DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

NEIL ABERCROMBIE
GOVERNOR

RICHARD C. LIM
INTERIM DIRECTOR

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February 10, 2011

Mr. Gary Hooser
Interim Director
Office of Environmental Quality Control
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

Subject: Draft Environmental Impact Statement (DEIS) for the Kawailoa Wind Farm Project Waialua District, Island of Oahu

Dear Mr. Hooser:

The Department of Business, Economic Development and Tourism (DBEDT) requests publication of the subject document in the February 23, 2011 issue of The Environmental Notice or as soon as possible thereafter. Enclosed are the following items:

- One (1) copy in PDF format of the DEIS and a completed OEQC publication form on CD
- One (1) hardcopy of the DEIS
- DEIS distribution list

If you have any questions, please call Malama Minn at (808) 587-9000 or email at Malama.C.Minn@dbedt.hawaii.gov.

Sincerely,

Richard C. Lim

Enclosures

c: Malama Minn, Strategic Industries Division

Draft Environmental Impact Statement

Kawailoa Wind Farm Project

Submitted to

State of Hawai`i Department of Business, Economic Development and Tourism (DBEDT)

Prepared for

First Wind, LLC

February 2011

CH2MHILL

Dear Participant:

Attached for your review is the Draft Environmental Impact Statement (EIS) for the Kawailoa Wind Farm Project, prepared pursuant to Hawaii's EIS law and rules (HRS Chapter 343 and HAR §11-200-17).

Name of Project:	Kawailoa Wind Farm Project
Island and District:	Island of Oahu; Waialua District
Tax Map Key:	**Wind farm:** 61005001, 61006001, 61007001, 62009001, 62011001 **Traversed by existing onsite access roads:** 61005003, 61005007, 61005014, 61005015, 61005016, 61005019, 61005020, 61005021, 61005022, 61008025, 62002001, 62002002, 62002003, 62002025 **Communication sites:** 67003024
Applicant:	Kawailoa Wind, LLC 810 Richards Street, Suite 650 Honolulu, HI 96813 Contact: Wren Wescoatt; Phone: (808) 265-9719
Accepting Authority:	State of Hawai`i, Department of Business, Economic Development and Tourism (DBEDT) P.O. Box 2359 Honolulu, HI 96804 Contact: Ms. Malama Minn; Phone: (808) 587-9000
Consultant:	CH2M HILL, Inc. 1132 Bishop Street, Suite 1100 Honolulu, HI 96813 Contact: Paul Luersen; Phone: (808) 943-1133

Please send comments to the Applicant, Accepting Authority, and Consultant.

Comments must be received or postmarked by: **April 8, 2011**

Thank you for your participation.

Draft Environmental Impact Statement

Kawailoa Wind Farm Project

SIGNATORY CERTIFICATION:

This Draft Environmental Impact Statement and all ancillary documents were prepared under my direction or supervision. To the best of my knowledge, the information submitted fully addresses the content requirements as set forth in HAR §11-200-17 and §11-200-18, as appropriate.

February 9, 2011

Paul Luersen, AICP; CH2M HILL — Date

February 2011

CH2MHILL

SUMMARY OF PROPOSED PROJECT	
Project	Kawailoa Wind Farm Project
Applicant	Kawailoa Wind, LLC 810 Richards Street, Suite 650 Honolulu, HI 96813 Contact: Wren Wescoatt; Phone: (808) 265-9719
Proposed Action	Construction of a renewable energy (wind power) facility with a generating capacity of up to 70 MW; specific components include wind turbine generators, collector lines to carry electrical power from each wind turbine generator to an electrical substation, a battery energy storage system, two interconnection facilities, two communication towers, an operations and maintenance building and temporary laydown area, meteorological monitoring equipment, and onsite access roads. Additional communication equipment would also be installed at two existing Hawaiian Telcom facilities on Mt. Ka`ala to provide a dedicated link for communication between the wind farm and Hawaiian Electric Company's electrical grid.
Location	Wind farm: Former Kawailoa Plantation, North Shore, Island of O`ahu Communication sites: Mt. Ka`ala, Waianae, Island of O`ahu
Land Ownership	Wind farm: Kamehameha Schools Communication site: State of Hawai`i
Tax Map Key	Wind farm: 61005001, 61006001, 61007001, 62009001, 62011001 Traversed by existing onsite access roads: 61005003, 61005007, 61005014, 61005015, 61005016, 61005019, 61005020, 61005021, 61005022, 61008025, 62002001, 62002002, 62002003, 62002025 Communication sites: 67003024
Permanent Project Footprint	Wind farm: 22.0 acres Communication sites: Equipment would be mounted on existing structures and would not have a footprint
State Land Use District	Wind farm: Agriculture Communication site: Conservation
County Zoning	Wind farm: AG-1 (Restricted Agricultural District) and P-1 (Restricted Preservation District) Communication sites: P-1(Restricted Preservation District)

