either action Alternative or the No-Action Alternative would have an impact on biological resources include reviewing and evaluating the potential for build-out, construction, or operation to result in diminished health, diversity, or population of biological resources. Compliance with applicable federal, state, and county regulations was also evaluated.

The assessment of effects on natural and biological resources considered direct and indirect impacts to threatened or endangered species, designated critical habitat, or otherwise ecologically sensitive areas. Impacts were assessed based on whether the proposed Project would result in any of the following: (1) potential "take" of a threatened or endangered species, as defined by the Endangered Species Act and HRS 195D; (2) loss or impairment of sensitive or other native habitats, including wetlands or riparian corridors; (3) interference with the movement of any native resident or migratory wildlife; or (4) introduction or spread of invasive or otherwise undesirable non-native species.

Cumulative effects are also evaluated, which consider the potential effects of these Alternatives when added to other past, present, and reasonably foreseeable future activities within the same ROI.

The level of intensity of an impact is described as major, moderate, minor, negligible, or no impact, as defined below.

- A major impact would result in substantial change to the character of the biological resource over a large area. Extensive mitigation would be required to offset major adverse impacts.
- A moderate impact would result in an apparent change to biological resources over a wide area. Mitigation measures would be necessary to offset moderate adverse impacts.

- A minor impact would result in a detectable change, but it would be small, localized, and of little consequence.
- A negligible impact would be below the lower levels of detection.
- No impact means the proposed Project would not impact biological resources.

Impacts are also quantifiable by the duration of the impact. A short-term impact is one that would occur only during build-out or construction. A long-term impact would continue into the operations of the facility.

4.3.1 Lease Alternative (Kīhei Property)

As described in Section 3.4.1, the majority of the ground cover on the Kīhei property is non-native vegetation. The ʻilima and ʻuhaloa are the only two native plant species present on the Kīhei property, and both are very common to the Hawaiian Islands. No special-status plants or sensitive habitats were identified on the Kīhei property.

No state or federally listed endangered or threatened animal species were observed on the Kīhei property, and no native forest birds were identified onsite. The species that were observed most frequently on the Kīhei property included axis deer, cats, and cattle.

Construction activities under the Lease Alternative would be minor, predominantly internal, and would utilize existing paved roadways and staging areas. No trees or vegetation would be removed as a result of the proposed renovation plan. Operations would be consistent with current uses. As such, there would be no direct or indirect impacts on listed species or other native flora or fauna under the Lease Alternative.

4.3.2 Construction Alternative (Pukalani Property)

The Pukalani property has been highly disturbed by human activity, grading, and filling (Starr Environmental 2015). The majority of onsite plant species consist of non-native ground cover vegetation, with the exception of one planted native kou tree. No listed plants or sensitive habitats occur on the Pukalani property. Furthermore, since the survey, the low-lying ground cover has been removed as part of regular maintenance activities.

Almost all the animals observed at the Pukalani property during the faunal surveys were non-native. Two native Pacific golden-plovers were identified flying over the site. However, there is very little suitable habitat

for the Pacific golden-plover and many other bird species. Additionally, no nēnē or other listed species were observed during faunal surveys. The nēnē, however, is known to occur in surrounding areas. Likewise, although no bats were identified onsite during faunal surveys, they are known to occur in the area. Because the site is mowed as part of maintenance, there is little potential for birds to roost, nest, or forage.

The only native insect identified onsite was the green darner dragonfly. No other insects, including the Blackburn's sphinx moth or tree tobacco, which acts as a host plant, were observed at the Construction Alternative location during faunal surveys.

Although many of the flora and faunal species identified are non-native, the Construction Alternative would include clearing, grading, and development of a currently vacant lot in an area known to have the potential to support several listed and native species, including the Hawaiian hoary bat, the green darner dragonfly, the Blackburn's sphinx moth, and its host plant, as well as native birds including the Pacific golden-plover and the nēnē.

Though the preferred roosting locations for bats in the area are likely in nearby gulches, there are a few trees on the property on which bats could potentially roost. To minimize the potential for impacts on the Hawaiian hoary bat or birds, these trees would be removed during the season when bats are not roosting or pupping. Although highly unlikely, if nēnē were observed, AURA would contact DLNR. To avoid impacts on night-flying birds, tall equipment, such as crane booms, would be lowered at the end of each day.

No major impacts on listed and native insects would be anticipated as a result of proposed Project-related activities. The Blackburn's sphinx moth's host plant does not occur onsite, and thus, would unlikely be impacted.

With these measures in place, impacts on sensitive faunal species would be unlikely and proposed activities under the Construction Alternative would have a negligible, adverse, direct, and short-term, impact on biological resources.

4.3.3 No-Action Alternative

No construction or change in operations is proposed under the No-Action Alternative. There would be no direct or indirect impacts on biological resources under the No-Action Alternative.

4.3.4 Cumulative Effects

Because the proposed Lease Alternative would have no impact on biological resources, by definition, there would be no contribution to or potential for a cumulative effect on this resource.

The Construction Alternative, however, would have a potential contribution toward a negligible to minor cumulative impact, specifically because of the potential for listed and native faunal species to occur near the Pukalani property. Activities associated with the Kulamalu Housing Development could have similar impacts on biological resources. The Hawaiian hoary bat, the green darner dragonfly, the Blackburn's sphinx moth, the Pacific golden-plover, and the nēnē would presumably continue to occur within the area and could be affected by human activities, tree and vegetation removal, and other maintenance or construction activities. Although the proposed Project property is mowed for maintenance, removing the potential for roosting, nesting, or foraging, it is not known whether these nearby properties employ similar maintenance that would minimize the potential to affect these species. As such, although the potential contribution of the Construction Alternative on biological resources would be negligible, the potential cumulative effect would be negligible to minor, adverse, direct and indirect, local, and short-term.

4.4 CULTURAL RESOURCES

Information to evaluate impacts relevant to this section has been obtained through review of existing documentation on cultural, historic, and archeological resources and by conducting an additional cultural resource survey of the proposed Project area. The information obtained has been considered in determining the level of impacts on cultural, historic, and archeological resources. Cumulative effects are also evaluated, which consider the potential effects of these Alternatives when added to other past, present, and reasonably foreseeable future activities within the same ROI.

Impacts are described by the level of intensity of impacts on cultural, historic, and archeological resources, and are categorized as major, moderate, minor, negligible, or no impact. For this analysis, these terms are defined as follows:

- A major impact would result in the disturbance of a site(s) and in loss of integrity, and impact(s) would alter resource conditions. There would be a barrier to, or great effect on, traditional access, site

preservation, or the relationship between the resource and the affiliated group's body of practices and beliefs, to the extent that the survival of a group's practices and/or beliefs would be jeopardized. Measures to minimize or mitigate adverse effects would not be agreed upon that would reduce the intensity of impacts under NEPA CEQ 1508.20 from major to moderate.

- A moderate impact would result in loss of integrity, and impact(s) would be apparent and would alter resource conditions. There would be an interference with traditional access, site preservation, or the relationship between the resource and the affiliated group's practices and beliefs, even though the group's practices and beliefs would survive. Also included are major impacts that have been mitigated to reduce their intensity from major to moderate.
- A minor impact would result in little, if any, loss of integrity and would be slight but noticeable, but would neither appreciably alter resource conditions, such as traditional access or site preservation, nor the relationship between the resource and the affiliated group's body of practices and beliefs.
- A negligible impact would be at the lowest levels of detection, though still detectible, with minimal, adverse, or beneficial consequences to resource conditions, such as traditional access or site preservation, or the relationship between the resource and the affiliated group's body of practices and beliefs.
- No impact means the proposed Project would have no detectible adverse or beneficial consequences and would neither alter resource conditions, such as traditional access or site preservation, nor the relationship between the resource and the affiliated group's body of practices and beliefs.

The duration of impacts is described as either short-term (would occur only during Project construction) or long-term (would continue after construction).

4.4.1 Lease Alternative (Kīhei Property)

The Lease Alternative location is a barren zone that has in the past been utilized for temporary transitory purposes. Consequently, historically significant Hawaiian populations did not settle in these areas and artifacts characteristic of these populations are not likely to be present (Chris Hart & Partners 2010). An inventory survey of over 338 acres of the MRTP resulted in the discovery of five historic artifacts primarily related to

WWII training activities. No other cultural, historic, or pre-historic features were identified.

Proposed construction activities would primarily occur in the interior of the existing structure. Therefore, ground-disturbing activities would not be anticipated and impacts on historic cultural resources would be unlikely. In the case that historic or culturally significant artifacts would be encountered, the SHPD would be contacted. No direct or indirect impacts on cultural and historic resources would be anticipated under the Lease Alternative.

4.4.2 Construction Alternative (Pukalani Property)

An archaeological assessment performed by IARII revealed that no traditional Hawaiian or historic cultural deposits or features are present on the Pukalani property. Additionally, the site has been heavily graded and soil characterization has shown that the topography of the property has undergone substantial disturbance from utility installation and other construction-related activities. Proposed construction activities associated with the Construction Alternative would be unlikely to encounter new historic or archaeological artifacts; however, in the event of an encounter, AURA would contact SHPD.

There are a number of SIHP sites within a 0.65-mile radius of the Construction Alternative location. These sites, however, are at a great enough distance from the site and segregated from the proposed construction by existing structures that these resources would not likely be impacted by construction activities or operation. As such, the potential impact on cultural, historic or archaeological resources under the Construction Alternative would be negligible, adverse, direct, and long-term.

4.4.3 No-Action Alternative

Although the No-Action Alternative location is also in close proximity to significant historic and archaeological features, the No-Action Alternative does not include construction or changes in operation. No direct or indirect adverse impacts on cultural, historic, or archaeological resources would result.

4.4.4 Cumulative Effects

Because the proposed Lease Alternative would have no impact on cultural resources, by definition there would be no contribution to or potential for a cumulative effect on this resource.

The Construction Alternative, however, would have a slight but detectible, negligible potential for impact on nearby archaeological and cultural resources. Other activities in the area, including day-to-day commercial operations, human activities, and development, have the potential to affect cultural, archaeological, or historic resources in the area. The proposed Project would not contribute considerably to cumulative impacts to these resources and the potential cumulative effect would be negligible, adverse, direct, and long-term.

4.5 ROADWAYS AND TRAFFIC

This impact analysis focuses on the potential for either action Alternative or the No-Action Alternative to affect roadways or traffic, either beneficially or adversely, directly or indirectly. In other words, this section analyzes whether the proposed activities would require new roadways or result in elevations or reductions in traffic on local roadways. Cumulative effects are also evaluated that consider the potential effects of these Alternatives when added to other past, present, and reasonably foreseeable future activities within the same ROI.

The intensity of impacts is described as major, moderate, minor, negligible, or no impact, as defined below.

- A major impact would result in substantial change to existing traffic levels, require new roadways, or substantially impair existing roadways, with severe adverse or beneficial impacts.
- A moderate impact would result in a measurable and consequential change in traffic, roadways, access, or/and transportation corridors.
- A minor impact would result in a small, localized change of little consequence.
- A negligible impact would result in a minimal change in existing traffic or roadway conditions.
- No impact means that the resulting effect would be too small to be of any measurable or perceptible consequence.

Impacts may be short-term or long-term. A short-term impact would only occur during build-out or construction. A long-term impact would occur into the operations of the proposed facility.

4.5.1 Lease Alternative (Kīhei Property)

Piʻilani Highway is the primary arterial road providing access to the Kīhei property. Proposed construction under the Lease Alternative would consist of primarily internal renovations and would be short-term in nature, occurring over approximately 6 to 9 months. Construction vehicles and equipment would access the site and be staged onsite for a temporary period. Equipment needed for contiguous phases would be staged so as to minimize traffic on the surrounding roadways. Because of this short duration and the minimal traffic increase, impacts on traffic volumes and levels of service in the area surrounding the Kīhei property during construction would be negligible, adverse, direct, adverse, and short-term.

During operations, an average of 25 to 30 permanent and visiting staff would use the proposed facility daily. In 2013 AADT counts were approximately 33,000 trips per day along Piʻilani Highway (Hawaiʻi DBEDT 2013). The projected increase (approximately 0.09 percent) in vehicle traffic from Project operations would be expected to blend with current traffic volumes and not affect the levels of service along Piʻilani Highway and other surrounding roads. This impact would be considered negligible, adverse, direct, and long-term.

4.5.2 Construction Alternative (Pukalani Property)

During construction, transportation of construction vehicles to and from the proposed Project site would be anticipated to occur on a short-term, basis over a 12- to 15-month period. Equipment needed for contiguous phases would be staged so as to minimize traffic on the surrounding roadways. The Kulamalu Commercial Subdivision master plan included roadway designs capable of accommodating future development (County of Maui DHHC 2014). Because the Construction Alternative location is within the Kulamalu Commercial Subdivision, the anticipated increases in vehicle traffic during construction and operations should be easily accommodated by the roads and highways surrounding the site. Increases would be short in duration and would have little consequence on the traffic flow. As such, impacts on traffic volumes and levels of service in the area surrounding the Kīhei property during construction would be minor, direct, adverse, and short-term.

During operations, an average of 25 to 30 permanent and visiting staff would use the proposed Project facility daily. Currently, average daily traffic volumes on Kula Highway were measured during the 2030 General Plan Update process to be around 12,000 trips per day (Fehr & Peers 2007). The projected number of vehicle trips generated by visiting and permanent staff as part of the proposed Project would increase traffic flow approximately 0.25 percent, which would be unnoticeable. The impact on traffic and roadways during operations would therefore be considered negligible, adverse, direct, and long-term.

4.5.3 No-Action Alternative

The proposed No-Action Alternative would not require construction or changes in operations, and therefore, would have no direct or indirect impacts on traffic volumes or levels of service in the vicinity of the site.

4.5.4 Cumulative Effects

Cumulative activities identified in both the Lease Alternative and the Construction Alternative site areas have the potential to create cumulative effects on roadways and traffic. Activities that might be considered cumulative as related to this resource area would exhibit a connected action either in location or timeframe. These might include similar construction activities or high traffic operations such as commercial or industrial operations or peak commute times for business or schools.

Construction under the Lease Alternative has the potential to contribute to cumulative traffic congestion on Piʻilani Highway on a short-term basis, given the increase in trips from construction vehicles. Likewise, during operation, an average of 25 to 30 permanent and visiting staff would be anticipated to use the proposed facility on a daily basis. Although measurable, the change in traffic flow and roadway conditions would have minimal contribution when added to the effects of other present and reasonably foreseeable uses in the area. This slight percentage increase in daily vehicle trips would have a negligible, long-term, direct, and indirect impact on cumulative traffic conditions along Piʻilani Highway and other surrounding roadways.

During construction at the Pukalani property, the presence of potentially slower moving construction vehicles along local roads and highways and increased vehicle trips would result in short-term increases in traffic. These increases, when added to the Kulamalu Housing Development construction and commercial operations within the development, would be noticeable in the short-term. Likewise, uses further down Aʻapueo

Parkway, including school drop-offs and pickups, could experience noticeable slowdowns during construction. To offset and minimize these effects, construction crews would avoid peak traffic times when mobilizing large equipment to the site. Equipment would remain staged onsite when used on consecutive days to avoid additional mobilization along these roadways. With these avoidance measures, although the impact would be noticeable during the short-term construction period, the impact would be considered minor, adverse, direct and indirect, local, and short-term.

During operation, increases in vehicle trips, primarily along Kula Highway, Aʻapueo Parkway, and Ohiʻa Ku Street, would be anticipated due to an average additional 25 to 30 staff expected to utilize the facility. This increase, however, when added to other cumulative activities in the area, would blend with current and projected traffic volumes, and might be slightly detectible. As such, the cumulative effect during operations would be considered negligible, adverse, direct and indirect, local, and long-term.

4.6 PUBLIC SERVICES AND UTILITIES

This impact analysis focuses on the potential for either action Alternative or the No-Action Alternative to affect public services and utilities, either beneficially or adversely, directly or indirectly. In other words, it analyzes whether the proposed activities impose a change in the demand placed on or otherwise impair local or regional services or utilities. Cumulative effects are also evaluated that consider the potential effects of these Alternatives when added to other past, present, and reasonably foreseeable future activities within the same ROI.

The intensity of impacts is described as major, moderate, minor, negligible, or no impact, as defined below.

- A major impact would result in substantial change to existing service or utility systems, substantially impair or improve functionality of existing systems, or require an expansion of an existing system or establishment of a new system.
- A moderate impact would result in a measurable and consequential change in existing service or utility systems.
- A minor impact would result in a small, localized change of little consequence well within the capacity of the current system.

- A negligible impact would result in a minimal change or a minimal demand on existing service or utility systems.
- No impact means that no additional demand would be placed on the existing service or utility system.

Impacts may be short-term or long-term. A short-term impact would only occur during build-out or construction. A long-term impact would occur into the operations of the proposed facility.

4.6.1 Lease Alternative (Kīhei Property)

The contractor would be responsible for supplying necessary water and power to the site for construction and build-out activities. Likewise, the contractor would be responsible for managing wastewater and solid waste collection and disposal needs. Proposed construction activities under the Lease Alternative would not place an increased demand on local service and utility systems.