SUMMARY OF PROPOSED PROJECT	
Special Designations	Special Management Area (SMA) (lower section of Kawailoa Road)
Required Permits & Approvals [a]	Wind farm: Federal Endangered Species Act (ESA) Section 10 Incidental Take Permit; Federal Aviation and Administration (FAA) Determination of No Hazard to Air Navigation; Federal Communications Commission (FCC) License; State Endangered Species Incidental Take License; Noise Permit; Permit to Operate or Transport Oversize and/or Overweight Vehicles and Loads; Conditional Use Permit (Minor) Communication site: Conservation District Use Permit; Request for Use of State Lands; Forest Reserve System Special Use Permit
Actions Potentially Requiring Environmental Review Under HRS Chapter 343[b]	Wind farm: Access improvements to a State Highway Communication site: Use of State Lands; Conservation District Use Permit
Accepting Authority	State of Hawai`i, Department of Business, Economic Development and Tourism (DBEDT) P.O. Box 2359 Honolulu, HI 96804 Contact: Ms. Malama Minn; Phone: (808) 587-9000
Anticipated Determination	Acceptance of Final Environmental Impact Statement
Consulted Parties	U.S. Fish and Wildlife Service (USFWS) Office of Deputy Assistant Secretary of the Army State of Hawai`i Department of Business and Economic Development and Tourism (DBEDT) DBEDT Office of Planning Department of Land and Natural Resources (DLNR) Office of Conservation and Coastal Lands (OCCL) DLNR, Division of Forestry and Wildlife (DOFAW) Office of Environmental Quality Control (OEQC) State of Hawaii Land Use Commission State of Hawaii Department of Transportation (DOT) City and County of Honolulu, Department of Planning and Permitting (DPP) Endangered Species Recovery Committee (ESRC) Regional Mission Compatibility Review Team (RMCRT) Waimea Valley (Hi`ipaka LLC) North Shore Neighborhood Board Outdoor Circle North Shore Chamber of Commerce

SUMMARY OF PROPOSED PROJECT	
Consultant	CH2M HILL, Inc. 1132 Bishop Street, Suite 1100 Honolulu, HI 96813 Contact: Paul Luersen; Phone: (808) 943-1133

NOTES:

[a] This list of required permits and approvals does not include construction-related permits and approvals.

[b] Issuance of the Incidental Take Permit by the U.S. Fish and Wildlife Service would require environmental review in compliance with the National Environmental Policy Act (NEPA).

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Executive Summary

Kawailoa Wind, LLC (Kawailoa Wind) is proposing to construct and operate a 70 megawatt (MW) wind farm on former Kawailoa Plantation lands, approximately 5 miles northeast of Hale`iwa town, on the north shore of the island of O`ahu, Hawai`i. In addition to the wind turbine generators and appurtenant facilities at the wind farm site, the project would require installation of communication equipment at existing facilities on Mt. Ka`ala, approximately nine miles southwest of the wind farm site.

The project would require the use of State lands and a Conservation District Use Permit, both of which trigger the requirement for compliance with the State of Hawai`i's environmental review process, as promulgated in Hawai`i Revised Statutes (HRS) Chapter 343 and Title 11, Chapter 200 of the Hawai`i Administrative Rules (HAR). Pursuant to HRS Chapters 343 and 201N, the Hawai`i Department of Business, Economic Development, and Tourism (DBEDT) is the accepting authority for the Environmental Impact Statement (EIS).

ES.1 Proposed Action

The Proposed Action would involve construction, operation, and maintenance of the following facilities at the Kawailoa wind farm site:

- Thirty wind turbine generators
- Electrical collector lines
- An electrical substation
- A battery energy storage system (BESS)
- Two interconnection facilities
- Two communication towers
- An O&M building and laydown area
- Meteorological monitoring equipment
- Onsite access roads

The project would also include installation, operation, and maintenance of up to four microwave dish antennae on two existing Hawaiian Telcom facilities near the summit of Mt. Ka`ala. The communication equipment would provide a link between the wind farm and the existing Hawaiian Electric Company (HECO) substations that would be receiving the power.