Operations under the Lease Alternative would require approximately 22,900 gallons of water per month, which would be within the capacity of the ʻĪao WTS once capacity is increased. This is projected to be completed prior to operation of the Lease Alternative, if approved. Construction and operations under the Lease Alternative would not be expected to measurably impact surface water and groundwater resources near the site. Therefore, while additive, the impact on existing WTSs and water supply sources would be minor, direct, adverse, and long-term.

Operations at the Lease Alternative would generate approximately 20,500 gallons of wastewater per month. Wastewater treatment for the Lease Alternative would be provided by Kīhei WWRF. Kīhei WWRF would have sufficient capacity to treat the wastewater generated onsite during construction and operations. As such, while this increased usage would contribute to the demand on this facility, the demand would be within its capacity. Therefore, impacts on wastewater systems would be minor, direct, adverse, and long-term.

Power and electrical services for the Kīhei property are provided by Maui Electric, which has a total power generation capacity of approximately 209.1 MW of energy. Projected energy demands under the Lease Alternative during operations would be approximately 41,000 kilowatt-hours (kWh) per month. The use of energy required to support activities under the Lease Alternative would be considered a minor, adverse, direct, and long-term impact.

Operations under the Lease Alternative would be expected to generate approximately 6 cubic yards, or 1.6 tons, of waste per month. This amount of waste could be adequately accommodated by Central Maui Landfill, Maui Demolition and Construction Landfill, Kīhei Recycling Center, and Kīhei Compost. The impact on waste streams would be considered minor, adverse, direct, and long-term.

4.6.2 Construction Alternative (Pukalani Property)

Like the Lease Alternative, under the Construction Alternative the contractor would be responsible for supplying necessary water and power to the site for construction and build-out activities. Likewise the contractor would be responsible for managing wastewater and solid waste collection and disposal needs. Proposed construction activities under the Construction Alternative would not place an increased demand on local service and utility systems.

Kamole Weir is the WTS serving the area surrounding the Pukalani property. Water supply under the Construction Alternative is provided by Wailoa Irrigation Ditch (County of Maui 2015c). Proposed operations under the Construction Alternative would require approximately 22,900 gallons of water per month. Both Wailoa Irrigation Ditch and Kamole Weir are currently operating below capacity and would be capable of sufficiently accommodating water supply and treatment demands under the Construction Alternative. Therefore, while additive, the impact to existing WTSs and water supply sources would be minor, adverse, direct, and long-term.

The proposed Construction Alternative would be expected to generate approximately 20,500 gallons of wastewater per month during operations. Currently, the Pukalani Wastewater Plant has the capacity to treat an additional 30,000 gpd. As such, while increased usage under the proposed Construction Alternative would contribute to the demand on this facility, the demand would be within its capacity and therefore would be a minor, adverse, direct, and long-term impact.

Lot 17 of the Kulamalu Commercial Subdivision property, the location of the Construction Alternative, is currently connected to the energy grid. More specifically, an electrical pull-box is already sited adjacent to the property. A transformer would be added to connect the newly proposed facility. Maui Electric has the capacity to generate 290.1 MW of energy, more than enough to support the Construction Alternative's projected energy demands of 41,000 kWh per month. The use of energy required to

support activities under the Construction Alternative would be considered a minor, adverse, direct, and long-term impact.

An estimated six cubic yards, or 1.6 tons, of waste would be generated at the Construction Alternative location during operations. With a remaining capacity of 1,259,400 cubic yards (780,000 tons) as of 2009 (County of Maui 2009), and an average production of 550 tons of waste per day (Gershman, Brinker & Bratton, Inc. 2012), Central Maui Landfill would have enough capacity to meet the solid waste disposal needs of the Construction Alternative. Therefore, waste generated by activities under the Construction Alternative would have a minor, direct, adverse, and long-term impact.

4.6.3 No-Action Alternative

Under the No-Action Alternative, AURA proposes to continue to lease the property located at 8 Kiopa'a Street in Makawao, Maui. There would be no change to the structure of the building or operations; therefore, there would be no additional demand on existing public services and utilities and no impact.

4.6.4 Cumulative Effects

Because of the cumulative nature of the shared set of services and utility systems within each Alternative region, the Project analysis considers the past and present activities and their contributing effects. Reasonably foreseeable activities that might occur in either the Kīhei or Pukalani areas might contribute cumulatively to increased demand on these systems.

Specifically, in the area of the Lease Alternative (Kīhei property), proposed development related to the Nu'u Aina Estates and continued use and development around the Maui Research and Technology Park and the Hokulani Golf Estates would demand higher water and power supplies and generate higher levels of wastewater and solid waste. The 'Īao WTS is the primary WTS in Kīhei and is currently operating at capacity. Potable water needs in the region are anticipated to be strained and, as a result, plans are in place to increase the capacity of the 'Īao Aquifer by 2017. This expansion is designed to meet these increased demands. Although the proposed Lease Alternative's contribution to the impact would be minimal, the resulting cumulative effect when added to these other future cumulative activities would be considered minor, adverse, direct and indirect, regional, and long-term.

The Kīhei WWRF and Maui Electric grid are currently operating below capacity and could accommodate these future activities. The cumulative effect on wastewater and electricity, including the proposed Project contribution, would be minor, adverse, direct and indirect, regional, and long-term.

The cumulative demand on solid waste facilities within the region is within capacity, but would require confirmation when specific volumes are known. This cumulative impact would be considered minor-to-moderate, adverse, direct, regional, and long-term; however, the contribution of the Lease Alternative would be negligible.

Like the Lease Alternative, the primary potential for cumulative effect on services and utility systems of the Construction Alternative is based on the contribution of reasonably foreseeable future actions because past and present activities in the Pukalani area were considered in the Project analysis. The only known future activity is the continued development of Kulumalo Housing across from Lot 17 at the proposed Construction Alternative site. Facilities serving the Pukalani area are operating below capacity and would be anticipated to accommodate continued operations and the two proposed construction activities (Construction Alternative and Kulamalu Housing). The cumulative impacts including the Construction Alternative on potable water, wastewater, and energy demand would be considered minor, adverse, direct and indirect, regional, and long-term.

The Central Maui Landfill is currently within capacity; however, it has the potential to result in reduced capacity over time as a result of activities across the region. The cumulative solid waste impact would therefore be considered minor, adverse, direct, regional, and long-term.

4.7 WATER RESOURCES AND HYDROLOGY

This analysis focuses on the effects, whether beneficial or adverse, direct or indirect, of either action Alternative and the No-Action Alternative on water and hydrologic features near the Project areas. Cumulative effects are also evaluated, which consider the potential effects of these Alternatives when added to other past, present, and reasonably foreseeable future activities within the same ROI.

Impacts are described by the level of intensity of impacts on water resources and hydrology, and are categorized as major, moderate, minor,

negligible, and no impact. For this analysis, these terms are defined as follows:

- A major impact would result in a substantial change to the surface or groundwater features, hydrologic flow, or water quality. Extensive mitigation measures to offset adverse impacts would be needed and their success could not be guaranteed.
- A moderate impact would result in a measurable and consequential change to the surface or groundwater features, hydrologic flow, or water quality. Mitigation may be needed to offset adverse impacts and would be relatively simple to implement and likely to be successful.
- A minor impact would result in a detectable change to the surface or groundwater features, hydrologic flow, or water quality, but the change would be small, localized, and of little consequence.
- A negligible impact would result in a minimal change so small it would not be measurable or perceivable.
- No impact means the proposed Project would result in no change to surface or groundwater features, hydrologic flow, or water quality.

The duration of impacts is described as either short-term (would occur only during Project construction) or long-term (would continue into operations).

4.7.1 Lease Alternative (Kīhei Property)

All work occurring during construction would be internal renovations, with the possible exception of adding a receiving dock bay door to the existing structural layout, and external staging and access would only use paved surfaces. There are no surface water futures on or around the Kīhei property. Proposed construction and operations under the Lease Alternative would not be expected to impact groundwater and there would be no change in hydrologic flow or storm water infrastructure. The Lease Alternative would have no direct or indirect impact on water resources or hydrology.

4.7.2 Construction Alternative (Pukalani Property)

There are no surface water features on or near the Pukalani property and the Construction Alternative would not be anticipated to have effects on groundwater during construction or operation. Grading, paving, and development activities could alter the hydrologic flow of the site and the amount of impervious surface would be reduced. The proposed

construction of the site would, however, include appropriate storm water infrastructure and would not increase the runoff toward neighboring properties. Prior to paving, water used during construction would be contained onsite and would not increase offsite flow. The proposed work would constitute less than an acre of land disturbance and, therefore, not require an NPDES permit or a Storm Water Pollution Prevention Plan. After construction, there would be no effect on water resources or hydrologic flow and storm water infrastructure would be maintained for property function. Although there would be a change to water resources, these changes would be localized and of little consequence. As such, impacts on water resources would be expected to be minor, adverse, direct, local, and long-term.

4.7.3 No-Action Alternative

The No-Action Alternative would not require construction; therefore, there would be no increase in impervious surface that could otherwise lead to increased storm water runoff. No changes in operation would be proposed under the No-Action Alternative; therefore, impacts on water resources and hydrology would not be anticipated. As such, there would be no direct or indirect impacts on surface water, groundwater, or drainage patterns with the implementation of the No-Action Alternative.

4.7.4 Cumulative Effects

Because there would be no impacts anticipated to water resources or hydrology as a result of the Lease Alternative, there would be no potential for a cumulative impact. The Construction Alternative, however, would potentially have impacts during the proposed construction phase. The primary impact could result from offsite runoff and reduction in impervious surfaces. Other activities occurring at the same time of construction could result in independently measurable impacts on water resources, although no other activities would be occurring within the same hydrologic flow path that could contribute cumulatively. As such, while the proposed Project could potentially result in a minor, adverse, direct impact, there would be no additional cumulative effect when considered with other past, present, or reasonably foreseeable future actions. The cumulative impact therefore would remain minor, adverse, direct, local, and long-term.

4.8 GEOLOGY, SOILS AND TOPOGRAPHY

This analysis focuses on the impacts, whether beneficial or adverse, direct or indirect, of either action Alternative or the No-Action Alternative on topography, geology, and soils within the proposed Project area. Cumulative effects are also evaluated that consider the potential effects of these Alternatives when added to other past, present, and reasonably foreseeable future activities within the same ROI.

Impacts are described by the level of intensity of impacts on topography, geology and soils, and are categorized as major, moderate, minor, negligible, or no impact. For this analysis, these terms are defined as follows:

- A major impact would result in a substantial change to the topography, geology, or soils. Extensive mitigation measures to offset adverse impacts would be needed and their success could not be guaranteed.
- A moderate impact would result in a measurable and consequential change to the topography, geology, or soils. Mitigation may be needed to offset adverse impacts and would be relatively simple to implement and likely to be successful.
- A minor impact would result in a detectable change to the topography, geology, or soils, but the change would be small, localized, and of little consequence.
- A negligible impact would result in a minimal change so small it would not be measurable or perceivable.
- No impact means the proposed Project would result in no change to topography, geology, or soils.

The duration of impacts is described as either short-term (would occur only during Project construction) or long-term (would continue after construction).

4.8.1 Lease Alternative (Kīhei Property)

The primary geologic concern for the Lease Alternative would be erosion because of the severe hazard rating given to the area. Proposed construction related to the Lease Alternative would be minimal, occurring predominantly internally and on paved surfaces. There would be no anticipated direct or indirect erosional impacts or effects on soils or

geologic conditions under the Lease Alternative. The Lease Alternative would conform to seismic standards of the Uniform Building Code.

4.8.2 Construction Alternative (Pukalani Property)

Under the Construction Alternative, there could potentially be erosional impacts as well as changes to topography, soil conditions, and geologic structure. The current topography would be altered through site preparation and grading. Portions of the Construction Alternative property contain soils that are characteristic of medium runoff and would have the potential to create a moderate level of erosion hazard. Erosional controls would be put into place during construction to minimize potential effects. The site would then be paved. Storm water infrastructure would be proposed to minimize operational erosional effects in the long-term. The existing geologic and topographic conditions under the Construction Alternative would impose no notable constraints on the proposed Project. The site has been characterized for construction of this nature as demonstrated on adjacent lots. Given the Construction Alternative's proximity to Haleakalā, landowners and residents are made aware of hazardous lava inundation potential when they purchase or inhabit such areas. That said, eruptions at Haleakalā are extremely rare and only expected to occur every 200 to 500 years (USGS 2010).

With the proposed construction plan, there would be no anticipated impacts on soils or geologic conditions under the Construction Alternative. There would be changes to the topography and adverse erosional effects during construction; however, these would be minor, adverse, direct, localized, short-term, and contained with erosional controls. Paving and storm water infrastructure to minimize runoff influence would minimize the erosional effects during operations in the long term.

Furthermore, the proposed Project would not significantly alter existing topography and soil characteristics at the proposed Project site. The Construction Alternative and associated structures would conform to seismic standards of the Uniform Building Code.

4.8.3 No-Action Alternative

There would be no new construction or changes to operations under the No-Action Alternative. As such, there would be no adverse direct or indirect erosional effects or impact on the topography, soils, or geologic conditions.

4.8.4 Cumulative Effects

There would be no Project impacts to geologic resources resulting from the Lease Alternative and, therefore, no potential for cumulative effect when added to other past, present, or reasonably foreseeable future actions in the area. There would be a potential for minor adverse impact to topography and erosional effects resulting during the construction phase of the proposed Construction Alternative. As previously discussed, the landscape of Pukalani is characterized as mountainous with rolling hills (Hawai'i Tourism Authority 2015). Other past actions in this area have included grading and site preparation activities similar to those proposed under the Construction Alternative, which have altered the topography of the original Pukalani landscape. Likewise, these activities have resulted in erosion over time. The proposed activities would continue this type of degradation; however, with erosional controls like those proposed under the Construction Alternative, the functionality of the landscape would be maintained. As such, cumulative impacts associated with the implementation of the Construction Alternative would be minor, adverse, direct and indirect, local, and, long-term.

4.9 AIR QUALITY

This analysis focuses on the impact, either beneficially or adversely, directly or indirectly, of either action Alternative and the No-Action Alternative on air quality. Cumulative effects are also evaluated that consider the potential effects of these Alternatives when added to other past, present, and reasonably foreseeable future activities within the same ROI.

Impacts are categorized by the level of intensity of impacts on air quality as major, moderate, minor, negligible, or no action. For this analysis, these terms are defined as follows:

- A major impact would result in a substantial change in air quality. Extensive mitigation measures to offset adverse impacts would be needed and their success could not be guaranteed.
- A moderate impact would result in a measurable and consequential change in air quality. Mitigation may be needed to offset adverse impacts and would be relatively simple to implement and likely to be successful.
- A minor impact would result in a detectable change in air quality, but the change would be small, localized, and of little consequence.

- A negligible impact would be so small that it would not be of any measurable or perceptible consequence.
- No impact means the proposed Project would not result in a change in air quality.

The duration of impacts is described as either short-term (would occur only during Project construction) or long-term (would continue into the operation of the facility).

4.9.1 Lease Alternative (Kīhei Property)

Because of the isolated nature of the Lease Alternative, which would consist primarily of an internal building renovation and addition on the structural facade, the main air quality concern would be emissions from the construction crew vehicles and equipment and, ultimately, from the increase of an average of 25 to 30 personal vehicles and a facility maximum of 35 vehicles daily during operations. Activities would be phased over an estimated 6- to 9-month construction period. Equipment would be staged onsite when used on consecutive days to minimize traffic and emissions associated with mobilization. There would be no generators or other external stationary emissions sources associated with the new facility. These contributing emissions would have no resulting change in the state's attainment status for all criteria pollutants and would be considered negligible to minor, adverse, direct, isolated and localized, and short-term.

4.9.2 Construction Alternative (Pukalani Property)

Construction activities such as vegetation removal, grading, and operation of construction equipment would have the potential to create localized emissions over a 12- to 15-month period. These activities would be phased, meaning emissions and other effects would be intermittent over this duration. Equipment would be staged onsite when used on consecutive days to minimize traffic and emissions associated with mobilization. Construction-related air emissions would be direct, adverse, and local; however, they would not change the attainment status of criteria pollutants for the state or local area. Still, measures would be taken to reduce the potential effects on air quality such as watering exposed soil, erecting dust screens, paving exposed areas, and revegetating areas not paved.

The main source of operational air emissions near the Pukalani property is from vehicle emissions. During proposed operations, up to 35 permanent

and visiting staff would use the facility daily in personal vehicles, with a more typical daily average of 25 to 30 staff. This would increase vehicle emissions from vehicle trips to and from the facility; however, these slight increases in emissions would have a minor, adverse, direct, local, and long-term effect on regional air quality.

4.9.3 No-Action Alternative

The No-Action Alternative would not require construction or changes in current operations. There would be no direct or indirect impacts on existing air quality conditions.

4.9.4 Cumulative Effects

Past and present cumulative activities have not degraded the air quality in the Project area. The potential for a cumulative effect on air quality, whether under the Lease Alternative or Construction Alternative, would result from future activities added to impacts associated with the proposed Alternatives. More specifically, impacts would include those from an activity occurring at the same time as either the construction or operation of the proposed Project in either location and in the same air basin in which contributing emissions could theoretically change the attainment status. Even if such impacts were to occur, however, because of the characteristic trade winds, pollutants in the air would quickly dissipate and it would be unlikely that any activity would potentially alter the attainment status within the air basin. As such, the cumulative effect would be both direct and indirect, regional, long-term, and would remain minor and adverse.

4.10 NOISE

This analysis focuses on the potential noise impacts, either beneficially or adversely, directly or indirectly, on either action Alternative and the No-Action Alternative. Cumulative effects are also evaluated that consider the potential effects of these Alternatives when added to other past, present, and reasonably foreseeable future activities within the same ROI.

The intensity of impacts is categorized as major, moderate, minor, negligible, or no action, as defined below.

- A major impact would substantially change noise conditions. Mitigation measures could be implemented to offset these changes; however, success is not guaranteed.

- A moderate impact would result in substantial changes to noise conditions. Mitigation measures could be implemented to offset these changes and success could be measured.
- A minor impact would result in changes in noise conditions that would be local and of small consequence. No mitigation would be necessary to offset changes.
- A negligible impact would result in minimal changes in noise levels.
- No impact means the proposed Project would have no noise-generating activities and no change in noise levels.

The duration of impacts is described as either short-term (would occur only during Project construction) or long-term (would continue into the operation of the facility).

4.10.1 Lease Alternative (Kīhei Property)

Noise levels surrounding the Kīhei property are characteristic of small industrial, commercial, and high-tech businesses. Proposed operations under the Lease Alternative would not affect current noise levels, but would be similar in nature to existing surrounding properties.

Construction activities, however, could introduce new noise sources as a result of building renovations. This would occur over a 9- to 12-month period during daytime hours only. NSF would comply with regulations established in Hawai‘i Administrative Rules Chapters 11-43, Community Noise Control, to reduce the potential for disturbances to the nearby residential properties. Impacts associated with construction under the Lease Alternative would be considered minor, adverse, direct, local, and short-term.

4.10.2 Construction Alternative (Pukalani Property)

Construction activities associated with the Construction Alternative, such as the operation of backhoes, heavy trucks, and other equipment, would likely result in short-term increases in noise levels. These activities, however, would be phased over the 12- to 15-month construction period, meaning that heightened noise levels would be intermittent and only during shorter periods of this duration. These activities would be consistent with recent and ongoing construction in the area. Noise levels from construction activities would comply with the limits established in the County of Maui General Plan and NSF would comply with regulations established in Hawai‘i Administrative Rules Chapters 11-43, Community

Noise Control. Additionally, appropriate construction permits, which would include work time limits and noise restrictions, would be obtained prior to construction. The noise impact associated with the construction activities under the Construction Alternative would, therefore, be considered minor, adverse, direct, local, and short-term.

During operations, noise levels would be expected to return to pre-construction conditions and would be consistent with operations of the adjacent UH IfA facility, which has a similar business practice. Operational impacts would comply with the local noise ordinance. There would be no noticeable noise impact associated with the operations of the Construction Alternative.

4.10.3 No-Action Alternative

No construction or changes in operations would be proposed under the No-Action Alternative; therefore, there would be no changes to current noise levels in the vicinity of the property and no direct or indirect adverse impacts on noise.

4.10.4 Cumulative Effects

Noise levels during operation under either the Lease or Construction Alternative would have no impact on current noise levels and therefore would have no potential for cumulative effect.

During build-out or construction activities, however, noise levels would be elevated for an estimated 9 to 12 months under the Lease Alternative and an estimated 12 to 15 months under the Construction Alternative. Other construction proposed in each Alternative area could contribute cumulatively to noise levels. Noise levels are not additive by decibel. In other words, if one activity results in a 50-decibel noise level and another is 40 decibels, the resulting noise level is only 50 decibels. The area of effect is, however, extended to cover the both activities. The buffer area for noise dissipation is similarly extended and based on the highest decibel level.

The primary sources of noise around the Lease Alternative site would be development proposed in the area and traffic. The proposed build-out activities would contribute to these noise impacts for a short period, resulting in a minor, adverse, direct, and indirect, local, and short-term cumulative impact.

The primary source of noise around the Construction Alternative site would be construction associated with the neighboring housing development, traffic, and wind. The proposed construction would contribute to these noise impacts for a short period, resulting in a minor, adverse, direct, and indirect, local, and short-term cumulative impact.

4.11 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

This analysis focuses on the potential impacts, either beneficially or adversely, directly or indirectly, on either action Alternative and the No-Action Alternative with regard to demographics, the economy, population, housing, minority or low income populations, or children. Cumulative effects are also evaluated that consider the potential effects of these Alternatives when added to other past, present, and reasonably foreseeable future activities within the same ROI.

The intensity of impacts is categorized as major, moderate, minor, negligible, or no action, as defined below.

- A major impact would result in housing displacement or a substantial change in the local economy, housing demand, or population or effects on the safety of children. Mitigation measures could be implemented to offset these changes; however, success would not be guaranteed.
- A moderate impact would result in substantial changes to these stated socioeconomic conditions, burden to minority or low income populations, or effects on the safety of children. Mitigation measures could be implemented to offset these changes and success could be measured.
- A minor impact would result in changes to socioeconomic conditions or effects on minority or low income populations, or the safety of children that would be local and of small consequence. No mitigation would be necessary to offset these effects.
- A negligible impact would result in minimal changes in socioeconomic conditions or effects on minority or low income populations or the safety of children.
- No impact means that the proposed Project would have no effect on local populations, the economy, or the safety of children.

The duration of impacts is described as either short-term (would occur only during Project construction) or long-term (would continue into the operation of the facility).

4.11.1 Lease Alternative (Kīhei Property)

Up to 35 permanent and visiting staff, and a more typical average of 25 to 30 staff, would use the facility daily. Other staff would be short-term visitors or staff from other facilities in the area. As such, the proposed operations of the facility would not require new or displace existing housing. Construction and operations at the Lease Alternative location would not negatively impact the economy in Maui, but would have the potential to advance opportunities related to scientific research and discovery. Renovation of the existing facility would further provide a short-term opportunity for construction crews. Proposed studies and operations at the facility would not impact economic growth related specifically to tourism or agriculture.

Proposed renovation activities at the Kīhei property would result in temporary increases in traffic along roadways shared by the local schools and could contribute additional particulate emissions and noise in the local area. These emissions would, however, dissipate before reaching schools. Proposed operations under the Lease Alternative would be characteristic of an office building and would have no impact on the children enrolled in Kīhei Elementary School and Lokelani Intermediate School. These operations would be consistent with neighboring businesses.

There would be no direct or indirect impacts on population, housing, or the local economy as a result of construction or operations under the Lease Alternative. There would be no disproportionate effects on low-income populations, minorities, or children as a result of these activities.

4.11.2 Construction Alternative (Pukalani Property)

The socioeconomic and environmental justice analysis for the Construction Alternative would be largely the same as that discussed for the Lease Alternative. The short-term increase in jobs associated with proposed construction activities would be proportionally higher under the Construction Alternative, as a result of the full construction and slightly longer construction duration. This would likely result in a short-term, beneficial impact on the local economy. Also, like the Lease Alternative, construction crews and operational staff would use Aʻapueo Parkway, which is also used for local schools. To avoid impacts on child safety, mobilization of heavy equipment or trucks would be scheduled outside of the school start and ending times. Otherwise, impacts would be largely the same, resulting in no direct or indirect impacts to population, housing, or the local economy as a result of construction or operations under the

Construction Alternative and no disproportionate effects on low-income populations, minorities, or children as a result of these activities.

4.11.3 No-Action Alternative

The No-Action Alternative would not require construction or changes to current operations; therefore, this Alternative would have no adverse direct or indirect impacts on socioeconomics or environmental justice concerns in the region.

4.11.4 Cumulative Effects

Because there would be no potential for impacts under either the Lease or Construction Alternative during construction or operations, by definition there would be no potential for cumulative effect on socioeconomic conditions or disproportionate cumulative effects on minority or low-income populations or children.

5.0 OTHER REQUIRED ANALYSES

In addition to the analyses discussed in Section 3.0, Environmental Resource Analysis, NEPA requires additional evaluation of the proposed Project's impacts on the relationship between local short-term uses of the environment and long-term productivity, irreversible or irretrievable commitment of resources, and unavoidable adverse impacts (40 CFR 1502.16).

5.1 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

Impacts associated with the proposed Project, whether at the Kīhei property or the Pukalani property, would primarily be associated with the construction phase. Once operational, both locations would function similarly to the adjacent properties and businesses. Traffic, noise, and other impacts associated with the daily staffing and visitors would not create measurable impacts. These operations would, however, facilitate long-term productivity in scientific research and education and additional recognition of the Hawai'i scientific community in the field of astronomy.

Impacts from construction activities would primarily occur from traffic, air emissions, and noise associated with construction equipment. Impacts identified under the Construction Alternative would be proportionally higher than those under the Lease Alternative relevant to the level of construction of a new facility and the additional time involved. The roads used to access each site would be the same used for local schools and residences; however, the number of trucks and vehicles would not be expected to add congestion. To minimize this impact, material and equipment deliveries would be scheduled around school drop-off and pickup hours and equipment used on consecutive days would remain staged onsite to minimize the traffic impact and avoid safety hazards. Potential impacts on biological and cultural resources, particularly at the Pukalani property, were identified; however, no sensitive or vulnerable resources were found within the proposed construction footprint.

Although any construction activity has the potential to use and impact sensitive environmental resources, no short-term use or impact was identified that would preclude the long-term value or productivity of that resource.

5.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

NEPA requires consideration of how the proposed Project might commit non-renewable resources to uses that would not be irreversible or irretrievable to future generations. This analysis considers the potential commitments of both action Alternatives. Other than the use of petroleum, oils, and fuels by equipment and vehicles, there would be no other irreversible or irretrievable commitment of resources associated with either the Lease Alternative or the Construction Alternative.

5.3 UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts include both short- and long-term impacts. No major unavoidable adverse impacts were identified as a result of the Lease Alternative or the Construction Alternative. Although short-term impacts associated with traffic flow and air emissions were identified, these could be minimized or potentially eliminated through scheduling or imposition of mitigation measures.

5.4 AGENCY CONSULTATION AND PUBLIC INVOLVEMENT

A literature review and archaeological inventory survey was completed at the Pukalani property on October 19, 2015. This survey was finalized, incorporated into this EA, and submitted to the State Historic Preservation Office, which then responded on December 24, 2015 with a concurrence of No Effect and a recommendation of no further work required pursuant to Section 106 of the National Historic Preservation Act. This letter is included in Appendix D.

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7.0 LIST OF PREPARERS

The preparers of this Environmental Assessment for the proposed Remote Office Building to Support the Daniel K. Inouye Solar Telescope are summarized on Table 7-1.

Table 7-1 List of Preparers

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Appendix A

Comparison of Preliminary Alternatives

Table A-1 Comparison of Preliminary Alternatives

Candidate Site	Type of Facility	Lease/ Construction	Available Space	Available for Functional Build-out?	Location Conducive for Daily Functions	Data Lines Conducive to Support Large Data Transfers	Adequate Parking	Distance from Haleakalā Summit	Long-Term Lease/ Purchase Option?	Acceptable Lease/ Purchase Terms	Alternative Carried Forward	Justification
DKIST Observatory	Observatory	Own/ Construct	No	No	No	N/A	No	0 mi	N/A	N/A	No	No land available for new construction and the existing facility would not support the required staff. Furthermore, the location is not conducive for daily function and accessibility is an issue for broad staff.
8 Kiopaʻa Street, Pukalani (Current DKIST Office)	Office Park	Lease	3,500 sf	No	Yes	No	No	~22 mi	3-5-year lease term	No	**Yes**	**Carried forward as No-Action Alternative** Does not meet space, build-out, or lease stability requirements to meet action Alternative criteria. Facility does not include sufficient data line support and cost to install would be insurmountable.
33 Lono Avenue, Kahului	Commercial Office Building – use of three separate upper floor spaces	Lease/ Build-out	~12,000 sf	Yes	Yes	No	Yes	~35 mi	Indefinitely	No	No	Standard commercial office space, non-contiguous square footage, no loading dock, no reinforced floors for lab space. Lease terms unacceptable for purposes of Project. Facility does not include sufficient data line support and cost to install would be insurmountable. Overall space not conducive for proposed function.
427 Ala Makani Street, Kahului	Maui Business Office Park	Lease/ Build-out	8,362 sf (max)	Yes	Yes	No	Yes	~35 mi	Indefinitely	Yes	No	Does not meet space requirement. Facility does not include sufficient data line support and cost to install would be insurmountable.
535 Lipoa Parkway, Kīhei	Maui Research and Technology Park	Lease/ Build-out	12,200 sf	Yes	Yes	Yes	Yes	~45 mi	Indefinitely	Yes	**Yes**	**Meets all criteria to meet the proposed Project purpose and need.** **Best lease option Alternative.**
270 Dairy Road, Kahului	Shopping complex	Lease/ Build-out	~12,000 sf	Yes	Yes	No	Yes	~35 mi	5-year lease term	Yes	No	Less than ideal location (shopping complex) and lease negotiations would be required every 5 years. Facility does not include sufficient data line support and cost to install would be insurmountable. Parking is adequate but could be problematic.
215 S. Wakea Avenue, Kahului	Business Park	Lease/ Build-out	~12,000 sf	Yes	Yes	No	Yes	~35 mi	No	Yes	No	Facility does not include sufficient data line support and cost to install would be insurmountable.
Maui Business Park, Kahului	New build within area zoned for commercial businesses *Build to own*	Purchase/ Construct	Lot only; sufficient space	Yes	Yes	Yes	Yes	~37 mi	Purchase (Permanent)	Yes	No	Although initially appearing to be reasonable, this Alternative was not considered further. The surrounding retail setting of the location is less than ideal for siting industrial/scientific operations because of the unpredictable traffic, noise, and accessibility during certain periods of the year.

Table A-1 Continued on Next Page

Table A-1 Comparison of Preliminary Alternatives (Continued)

Candidate Site	Type of Facility	Lease/ Construction	Available Space	Available for Functional Build-out?	Location Conducive for Daily Functions	Data Lines Conducive to Support Large Data Transfers	Adequate Parking	Distance from Haleakalā Summit	Long-Term Lease/ Purchase Option?	Acceptable Lease/ Purchase Terms	Alternative Carried Forward	Justification
Maui Lani Village, Wailuku	**Two Locations** New build within area zoned for commercial businesses *3 Options*: • *Build to own* • *Lease to own (over 10 years)* *Developer financed*	Purchase/ Construct	Lot only; sufficient space	Yes	Yes	Yes, for the new construction option	Yes	~37 mi	Purchase (Permanent)	Yes	No	Although initially appearing to be reasonable, this Alternative was not considered further. The surrounding retail setting of the location is less than ideal for siting industrial/scientific operations because of the unpredictable traffic, noise, and accessibility during certain periods of the year.
Lot 17, Kulamalu Property, Pukalani	Business Park; Adjacent to UH IfA Facility	Purchase/ Construct	Lot only; sufficient space	Yes	Yes	Yes	Yes	~22 mi.	Purchase (Permanent)	Yes	**Yes**	**Meets all criteria to meet the proposed Project purpose and need.** **Best construction option Alternative.**

Appendix B

Botanical and Faunal Survey, October 2015

BOTANICAL AND FAUNAL SURVEY

PROPOSED REMOTE OPERATIONS BUILDING
DANIEL K. INOUYE SOLAR TELESCOPE

PUKALANI, MAUI

Prepared By:
FOREST & KIM STARR
STARR ENVIRONMENTAL

Prepared For:
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OCTOBER 2015

BOTANICAL AND FAUNAL SURVEY
PROPOSED REMOTE OPERATIONS BUILDING
DANIEL K. INOUYE SOLAR TELESCOPE
PUKALANI, MAUI

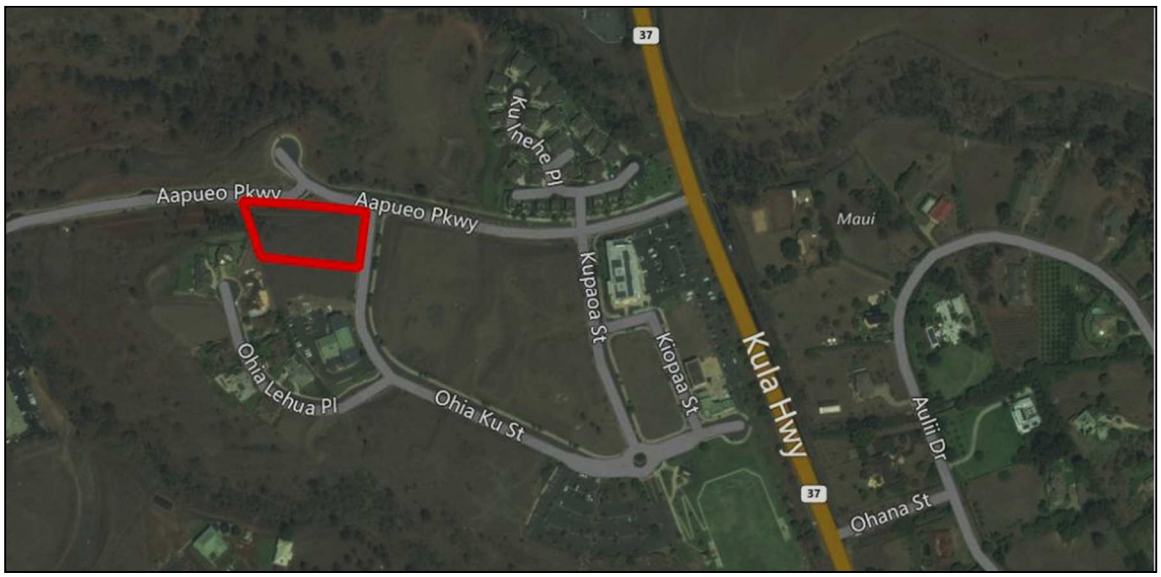
INTRODUCTION

The National Science Foundation is proposing to build a Remote Operations Building on the island of Maui, to support the Daniel K. Inouye Solar Telescope (DKIST) facility. The proposed Remote Operations Building would provide offices and work areas for scientists and researchers, non-site operations personnel, and administrative staff not required to work at the summit on a daily basis, as well as an instrument laboratory, electronics laboratory, machine shop, parking area, and loading dock.

The Proposed Remote Operations Building site lies on 1.4 acres in Pukalani, Maui (TMK 223066017). The project area is located within the Kulamalu Commerical Subdivision. It is bound by Ohia Ku Street to the east, Aapueo Parkway to the north, Kulamalu Hilltop residential community to the west, and the existing University of Hawaii Institute for Astronomy facility (IfA) to the south. This study was initiated to gather information about the flora and fauna of the proposed project area.

SITE DESCRIPTION

The project area is situated on highly disturbed land that was graded and filled before IfA was constructed in 2005. The bulk of the site is relatively flat, with steep graded slopes on the east and north sides. The vegetation is reminiscent of an abandoned pasture, with a mixture of non-native tree, shrub, grass, and vine species commonly found in the area. The project elevation is approximately 1,750 ft. feet above sea level. Annual rainfall averages 36 inches. Annual air temperature averages 68 degrees Fahrenheit.



Project site, Kulamalu Commercial Subdivision, Pukalani, Maui.

BIOLOGICAL HISTORY

The original vegetation on the site would have been a diverse dryland native forest. The dominant tree likely would have been wiliwili (*Erythrina sandwicense*) with understory shrubs of mao hau hele (*Hibiscus branckenridgei*), kooloaula (*Abutilon menziesii*), and ilima (*Sida fallax*). Native grasses, such as *Panicum* spp., were also likely present.

After the arrival of humans, a series of events, including fire, agriculture, and introduced plants, animals, and diseases transformed the area to predominantly non-native vegetation. Major uses of the land on and near the site included cattle grazing and pineapple cultivation. The entire site has been disturbed by grading and fill during initial development of the Kulamalu Commercial Subdivision.

Today there are still some remnant native plants in nearby gulches, but the vegetation on the survey site is composed of common weedy trees, shrubs, grasses, and vines.

SURVEY OBJECTIVES

The objectives of the survey were to:

- Document what plant and animal species occur on the site or may likely occur in the existing habitat.

- Document the status and abundance of each species.

- Determine the presence or likely occurrence of any native flora and fauna, particularly any that are federally listed as Threatened or Endangered. If such occur, our objective was to identify what features of the habitat may be essential for these species.

- Determine if the proposed project area contains any special habitats which if lost or altered might result in a significant negative impact on the flora and fauna in this part of the island.

BOTANICAL SURVEY

SURVEY METHODS

A walk-through botanical survey method was used following a route to ensure coverage of different habitat types. Notes were made on plant species, distribution and abundance. Extra emphasis was placed on areas with high diversity and areas where management was most feasible and likely. The site was surveyed on October 19 & 20, 2015.

Taking notes on vegetation. The site is dominated by the non-native vine glycine (*Neonotonia wightii*).

DESCRIPTION OF VEGETATION

The vegetation on the site is entirely non-native, with the exception of a single planted kou tree (*Cordia sebestena*). The relatively flat open areas that make up the bulk of the site are an open grassland of numerous non-native grasses and vines. The steeper parts of the site are being colonized by non-native shrubs and trees commonly found in the area.

The site is currently dominated by glycine (*Neonotonia wightii*), an aggressive vine introduced for erosion control and cattle forage. Normally dormant in dry years, the abundant moisture from the strong El Nino during the summer and fall of 2015 has resulted in lush growth of the glycine vines, which are able to climb over the grass and shrubs on the site.

The dominant grass on the site is Guinea grass (*Megathyrsus maximus*). Scattered patches of Rhodes grass (*Chloris gayana*), buffel grass (*Cenchrus ciliaris*) and Natal red top (*Melinis repens*) are also present.

Herbaceous plants were not common on the site given the dominance of glycine. The few that were able to find a spot to grow include partridge pea (*Chamaecrista nictitans*), Spanish needle (*Bidens pilosa*), apple of Peru (*Nicandra physalodes*), yellow sow thistle (*Sonchus oleraceus*), and balloon plant (*Asclepias physocarpa*).

A few shrubs exist on the site, mostly on the margins of the property, though they are also currently smothered by glycine. The most common shrubs on the site are castor bean (*Ricinus communis*), haole koa (*Leucaena leucocephala*), hairy abutilon (*Abutilon grandifolium*), klu (*Acacia farnesiana*), and indigo (*Indigofera suffruticosa*).

Red river gum (*Eucalyptus camaldulensis*) is the tallest and most abundant of the trees found on the site. Other non-native trees on the site are black wattle (*Acacia mearnsii*), silky oak (*Grevillea robusta*), and Christmas berry (*Schinus terebinthifolius*). The only native plant observed on the site is a kou tree (*Cordia subcordata*) that appears planted.

Typical vegetation on site, a mix of locally common non-native plants.

DISCUSSION AND RECOMMENDATIONS

The entire project area has been heavily impacted by previous human disturbances and is currently dominated by hardy non-native plants. The one native plant species found on the site appears planted, is common throughout Hawaii and elsewhere, and is of no special conservation concern. No special native plant habitats occur on the project site. The proposed project is not expected to have a significant negative impact on the botanical resources in this part of Maui.

PLANT SPECIES LIST

Following is a checklist of all those vascular plant species inventoried during the field studies. Taxonomy and nomenclature of the flowering plants are in accordance with Wagner et al. (1999).

For each species, the following information is provided:

- Scientific name
- Common English or Hawaiian name.
- Bio-geographical status. The following symbols are used:
    - Endemic = Native only to the Hawaiian Islands; not naturally occurring anywhere else in the world.
    - Indigenous = Native to the Hawaiian Islands and also to one or more other geographic area(s).
    - Non-native = All those plants brought to the islands intentionally or accidentally after western contact.
- Abundance of each species within the project area:
    - Dominant = Forming a major part of the vegetation within the project area.
    - Common = Widely scattered throughout the area or locally abundant within a portion of it.
    - Occasional = Scattered sparsely throughout the area or occurring in a few small patches.
    - Rare = Only a few isolated individuals within the project area.

PLANT SPECIES LIST

Scientific names	Common names	Status	Abundance
Abutilon grandifolium	Hairy abutilon	Non-native	Rare
Acacia farnesiana	Klu	Non-native	Occasional
Acacia mearnsii	Wattle	Non-native	Occasional
Asclepias physocarpa	Balloon plant	Non-native	Rare
Bidens pilosa	Beggars tick	Non-native	Rare
Cenchrus ciliaris	Buffel grass	Non-native	Occasional
Chamaecrista nictitans	Partridge pea	Non-native	Common
Chloris gayana	Rhodes grass	Non-native	Occasional
Conyza bonariensis	Hairy horse weed	Non-native	Rare
Cordia subcordata	Kou	Indigenous	Occasional
Crotalaria pallida	Smooth rattle pod	Non-native	Rare
Desmodium sp.	Desmodium	Non-native	Rare
Eucalyptus camaldulensis	River redgum	Non-native	Occasional
Euphorbia hirta	Hairy spurge	Non-native	Rare
Grevillea robusta	Silky oak	Non-native	Occasional
Indigofera spicata	Creeping indigo	Non-native	Rare
Indigofera suffruticosa	Upright indigo	Non-native	Common
Leucaena leucocephala	Haole koa	Non-native	Occasional
Macroptilium atropurpureum	Macroptilium	Non-native	Occasional
Malva neglecta	Cheese weed	Non-native	Rare
Megathyrsus maximus	Guinea grass	Non-native	Dominant
Melinis repens	Natal red top	Non-native	Dominant
Neonotonia wightii	Glycine	Non-native	Occasional
Nicandra physalodes	Apple of Peru	Non-native	Rare
Opuntia ficus-indica	Panini	Non-native	Rare
Oxalis corniculata	Yellow wood sorrel	Non-native	Occasional
Ricinus communis	Castor bean	Non-native	Rare
Schinus terebinthifolius	Christmas berry	Non-native	Occasional
Sida cordifolia	Mallow plant	Non-native	Rare
Sonchus oleraceus	Yellow sow thistle	Non-native	Rare

FAUNAL SURVEY

SURVEY METHODS

A walk-through survey method was conducted in conjunction with the botanical survey. Field observations were made with the aid of binoculars and by listening to vocalizations. Notes were made on species, abundance, activities and location as well as observations of trails, tracks, scat and signs of feeding.

Conspicuous insects were noted. A sweep net was used to help with identification of insects that were difficult to view closely.

A Listed species known to occur in the general area is the Hawaiian Hoary Bat (*Lasiurus cinereus semotus*). An evening visit was made to record crepuscular activities and vocalizations and to look for presence of Hawaiian Hoary Bats. Along with visually scanning the sky for bats, active and passive ultrasonic bat detectors were used. The site was surveyed on October 19 & 20, 2015.

Surveying for bats at sunset, using both visual searches and ultrasonic bat detectors. No bats were observed or detected. A barn owl (*Tyto alba*) was heard screeching while hunting at night.

BATS

Bats are present in the general area, and are regularly observed foraging for insects at lights at nearby King Kekaulike High School. However, during the night survey of the subject property, no bats were observed, and no ultrasonic bat calls were detected.

Hawaiian hoary bats roost in tall trees in sheltered areas, such as on the branch tips of mature *Eucalyptus* trees. The bats give birth to and raise their young in the summer.

Though the preferred roosting locations for bats in the area are likely in nearby gulches, there are a few trees on the property that bats could potentially roost in. Avoiding cutting trees greater than 15 feet tall during the summer months will help minimize potential impact to young bats that have not yet learned to fly.

NON-NATIVE MAMMALS

No non-native mammals were observed on the site. Dogs (*Canis familiaris*) were heard barking from nearby residential housing.

Other non-native mammals likely to utilize this property, but which were not observed or heard include axis deer (*Axis axis*), mongoose (*Herpestes javanicus*), rats (*Rattus* spp.), mice (*Mus domesticus*), and cats (*Felis domesticus*).

BIRDS

Other than two Pacific golden-plovers (*Pluvialis fulva*) that flew over the site, the few birds observed were all common non-native species. Interestingly, the site has relatively few birds, perhaps due to the profusion of the glycine vine which isn't preferred habitat for many bird species.

Non-native bird species at the site included chestnut munia (*Lonchura atricapilla*), Japanese white-eye (*Zosterops japonicus*), and house finches (*Carpodacus mexicanus*). A flock of 35 rock pigeons (*Columba livia*) flew over the site. At night, a screeching barn owl (*Tyto alba*) was heard hunting nearby.

Nene (*Branta sandvicensis*) were not observed utilizing the site, but are known from the general area. If nene breeding is found to be occurring on the site, the Department of Land and Natural Resources (DLNR) should be contacted to determine appropriate actions. Generally, this involves minimizing activity around the nesting site until the eggs hatch and the nene are mobile enough to be relocated or leave on their own.

Hawaiian Petrels (*Pterodroma sandwichensis*) and other seabirds raise their young in Haleakala National Park and other upland sites of East Maui. After feeding at sea during the day, the birds fly up to the mountain burrows at night, using the moon, stars, and land features for navigation. Bright lights can disorient the birds. Using downward facing lights will help minimize distractions to these night flying birds.

INSECTS

A complete inventory of the insects on this site was beyond the scope of this survey. Conspicuous insects were noted and special effort was made to look for native insects of conservation concern.

The only native insect observed on the site was the indigenous green darner dragonfly (*Anax junius*), which was flying around hawking insects. More intensive surveys would undoubtedly turn up many more cryptic native species, though it is unlikely any would be of conservation concern.

Some of the more conspicuous non-native insects on the site were butterflies. Commonly seen flitting about the area were the monarch butterfly (*Danaus plexippus*), bean butterfly (*Lampides boeticus*), sleepy orange (*Abaeis nicippe*), and lesser grass blue (*Zizina otis*).

Spiders and crickets were the dominant insects found among the large expanse of glycine (*Neonotonia wightii*) and Guinea grass (*Megathyrsus maximus*). Also common in the low growing vegetation were numerous lady-bird beetles (Coccinellidae).

A few paper wasp (*Polistes olivaceus*) were observed nesting in the wattle trees (*Acacia mearnsii*). Honey bees (*Apis mellifera*) were observed visiting flowers of many species.

No tree tobacco (*Nicotiana glauca*) plants were observed on the site. The only solanaceous plant encountered, apple of Peru (*Nicandra physalodes*), was checked for signs of Blackburn's sphinx moth (*Manduca blackburni*) eggs, larvae, frass, or damage. No signs of this endangered moth were observed.

Looking for insects, using visual searches and a sweep net. These river redgum (*Eucalyptus camaldulensis*) had redgum lerp psyllids (*Glycaspis brimblecombei*), a recent arrival to Hawaii.

DISCUSSION & RECOMMENDATIONS

Virtually all the animals observed on the site are non-native and of no special conservation concern. The only native birds observed were two Pacific golden-plovers that flew over the site, which is currently too vegetated for them to utilize. The lone native insect species observed, green darner dragonfly, hunts for insects on the site and will continue to be able to do so. No bats were detected. No signs of the Blackburn's sphinx moth or tree tobacco were observed on the site.

By contacting DLNR if nene are thought to be nesting on the site, not cutting large trees during summer months while bats are pupping, and using downward facing lights so as to not disorient night flying native seabirds, the impacts from the proposed project appear negligible and are not expected to have a significant negative impact on the faunal resources in this part of Maui.

ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. For each species the following information is provided:

- Common name
- Scientific name
- Bio-geographical status. The following symbols are used:
    - Endemic = Native only to Hawaii; not naturally occurring anywhere else in the world.
    - Indigenous = Native to the Hawaiian Islands and also to one or more other geographic area(s).
    - Non-native = All those animals brought to Hawaii intentionally or accidentally after western contact.
    - Migratory = Spending a portion of the year in Hawaii and a portion elsewhere.
- Abundance of each species within the project area:
    - Abundant = Many flocks or individuals seen throughout area at all times of day.
    - Common = A few flocks or well scattered individuals throughout the area.
    - Uncommon = Only one flock or several individuals seen within the project area.
    - Rare = only one or two seen within the project area.

ANIMAL SPECIES LIST

Scientific names	Common names	Status	Abundance
Birds			
Carpodacus mexicanus	House Finch	Non-native	Occasional
Columba livia	Rock Pigeon	Non-native	Occasional
Lonchura atricapilla	Chestnut Munia	Non-native	Occasional
Passer domesticus	House Sparrow	Non-native	Occasional
Pluvialis fulva	Pacific Golden Plover	Indigenous	Occasional
Tyto alba	Barn Owl	Non-native	Rare
Zosterops japonicus	Japanese White-eye	Non-native	Occasional
Insects			
Abaeis nicippe	Sleepy orange butterfly	Non-native	Occasional
Adoretus sinicus	Chinese rose weevil	Non-native	Occasional
Anax junius	Green darner dragonfly	Indigenous	Occasional
Apis melifera	Honey bee	Non-native	Common
Argiope appensa	Garden spider	Non-native	Common
Blattella germanica	German cockroach	Non-native	Occasional
Cheiracanthium sp.	Yellow sac spider	Non-native	Dominant
Coccinella spp.	Lady-bird Beetles	Non-native	Common
Danaus plexippus	Monarch butterfly	Non-native	Common
Enallagma civile	Familiar bluet	Non-native	Rare
Glycaspis brimblecombei	Redgum lerp psyllid	Non-native	Occasional
Hierodula membranacea	Asian praying mantis	Non-native	Occasional
Hylephila phyleus	Fiery skipper	Non-native	Occasional
Lampides boeticus	Bean butterfly	Non-native	Common
Lema trilinea	Three-lined potato beetle	Non-native	Occasional
Macaria abydata	Haole koa looper moth	Non-native	Occasional
Musca sp.	House fly	Non-native	Occasional
Oxyopes sp.	Lynx spider	Non-native	Dominant
Pheidole megacephala	Big-headed ant	Non-native	Common
Pieris rapae	Cabbage worm	Non-native	Occasional
Polistes olivaceus	Paper wasp	Non-native	Common
Shistocerca nitens	Vagrant grasshopper	Non-native	Occasional
Spolodea recurvata	Hawaiian beet webworm	Non-native	Occasional
Tetramorium simillimum	Tetramorium ant	Non-native	Common
Unknown isopoda	Sow bugs	Non-native	Occasional
Zizina otis	Lesser grass blue butterfly	Non-native	Common

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Appendix C

Archaeological Assessment for Tax Map Key (2) 2-3-066:017, Pukalani, A‘apueo Ahupua‘a, Makawao District, Maui, Hawai‘i, December 2015

— Final —

Archaeological Assessment for Tax Map Key (2) 2-3-066:017, Pukalani, A‘apueo Ahupua‘a, Makawao District, Maui, Hawai‘i

Prepared by:

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Prepared for:

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Makawao, Hawaii 96768

INTERNATIONAL ARCHAEOLOGICAL RESEARCH INSTITUTE, INC.

DECEMBER 2015

— FINAL —

ARCHAEOLOGICAL ASSESSMENT FOR TAX MAP KEY (2) 2-3-066:017, PUKALANI, A‘APUEO AHUPUA‘A, MAKAWAO DISTRICT, MAUI, HAWAI‘I

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December 2015

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ABSTRACT

Under contract to KC Environmental, Inc., International Archaeological Research Institute, Inc., (IARII) completed an archaeological inventory survey of TMK (2) 2-3-066:017 for the proposed construction of a Remote Operations Building (ROB) in support of the Daniel K. Inouye Solar Telescope (DKIST) facility. No significant cultural deposits or features were encountered during the surface survey and subsurface testing. Several push piles composed of concrete, stone, wood, and late 20th century garbage, as well as recently installed utilities, were identified on the property, indicating that the project area's topography has been substantially modified from its original state. Grading and utility installation presumably occurred during the construction monitored by Pickett et al. (2003).

In accordance with HAR §13-284-7, the proposed Determination of Effect is "no historic properties affected." No archaeological mitigation is recommended. However, if significant cultural features or materials are encountered during construction activities, all work in the vicinity should stop and the State Historic Preservation Division (SHPD) should be notified.

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INTRODUCTION

Under contract to K.C. Environmental, Inc., International Archaeological Research Institute, Inc., (IARII) completed an archaeological inventory survey (AIS) of Tax Map Key (TMK) (2) 2-3-066:017, Pukalani, Aʻapueo Ahupuaʻa, Makawao District, Maui (Fig. 1). The 1.447-acre (0.585 hectares [ha]) project area is owned by the National Science Foundation, and is being proposed for the construction of the Remote Operations Building (ROB), which would be a support building to the Daniel K. Inouye Solar Telescope (DKIST) facility. The archaeological inventory survey was undertaken to identify surface and subsurface archaeological sites prior to the proposed construction of the ROB. The archaeological inventory survey fieldwork and reporting fulfill the requirements specified in Hawaiʻi Administrative Rules (HAR) §13-276. This report is designated as an archaeological assessment because of the lack of significant findings (per HAR §13-275-5[b][5][A]).

PROJECT LOCATION

The project is to the west of Kula Highway (State Highway 37) within the Kulamalu Town Center development, Pukalani, Makawao District, island of Maui (Figs. 2 and 3). The eastern boundary of the project area is ʻŌhiʻa Kū Street. The northern boundary is Aʻapueo Parkway and the intersection with a portion of the parkway that constitutes the Kamehameha Schools' Maui Campus driveway. The western portion of the property is bordered by the Kulamalu Hilltop development on ʻŌhiʻa Lehua Place and the Kamehameha Schools' Maui Campus. The Institute for Astronomy Advanced Research Technology Center is approximately 50 meters (m) to the south of the project area. Approximately 230 m to the east is the Longs Drugs at Kulamalu Town Center. The Kamehameha Schools' Maui Campus buildings are approximately 300 m to the west. To the north and south, beyond the bounding roads and Institute for Astronomy are branches of the Kaluapulani Gulch. The Pukalani Town Center and Pukalani Park are located approximately 2,000 m to the northwest. Kalialinui Gulch is approximately 740 m to the south.

PROJECT PERSONNEL AND DATES OF FIELDWORK

Timothy Rieth, M.A., was the Principal Investigator (PI) for this project and was responsible for overall management, providing direction and oversight, and ensuring research standards were maintained. Adam Lauer, M.A., was the Project Director (PD) and was responsible for completing the fieldwork and writing the report. The PD was assisted in the field by Field Technician Daniel Knecht, M.A. Fieldwork was completed on October 19, 2015.

DISPOSITION OF FIELD NOTES AND OTHER MATERIALS

Project field notes and electronic files are stored at the IARII Honolulu Office. The final disposition of these materials will be determined through consultation with the landowner and the State Historic Preservation Division (SHPD).

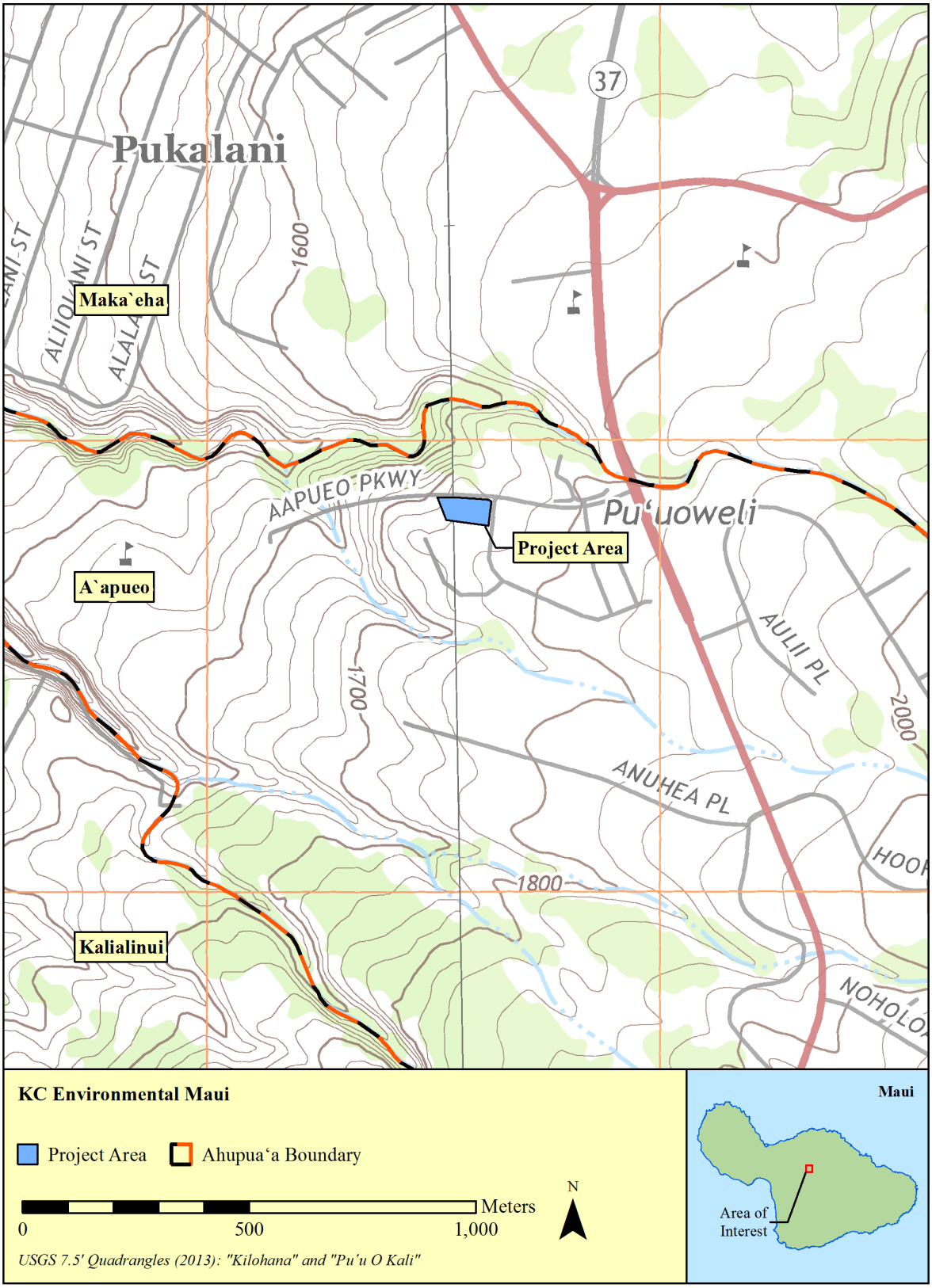

Figure 1. Location of the project area (base map is 1:24,000 USGS Kilohana and Pu'u O Kali quadrangle maps [2013]).

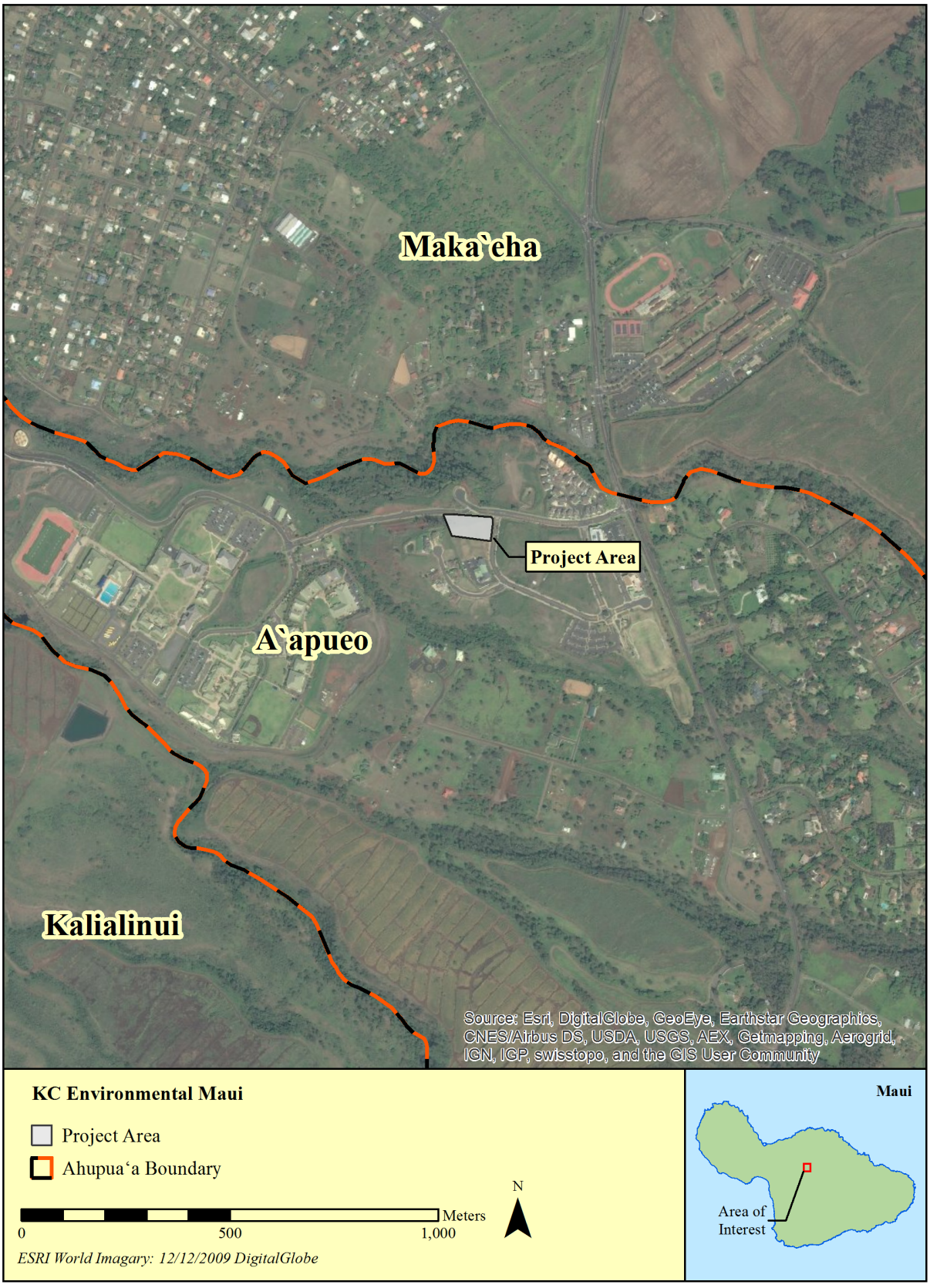

Figure 2. Detail of the project area with *ahupua'a* (traditional sub-district land units) boundaries.

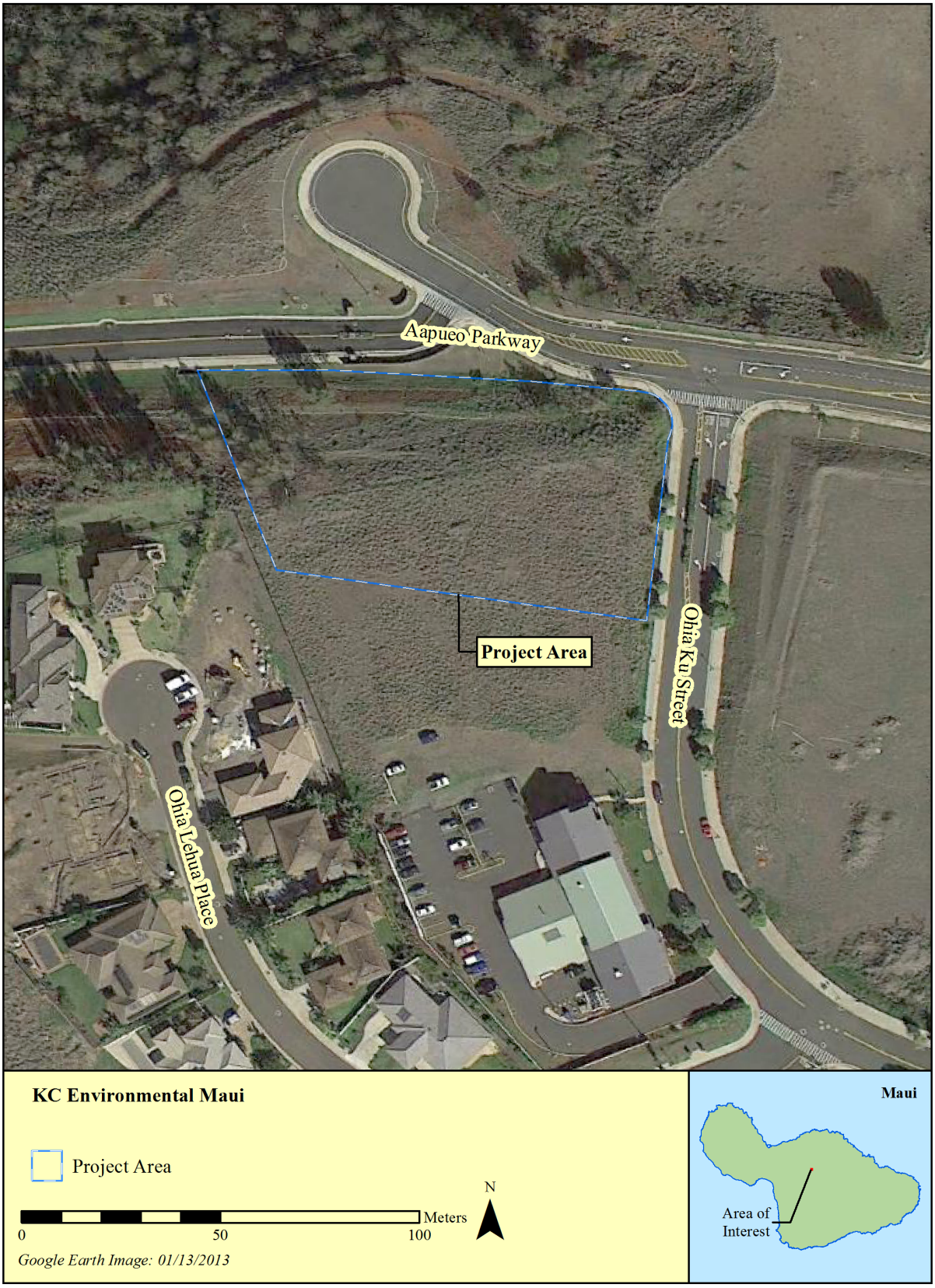

Figure 3. Project area overlaid on an orthophotograph (2013).

BACKGROUND

This section presents background environmental, historical, and archaeological information for the general area of the project parcel. Much of this text is excerpted, with some modification, from Duarte and Allen (2014:3-27).

PHYSICAL ENVIRONMENT

The island of Maui is the second largest (1,883 km^2) and second youngest island in the Hawaiian Islands. Its geographic location is central to the archipelago, with Molokaʻi to the west, Lānaʻi and Kahoʻolawe to the south, and Hawaiʻi Island to the east. Maui is composed of two degenerated shield volcanoes. The older volcano forms the West Maui Mountains, with the highest peak, Puʻu Kukuʻi, rising 1,764 m above sea level (m asl). The younger volcano is Haleakalā, which forms the eastern portion of the island, rising 3,056 m asl. Together these volcanoes create a dynamic ecological variation from the lava fields of Keonioʻiō, which cover much of the island between the two, continuing westward to the tropical forest of ʻIao Valley, which is cut into the rocks of the West Maui caldera (Macdonald et al. 1983:380-401). Maui's mountain systems create a rain shadow for the leeward (west) areas of the island, as well as for the neighboring islands of Kahoʻolawe and Lānaʻi. The effect of this widespread rain shadow has limited the development of perennial streams and rivers to the northeast sections of Hāna and Wailuku Districts.

The project area is located on the lower northwestern slopes of Haleakalā, on a plateau of the north fork of Kaluapulani Gulch (see Fig. 2: the gulch is visible as dense swaths of vegetation along the north, west, and south sides of the property). More generally the area is between the Kaluapulani and Kalialinui Gulches. The project-area terrain is relatively level, due to both previous cultivation and grading and construction work (Photos 1-4). Elevation in the project area is roughly 533 m asl. The area receives an annual rainfall of 93.41centimeters (cm), most of which falls between the months of November to April (Giambelluca et al. 2011, available, <http://rainfall.geography.hawaii.edu>, accessed November 2, 2015).

Photo 1. Project parcel overview. The project boundary can be seen where the low vegetation starts. View to the northeast.

Photo 2. Project parcel overview. Note leveled ground and mechanically constructed mounds to the north and west. Red car is on neighboring property. View to the west.

Photo 3. Kaluapulani Gulch (left of photo) beyond A‘apueo Parkway/Kamehameha Schools’ Maui Campus Driveway. Photo from the project area. View to the northwest.

Photo 4. Project parcel overview. Note the Institute for Astronomy and leveled parcels from Kulamalu Town Center development. Haleakalā is in the background. View to the south.

GEOLOGY AND SEDIMENTS

Land in the project area and across most of the northwestern slopes of Haleakalā is dominated by the Kula Volcanic series, composed predominantly of hawaiite with lesser amounts of alkalic olivine basalt and ankaramite (Macdonald et al. 1983:390).

SOILS

The project area is described by Foote et al. (1972:89-90) as covered by Keahua cobbly silty clay loam , sloping 15-25 percent, (KnaD) and Keahua cobbly silty clay, sloping 7-15%, (KnhC), both of which are well-drained soils that develop in material weathered from basic igneous rock (primarily basalt in the project area). Runoff is slow, and the erosion hazard is slight. These soils were primarily used for sugarcane, pasture, and wildlife habitat, as well as pineapple, truck crops, and homesites. The project area was formerly under pineapple cultivation and pasture (McPhatter and Rosendahl 1996).

VEGETATION

The project area is classified as alien grassland-vegetation (XG) (USGS GAP 2011). Vegetation is non-native weeds, low grasses, vines, and shrubs.

CULTURAL LAND USE: INFORMATION FROM PLACE NAMES AND HISTORY

The first discussion below concerns certain evidence for traditional land uses and environmental characteristics that are provided by Hawaiian place names. The second discussion considers the history of land use and ownership in the project parcels and more recent historical evidence concerning the project area.

TRADITIONAL HAWAIIAN PLACE NAMES

A‘apueo (alternatively spelled Ā‘āpueo or ‘A‘apueo), the name of the *ahupua‘a* (traditional sub-district land unit) where the current project area is located, is translated as “owl call” (Parker 1922:625). The *ahupua‘a* of A‘apueo climbs partially up the northwest slope of Haleakalā and is generally pastureland. A‘apueo may be named after a female from the upland of Kula (Sterling 1998:259). The alternative spelling ‘A‘apueo (Wong Smith 1996: B-6) can be translated as *‘a‘a*, a term for girdle or belt, made of feathers.

Makawao, the name of the current district, translates as “forest beginning” (Pukui et al. 1986:142). Prior to the creation of the modern districts, the *ahupua‘a* fell within either the Kula or Hāmākua Poko Districts (Fig. 4). Kula translates as “plain” (Pukui et al. 1986:123) while Hamakuapoko means “short Hāmākua” (Pukui et al. 1986:39).

HISTORICAL LAND UNITS

According to oral historical accounts (Beckwith 1976:383; Handy and Handy 1972:491; Kamakau 1993:152; also, Dixon et al. 2002), Maui was first officially divided into districts and smaller land units during the reign of Kaka‘alaneo. Based on 25- to 30-year generational counts, Kaka‘alaneo ruled Maui sometime between the 14th and early 16th centuries—sometime between ca. A.D. 1360 and 1538 (Fornander 1916-1920:6:313, 1996:71, 78 footnote, 107; Kolb 1991:66). Three related and more commonly cited dates may support the dating of Kaka‘alaneo’s reign to the early part of the suggested range—A.D. 1330 for the reign of his father, Kaulahea I, and A.D. 1360 for two contemporaries of Kaka‘alaneo, Ma‘ilikukai‘i of O‘ahu and Kauholanui-mahu of Hawai‘i Island.

Since the initial division of lands, Maui Island has been subdivided several additional times into districts and other land units above the *ahupua‘a* level, with boundary revisions and other major (and confusing) changes in the district arrangement. East Maui (Maui east of the isthmus), where the project area is located, seems to have been the area most affected by these changes.

Traditional Maui Land Units

At Mahele—the redistribution of Hawaiian lands that began in 1848 (Chinen 1958:16; Kame‘elehiwa 1992)—east Maui alone included nine districts (Sterling 1998:3, citing 1935 work by R. D. King). Clockwise from the northwest, the nine traditional districts of east Maui included Hāmākua Poko, Hāmākua Loa, Ko‘olau, Hāna, Kīpahulu, Kaupō, Kahikinui, Honua‘ula, and Kula. West Maui added two more, Lahaina and Kā‘anapali Districts. In the central isthmus, Waihe‘e, Waiehu, Wailuku, and Waikapu were *ahupua‘a* independent of any district.

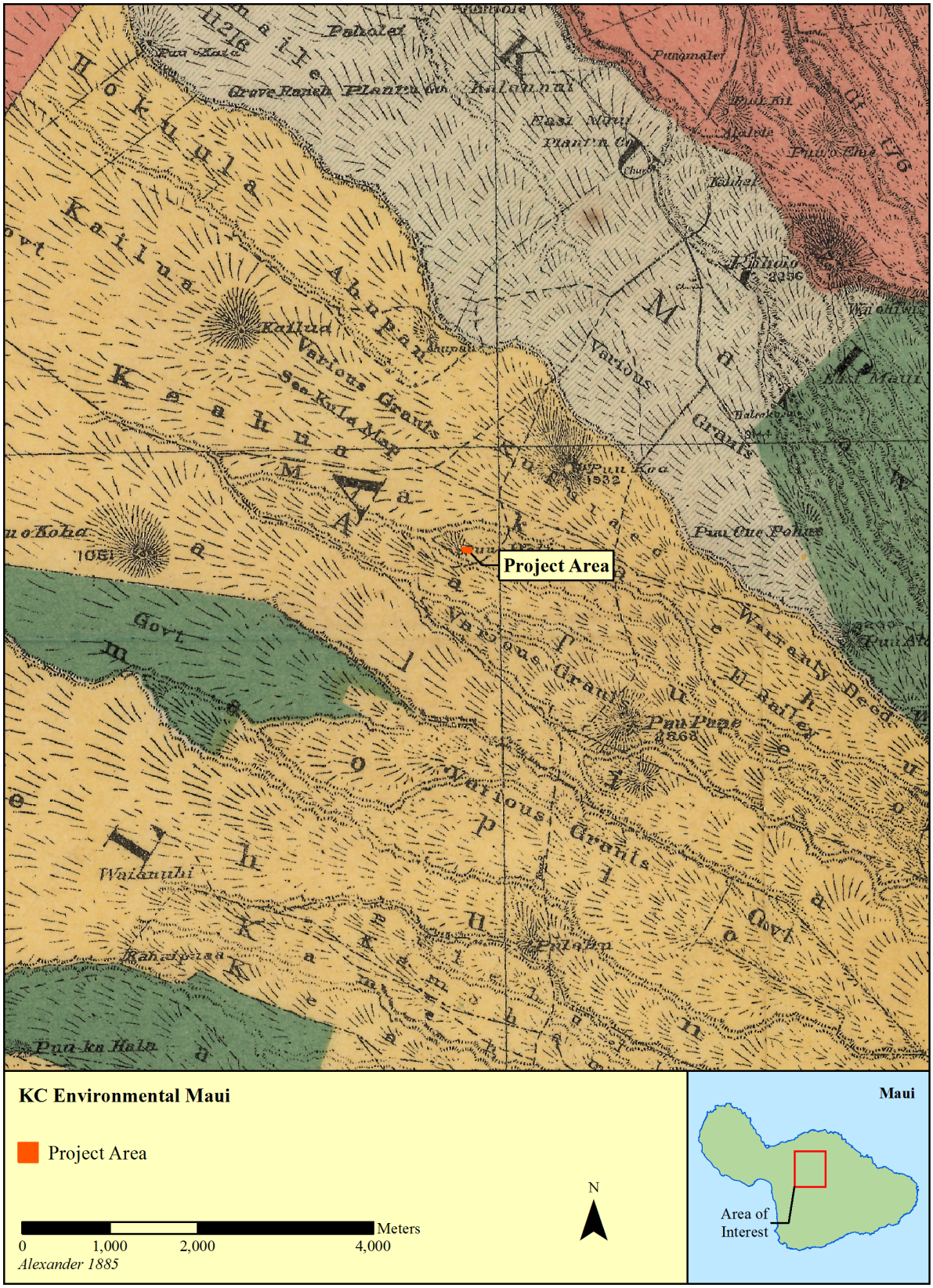

Figure 4. Kula District with the project area. Map: Alexander (1885), Registered Map 1408.

Maui Land Units Since 1909

The Session Laws of 1909 (revised in 1932) created a four-district system for the entire island of Maui, with Lahaina in the west, Wailuku incorporating the central isthmus, Makawao east of the isthmus, and Hāna the farthest east and southeast. Maui County today also includes three offshore districts, Lānaʻi Island and District, and Kalawao and Molokaʻi Districts on Molokaʻi Island; Kahoʻolawe Island is part of Makawao District. Today, Makawao District includes the former Hāmākua Poko and Hāmākua Loa Districts in the north, inland portions of the former Kula and Honuaʻula Districts in the southwest, and Kahoʻolawe Island. Wailuku District includes the coastal portions of the former Kula District. Hāna District includes the former Hāna, Kīpahulu, Kaupō, and Kahikinui Districts, and part of the former Honuaʻula District. As noted, the project area is in Aʻapueo Ahupuaʻa. This *ahupuaʻa* is now part of Makawao District.

Nineteenth-Century Changes in Land Use and Tenure in the Project Area

No available documents clarify how the project area and immediately surrounding lands were used before Western Contact. Since it was difficult to route sufficient water to the area for agricultural use, these lands may have supported dryland (non-irrigated) traditional crops such as unirrigated taro (*kalo*; *Colocasia esculenta*) or sweet potato (*ʻuala; Ipomoea batatas*). Alternatively, most or all of the surrounding lands may have remained forested, perhaps exploited for collection of valued plants such as paper mulberry (*wauke*; *Broussonetia papyrifera*) and *maile* (*Alyxia stellata*).

Changing Land Use

Little is reported on the impact of changing land uses on the project area; however, it was likely consistent with the general process of land tenure and change for Hāmākua Poko.

Maly and Maly (2006) mention the impacts cattle and cattle ranching were already having on areas including Hāmākua Poko by the 1840s, only a few decades after their A.D. 1793 introduction to Hawaiʻi Island by Captain George Vancouver. Ranching spread quickly from Hāmākua Poko to Hāmākua Loa and further, including areas of Kula and Wailuku Districts (Maly and Maly 2006:38). A letter, dated September 10, 1838 from Governor Hoapilikāne to William A. McLane and Edwin Miner, granted them one of the earliest formal leases for cattle ranching in the Makawao- Hāmākua Poko area. This was a 50 year lease of the land, with the right to water, and trail access to the shore, in order for them to export their cattle (Maly and Maly 2006:38).

Sugar and other commercial plantations also developed early in the Hāliʻimaile-Makawao area. As reported in July and August 1846 in the newspaper *The Polynesian* by editor and writer J. Jarves, the Brewer Plantation, at Kawaʻapae, Hāliʻimaile—approximately 5 kilometers (km) inland from the north shore (north of the project area)—was operating successfully by then and its crops were being expanded to include temperate and tropical fruits and vegetables.

In Makawao, the only plantation seems to have been that of William A. McLane, mentioned above. McLane's house was located at Piʻiholo. His sugar mill was operating less than a kilometer below his fields; Lyons' (1872) map shows an "Old McLean Mill," possibly the 1840s mill, about a kilometer southeast of the project area. In 1848, McLane owned or leased huge areas surrounding the current parcel (see also Maly and Maly 2006:38-39).

The Polynesian's Jarves traveled from Lāhainā to Haleakalā, crossing Kahului and Hāmākua Poko and ascending the slope through Hāliʻimaile and Makawao. Among other important observations Jarves made, as summarized and excerpted by Maly and Maly (2006:37-40), he noted that goats and cattle

destroyed grasslands, sugarcane, and trees on the Wailuku plain, and that wild cattle had caused significant changes in the uplands of Hāliʻimaile and Makawao. Jarves also commented on the difficulty of getting water to the lands of Hāliʻimaile and Makawao.

Commander Charles Wilkes of the United States Exploring Expedition of 1840-1841 ascended Haleakalā in April 1841 and described the environment much as Jarves described it, adding that Irish potatoes are common in the dry regions near Makawao (Malay and Malay 2006: 31).

The numbers of cattle and sizes of grazing areas would eventually be brought under control by Kingdom laws and by business, which, by ca. 1875, developed in the form of large, independent ranches that provided a plentiful supply of beef. Once reliable water sources were established and irrigation of commercial crops became possible, the interest in sugarcane cultivation on plantations intensified in the region.

The sizes of areas set aside for grazing on the *kula* (slope) lands of the Hāmākua region were shrinking significantly during the late 19th century. By 1900, cattle were increasingly relegated to narrower grazing lands far upslope (Maly and Maly 2006:38, citing the observations of W. Maxwell in 1900).

Changing Land Tenure and the Introduction of Private Property Law

Along with land changes, land-tenure changes came to Makawao far earlier than to many areas in the islands. Along with only one other area, Mānoa, Oʻahu, Makawao was the location where a non-traditional land-tenure experiment began. On January 13, 1846, Minister of the Interior Gerrit P. Judd, on behalf of King Kamehameha III and Premier Keoni Ana (John Young), presented an official outline of the program (excerpted and discussed by Maly and Maly 2001:299), which was to provide, for the first time, fee-simple interest in land to native tenants who applied for it and purchased it. A document of ownership would establish the purchaser's ownership, and that of the applicant's heirs and representatives, forever, with protections similar to those offered foreign owners. This was the forerunner of the Mahele. A New England missionary, Reverend Jonathan Smith Green, was the land agent for the area. Part of the agreement stipulated that each new native owner of land would cultivate a certain portion of the land area (to be appointed by Smith Green) for the land agent's use and support. Judd's January 13, 1846, proclamation outlining the program and the lands involved, adds that the single portion of Makawao to be excepted from the program was the land leased earlier to William McLane for his plantation (Maly and Maly 2001:299-300). McLane's activities and tenure apparently continued unchanged through this period, as land tenure changed for Makawao's native Hawaiians from the old, cooperative traditional system to a new system based on private-property ownership.

Land Holdings in the Project Area at Mahele

The project area occupies approximately 1.447 acres (0.585 ha). The principal awardee of Aʻapueo was Analea Keohokalole (Wong Smith 1996: B-12). Keohokalole, the mother of King Kalakaua, Queen Liliuokalani, Miriam Likelike Cleghorn, and William Pit Leleiohoku, relinquished this land to the government. The project area was awarded to Keawe (Land Grant 1829) as part of 117 acres of Kohoilo ʻIli, Aʻapueo Ahupuaʻa, Kona District, in 1855 (Hawaii Commission of Public Lands 1929, Native Register vol. 10:59-60) (Fig. 5).

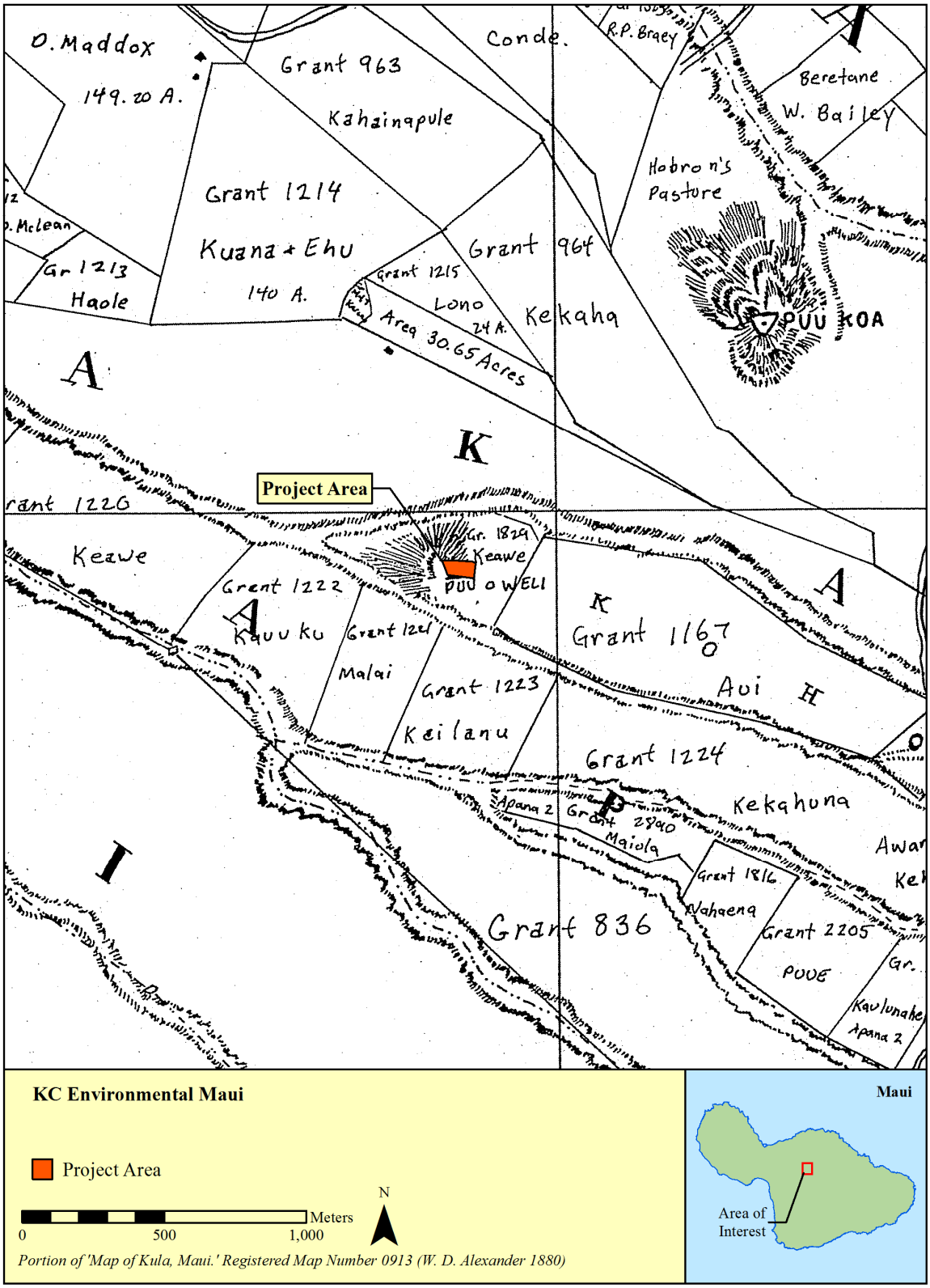

Figure 5. Land Grants and other land holdings in A‘apueo Ahupua‘a of the former Kula District. Map: Alexander (1880), Registered Map 0913.

Recent Land Use in the Project Area

A‘apueo saw an influx of Chinese farmers in the 1840’s (Wong Smith 1996: B-17). Many of the Chinese moving into the region were ethnic Hakkas from other areas of Maui, Kohala (Hawai‘i Island), Honolulu, or directly from Kwangtung (Guangdong) China (Wong Smith 1996: B-17). These farmers leased lands throughout Kula and grew crops such as Irish potatoes, sweet potatoes, corn, beans, onions, Chinese cabbage, and wheat (Wong Smith 1996: B-19). These farms were not irrigated and gradually converted to ranching by the 1880’s to supply cattle for the California gold rush of the 1850’s (Wong Smith 1996: B-19). Water remained scarce and lack of economic opportunity, combined with depleted soils forced most farmers to move out of Kula by 1920 despite the construction of the Kula Pipeline in 1910 (Wong Smith 1996: B20-21).

The project area was under pineapple cultivation and was later left fallow prior to the recent grading and construction activities related to the Kulamalu Town Center development (Wong Smith 1996: B-21).

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PREVIOUSLY DOCUMENTED ARCHAEOLOGICAL RESOURCES

Several archaeological studies have been undertaken within and immediately adjacent to the current project area (Fig. 6). Table 1 summarizes these projects. Figure 7 shows the locations of archaeological sites within 1 km of the project area, while Table 2 summarizes these sites. This includes portions of A‘apueo, Maka‘eha, and the border of Kalialinui Ahupua‘a. Reports concerning work in A‘apueo include, Hauani‘o and Rechtman (2010), Hommon (1974), McPhatter and Rosendahl (1996), Pickett et al. (2003), Rechtman (2011), Wulzen and Rosendahl (1996), and Wulzen et al. (1996). Reports concerning work in Maka‘eha include Connelly (1973), Donham (1990), Kennedy (1990), Pantaleo (2003), and Sinoto and Pantaleo (2004). No archaeological sites have been documented within the project area, and the closest site is approximately 100 m to the east.

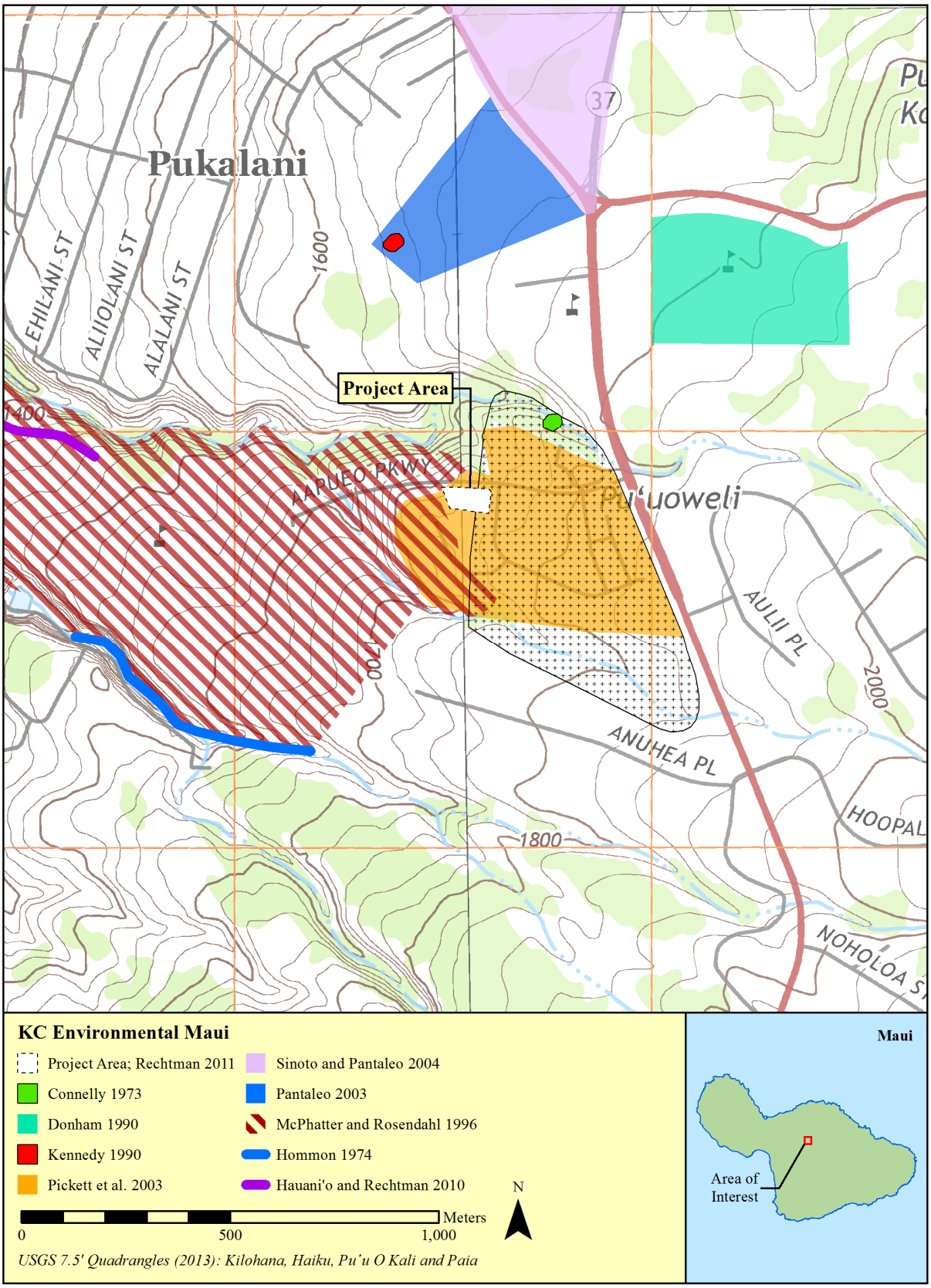

Figure 6. Previous archaeological investigations within 1 km of the project area.

Table 1. Previous Archaeological Investigations Within 1 km of the Remote Operations Building Parcel.

Ahupua‘a	Reference	Nature of Study	Findings
A‘apueo	Hommon (1974)	Reconnaissance survey	Site 50-50-10-1061: ca. 191 petroglyphs, rockshelters
	McPhatter and Rosendahl (1996)	Reconnaissance survey	Sites 50-50-10-4179 and 4180: petroglyph panel, boundary wall
	Wulzen and Rosendahl (1996)	Reconnaissance survey	Site 50-50-10-4181: agricultural terraces
	Wulzen et al. (1996)	Inventory survey	Re-located sites 50-50-10-1061, 1062, 4179; tested 4181: petroglyph panels, agricultural terraces
	Pickett et al. (2003)	Archaeological monitoring	Sites 50-50-10-5173, 5469, 5470: historic Chinese cemetery, pre-Contact fire pit, probable historic irrigation ditch
	Hauani‘o and Rechtman (2010)	Archaeological monitoring	None
	Rechtman (2011)	Archaeological due diligence survey	None
Maka‘eha	Connelly (1973)	Field inspection	Site 50-50-05-1062: 87 petroglyphs
	Kennedy (1990)	Archaeological investigations	Site 50-50-05-2701: *heiau*
	Donham (1990)	Reconnaissance survey	None in Parcel 2
	Sinoto and Pantaleo (2004)	Inventory survey, testing	Site 50-50-05-5169: Corn Mill Camp warehouses
	Pantaleo (2003)	Inventory survey, testing	None; revisited Site 50-50-05-2701

A‘APUEO AHUPUA‘A

Hommon (1974) identified a large site (50-50-10-1061) in the Kalialinui Gulch on the border of A‘apueo and Kalialinui Ahupua‘a (also see Sterling 1998:259 [Kula entry 59], Canoe Petroglyphs). This site is roughly 500 m long and consists of petroglyphs (ca. 191) and rockshelters.

The earliest archaeological surveys directly incorporating portions of project area are McPhatter and Rosendahl (1996), Wulzen and Rosendahl (1996) and Wulzen et al. (1996). These projects identified several sites near the current project area, but none within this parcel. Wulzen and Rosendahl (1996) identified a site adjacent to the project area. East of the project area, across ‘Ōhi‘a Kū Street, was an

agricultural clearing mound associated with pineapple farming (50-50-10-4181) consisting of two agricultural clearing piles connected by two rock alignments functioning as terrace walls. This site was evaluated as no longer significant.

McPhatter and Rosendahl (1996) completed the most extensive investigations in the project area. They identified a canoe petroglyph (50-50-10-4179) in a tributary of Kaluapulani Gulch, south of Puʻu o Weli, on the eastern border of the current Kamehameha Schools' Maui Campus. A second site, a historical boundary wall (50-50-10-4180), is located at the northern edge of Kalialinui Gulch.

More recently, Pickett et al. (2003) conducted archaeological monitoring for the Kulamalu Commercial Site (Kulamalu Town Center), which included the current project parcel. As a result of the monitoring, Pickett et al. (2003) investigated a mid- to late 19th century Chinese cemetery encountered during monitoring of the Kulamalu Commercial Site (Kulamalu Town Center). This site (50-50-10-5173) is on the edge of the same tributary arm of Kaluapulani Gulch where Site 4179 is located and consists of 25 features identified as historical Chinese burials and associated burning episodes. Two features in the same geographic location were not related to the historical cemetery. Feature 10 is a pre-Contact (AD 1440-1660) firepit and Feature 21 is a possible agricultural ditch. These features were assigned as Site 50-50-10-5469 and 5470, respectively. Sites 5173, 5469, and 5470 have been preserved and protected by being covered with several layers of fill.

Rechtman (2011) conducted an archaeological due diligence study of the current project parcel. This project was undertaken because the current project parcel (TMK: (2) 2-3-066:017) was subdivided from a portion of TMK: (2) 2-3-066:005. Rechtman conducted a surface inspection of the project parcel and identified a totally "developed" area with imported fill, grading, alien vegetation, and the placement of subsurface utilities and a silt fence.

Archaeological reconnaissance and inventory surveys by McPhatter and Rosendahl (1996), Wulzen and Rosendahl (1996), and Wulzen et al. (1996), construction monitoring by Pickett et al. (2003), and an archaeological due diligence study of the project area by Rechtman (2011) have not identified any cultural or archaeological resources within the project area (see Table 2 and Fig. 7). The area is considered "developed" with heavy grading and imported fills, along with sub-surface utilities (Rechtman 2011).

MAKAʻEHA AHUPUAʻA

Connelly (1973) recorded 87 petroglyphs during an archaeological field inspection. This site is designated Site 50-50-05-1062 (also see Sterling 1998:259 [Kula entry 61, Canoe Petroglyphs]) and is located in the Kaluapulani Gulch on the border between Aʻapueo and Makaʻeha Ahupuaʻa.

Donham (1990) conducted an archaeological survey of five parcels in Haliʻimaile, Hōkūʻula, Makaʻeha and Kailua Ahupuaʻa. Parcel 2 is within 1 km of the Remote Operations Building project area. No archaeological resources were identified in this 35-acre (14.16 ha) parcel.

Kennedy (1990) investigated a *heiau* (State Site 50-50-05-2701) located just southeast of Pukalani. This site is interpreted as a pre-Contact temple dating to the mid-16th century. Pantaleo (2003) surveyed and tested the 28.695-acre (11.612 ha) Kualono (formerly Hanohano) subdivision surrounding the *heiau* and did not find any archaeological resources.

Sinoto and Pantaleo (2004) investigated a 40.574-acre (16.419 ha) parcel bordering the Old Haleakala Highway and Pukalani Bypass. No pre-Contact archaeological resources were identified in this investigation; however, historical buildings, including sheds, warehouses, and water tanks associated with

the "Corn Mill Camp," a former operations and residential center for the Maui Land & Pineapple Company, are present. This site is designated Site 50-50-05-5169.

Table 2. Previously Identified Archaeological Sites Within 1 km of the Remote Operations Building Parcel.

Site No. (50-50-)	Reference	Name/Description	Function	Period	Excavation (X= Yes)
10-1061	Hommon (1974)	ca. 191 petroglyphs, rockshelters	Symbolism	Traditional Hawaiian	
10-4179	McPhatter and Rosendahl (1996)	Canoe petroglyph	Symbolism	Traditional Hawaiian	
10-4180	McPhatter and Rosendahl (1996)	Rock wall	Boundary wall	Post-Contact	
10-4181	Wulzen and Rosendahl (1996)	Mound	Agriculture (clearing mound)	Post-Contact	X
10-5173	Pickett et al. (2003)	Multiple coffin burials	Burial	Post-Contact	X
10-5469	Pickett et al. (2003)	Firepit	Temporary habitation	Traditional Hawaiian	X
10-5470	Pickett et al. (2003)	Ditch	Agricultural (irrigation)	Post-Contact	X
5-1062	Connelly (1973)	87 petroglyphs	Symbolism	Traditional Hawaiian	X
5-2701	Kennedy (1990)	Rock platform	Mo‘omuku Heiau	Traditional Hawaiian	X
5-5169	Sinoto and Pantaleo (2004)	Maui Land & Pineapple Company operations and residential camp, "Corn Mill Camp"	Agricultural, habitation	Post-Contact	

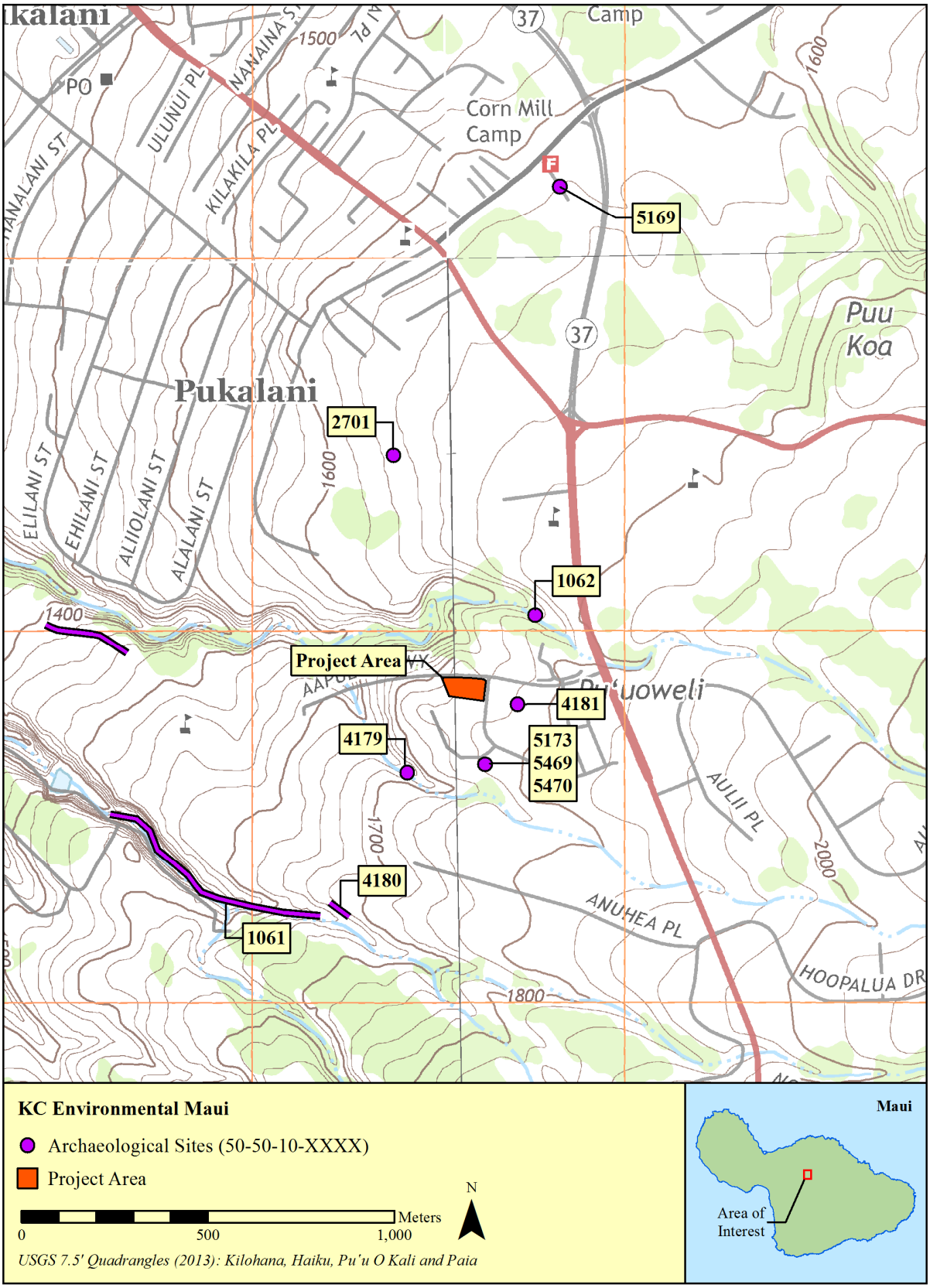

Figure 7. Archaeological sites within 1 km of the project area.

SUMMARY AND EXPECTATIONS

The sites documented by Connelly (1973), Hommon (1974), and McPhatter and Rosendahl (1996) relate to pre-Contact religious or otherwise specialized (i.e., petroglyph) activities. The lack of archaeological resources outside of the gulches in the area suggests that there either was not a large population living in this region prior to the 1850's, or subsequent historical agriculture destroyed evidence of this occupation. The heavy plowing and grading for pineapple farming has most likely destroyed any archaeological sites and resources that were on the plateaus between gulches in this area. Based on current information, particularly evidence that the project parcel was recently graded and subject to fill deposition, no archaeological resources were anticipated.

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RESEARCH METHODS

This section presents the project's field methods and the research questions that directed data generation.

RESEARCH QUESTIONS

Three site-specific research questions were formulated for the current project area.

1) Are traditional Hawaiian cultural deposits present? If so, what activities are represented? Evidence may be encountered for traditional activities such as temporary or permanent habitation or agriculture. Nearby petroglyph and rockshelter sites have demonstrated the area was visited for cultural reasons and the highland areas nearby may have been used for temporary habitation or sweet potato cultivation.

2) Are historic-era cultural deposits present? If so, what activities are represented? The project parcel was used for pineapple cultivation and, likely, ranching activities. It is possible that deposits relating to agriculture or ranching may be present.

3) Are human skeletal remains present? Pickett et al. (2003) recorded a historical cemetery (Site 5173) approximately 160 m south of the project area. These burials are believed to be associated with a mid- to late 19th century Chinese community.

FIELDWORK METHODS

The pedestrian survey covered 100% of the project area. Survey transects were spaced 5 m apart. The systematic survey included visual inspection for archaeological features and artifacts, along with evidence for historical or modern land alteration. Ground visibility was below 5%, therefore vegetation was cut away every 5 m along survey transects to allow for direct inspection of the surface. Subsurface testing was conducted through manual excavation of shovel test pits (STPs) and inspection of exposed soil profiles. The STPs were distributed to record stratigraphy across the level portions of project area (Fig. 8). The northern and eastern boundaries of the project area had been previously mechanically graded to 45° or greater slopes, and therefore, no STPs were located on these slopes.

The STPs were excavated without vertical control in order to expeditiously determine the presence or absence of natural soils and cultural material. All excavated soils were sieved through a 1/8-inch mesh. The STPs were manually excavated by shovel and trowel. The average width and depth of each STP was 40 cm by 60 cm.

All layers were described on standardized field forms. Photographs were taken throughout the project with a digital camera and were listed in a standardized photographic record. Following excavation and photography each STP was profiled and described. The soil characteristics recorded include the following at a minimum: color, including moisture condition (wet, moist, dry) when color read; texture; structural grade, size, and form (or absence of structure); dry or moist consistence; wet consistence (stickiness, plasticity); root frequency and size; presence of charcoal or other cultural materials; and lower boundary distinctness and topography (Munsell Color 2000). After data recording was completed, flagging tape was placed at the base of each STP, and they were backfilled.

Locations of the STPs were recorded using a professional-grade Trimble GEOXH Global Positioning System (GPS) unit using North American Datum of 1983 (NAD 83) in Universal Transverse Mercator Zone 4 North (UTM 4N); the resulting spatial data were differentially corrected for submeter accuracy.

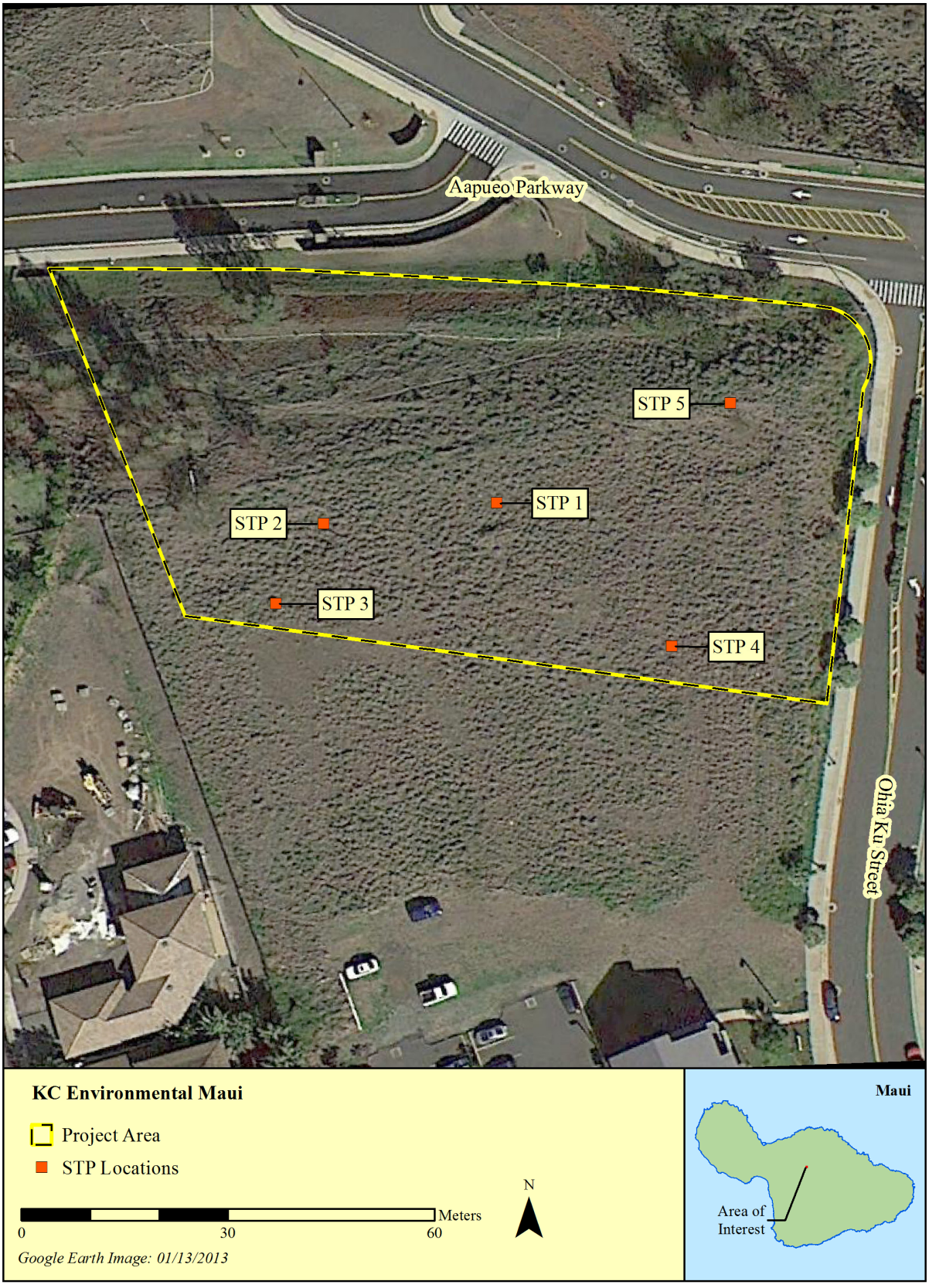

Figure 8. Overlay of the STP locations on an orthophotograph (2013) of the project area.

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RESULTS

This section presents the results of the fieldwork. No traditional Hawaiian or historical cultural deposits or features were identified. Project area deposits and stratigraphy are summarized.

SOILS AND DEPOSITS

All soils identified in the STPs are fills (Table 3). Excavations revealed fills and construction debris deposits (Figs. 9 and 10) and typically ended at large rocks (Photos 5-9). Several push piles composed of concrete, stone, wood, and late 20th century garbage, as well as recently installed utilities, were identified on the property, indicating that the project area's topography has been substantially modified from its original state.

Table 3. General Soil Descriptions for the Project Parcel.

Layer	Depth (cm bs)	Soil Description	Interpretation
I	0-13/65	Very dark greyish brown (10YR 3/2, moist) silty clay loam with red (2.5YR4/6) clay mottles, structureless, loose to slightly sticky, slightly plastic, common roots, very fine to coarse, sub-rounded, sub-angular, angular granules, pebbles, cobbles, and boulders common, base not reached	Fill
II (STP 5 only)	13-37	Gray (2.5Y 5/1 moist) sandy clay, structureless, loose to slightly sticky, plastic. Base not reached.	Decomposing cement aggregate/sand, construction fill

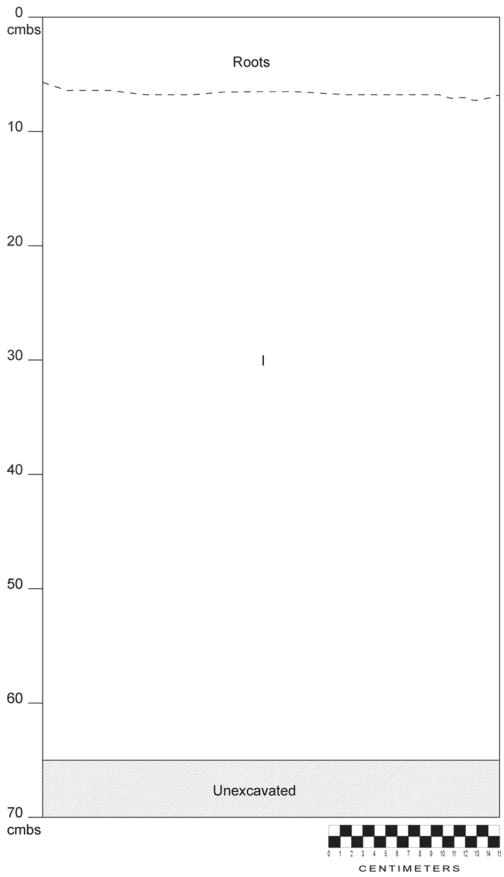

Figure 9. Profile of STP 1.

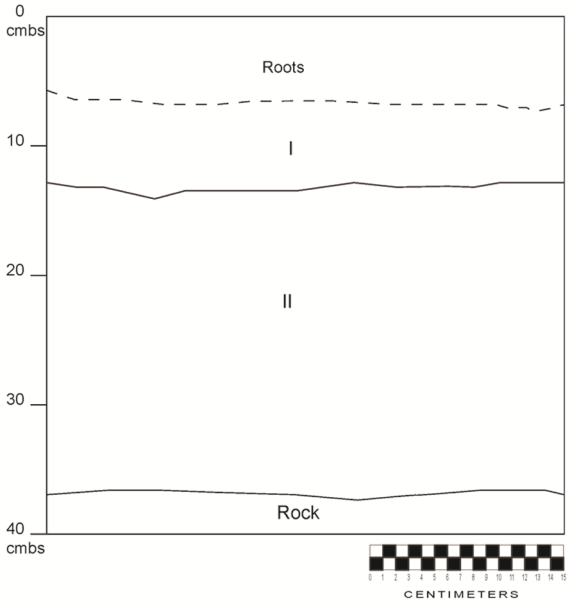

Figure 10. Profile for STP 5.

Photo 5. STP 1. View to the north.

Photo 6. STP 2. View to the north.

Photo 7. STP 3. View to the north.

Photo 8. STP 4. View to the north.

Photo 9. STP 5. View to the north.

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DISCUSSION

No pre-Contact or historical deposits or features were found within the project parcel during survey or subsurface testing. The project area was used for pineapple cultivation, and likely ranching activities, during the historical period. Recently, it was graded and trenches were excavated for utility installation. Fill is present to at least 65 cm below the surface, confirming that the present topography is the result of recent construction activities. Consequently, traditional Hawaiian or historical properties are unlikely to exist within the project parcel.

Previous surface surveys and monitoring in the Kulamalu Town Center development, where the project parcel is located, have not identified any surface or subsurface historic properties within 100 m of the property. Although several archaeological sites have been recorded in the gulches of A‘apueo Ahupua‘a, no pre-Contact sites have been identified in the relatively flat plateaus of the area. It is likely that pineapple farming activities in the area, and later, modern construction activities, would have destroyed evidence for earlier activities (if they had occurred).

In summary, with regards to the project’s research questions the following can be stated:

1) Are traditional Hawaiian cultural deposits present? If so, what activities are represented? No traditional Hawaiian cultural deposits are present. It is likely that historical agriculture would have destroyed any evidence of traditional activities. Only modern construction fill deposits were documented.

2) Are historic-era cultural deposits present? If so, what activities are represented? No historical cultural deposits are present. Only modern construction fill deposits were documented.

3) Are human skeletal remains present? No human skeletal remains were encountered.

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CONCLUSIONS AND RECOMMENDATIONS

International Archaeological Research Institute, Inc., (IARII) completed an archaeological inventory survey of TMK (2) 2-3-066:017 for the proposed construction of a Remote Operations Building (ROB) in support of the Daniel K. Inouye Solar Telescope (DKIST) facility. No significant cultural deposits or features were encountered during the surface survey and subsurface testing. Several push piles composed of concrete, stone, wood, and late 20th century garbage, as well as recently installed utilities, were identified on the property, indicating that the project area's topography has been substantially modified from its original state. Grading and utility installation presumably occurred during the construction monitored by Pickett et al. (2003).

In accordance with HAR §13-284-7, the proposed Determination of Effect is "no historic properties affected." No archaeological mitigation is recommended. However, if significant cultural features or materials are encountered during construction activities, all work in the vicinity should stop and the SHPD should be notified.

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Appendix D

Chapter 6E-42 Historic Preservation Review Concurrence Letter, dated December 24, 2015

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
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December 24, 2015

Adam Lauer, Project Director
International Archaeological Research Institute, Inc.
2081 Young Street
Honolulu, Hawaii 96826-2231
Via email to alauer@iarii.org

Log No: 2015.04146
Doc No: 1512MD51
Archaeology

Aloha Mr. Lauer:

SUBJECT: Chapter 6E-42 Historic Preservation Review -
Draft Archaeological Inventory Survey Report of 1.447 Acres with No New Sites
A‘apueo Ahupua‘a, Makawao District, Island of Maui
TMK (2) 2-3-066:017

Thank you for the opportunity to review the report titled *Draft Archaeological Assessment Report for Tax Map Key (2) 2-3-066:017, Pukalani, A‘apueo Ahupua‘a, Makawao District, Maui, Hawaii* (Lauer November 2015), which we received on November 27, 2015. This report was developed for K.C. Environmental, Inc. in advance of the proposed construction of a Remote Operations Building for the Daniel K. Inouye Solar Telescope facility.

Fieldwork was conducted by two archaeologists on October 19, 2015. Five (5) shovel test pits were manually excavated; no historic properties were encountered. Due to negative findings from the inventory survey this report has been submitted as an Archaeological Assessment. No further work is recommended for this parcel and we concur with that recommendation.

The draft archaeological assessment meets the requirements specified in Hawai‘i Administrative Rule §13-275 and is accepted. Please send one hardcopy of the document, clearly marked **FINAL**, along with a copy of this review letter and a text-searchable PDF version on CD to the Kapolei SHPD office, attention SHPD Library. Please contact me at (808) 243-4641 or Morgan.E.Davis@hawaii.gov if you have any questions or concerns about this letter.

Mahalo,

Morgan E. Davis
Lead Archaeologist, Maui Section

cc: County of Maui
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