Based on an evaluation of the distribution of wind resources and known site constraints, those portions of the former Kawailoa Plantation lands that are acceptable locations to site the project components were identified, resulting in the delineation of a series of corridors which cumulatively represent the maximum project envelope. Within this envelope, the components have been sited to maximize energy production, while minimizing site disturbance and adverse impacts on existing vegetation and agricultural use of the land. A total of approximately 306.4 acres would be disturbed during construction and operation of the Proposed Action; of this, the permanent project footprint would occupy approximately 22.0 acres.

ES.2 Alternatives to the Proposed Action

A range of alternative actions were considered through the project planning process. Alternative actions involving different project locations, equipment types, generating capacities, and sources of renewable energy were eliminated from further consideration as they do not meet the project objectives or are otherwise not considered to be feasible.

Specific to project implementation on the former Kawailoa Plantation lands, a detailed site layout process was conducted, with the Proposed Action representing the optimal locations of the project components within the maximum project envelope (as described above). No other alternative layout has been identified at this time. It is expected that additional micrositing will be conducted based on ongoing site evaluations, resulting in minor shifts in the location of project components. These modifications would be expected to fall within the range of impacts characterized for the Proposed Action, and would be described as such in the Final EIS. In the event that there are substantial changes in component location, the modified site layout would be identified as a new alternative in the Final EIS and evaluated accordingly. However, the maximum project envelope is relatively limited in area (because of the distribution of wind resources and extent of site constraints) and, given the siting requirements for each of the project components (for example, turbine spacing), very few (if any) alternative layouts for the wind farm site are expected to be feasible.

An alternative layout for the communications facilities near Mt. Ka`ala has been identified and is evaluated in the Draft EIS. This alternative involves installation of two new towers to house the microwave dish antennae; a tower would be installed adjacent to each of the existing Hawaiian Telcom structures. The Draft EIS also includes evaluation of the No Action alternative.

ES.3 Potential Impacts and Proposed Mitigation Measures

Pursuant to HAR §11-200-2, the Draft EIS evaluates the ecological, aesthetic, historic, cultural, economic, social, and health effects that could result from construction and operation of the Proposed Action and its alternatives. In general, this evaluation indicates that the adverse impacts would be relatively small in comparison to the benefits provided by the generation of additional renewable energy. To the extent possible, the project has been developed so as to avoid and/or minimize potential adverse impacts; in those cases where impacts cannot be avoided or minimized, measures to mitigate the impact have been identified. Table ES-1 provides a summary of the potential impacts that could result from implementation of the Proposed Action and its alternatives. These impacts and the applicable mitigation measures are described in detail in Section 3.0.

ES.4 Unresolved Issues

Permits and approvals must still be obtained from various agencies and it is possible issues may arise during the processing of applications. However, early consultations with agencies and stakeholders as well as the technical evaluations of potential impacts have not identified issues that cannot be resolved.

ES.5 Compatibility with Land Use Plans and Policies

The project was reviewed for consistency with the full range of applicable land use plans, policies and controls, as well as a variety of other Federal and State laws that could potentially be applicable to the project. These include:

- Federal Endangered Species Act
- Federal Clean Air Act
- Clean Water Act
- Federal Aviation Regulations
- Hawai`i State Energy Resources (HRS Chapter 196)
- Hawai`i State Planning Act (HRS Chapter 226)
- Hawai`i Environmental Impact Review Law (HRS Chapter 343)
- Hawai`i State Environmental Policy (HRS Chapter 344)
- Hawai`i State Land Use Law (HRS Chapter 205)
- Conservation District (HRS Chapter 183C)
- Coastal Zone Management (HRS Chapter 205A)
- National Historic Preservation Act
- State Endangered Species Act (HRS §195D-4)
- Mt. Ka`ala Natural Area Reserve Management Plan
- City and County of Honolulu General Plan
- North Shore Sustainable Communities Plan
- County Zoning
- Kamehameha Schools North Shore Master Plan

The proposed project is consistent with these State and County land use plans, policies and controls. It would be constructed and operated in accordance with applicable environmental regulations.

ES.6 Required Permits and Approvals

Implementation of the proposed project would require permits or approvals from a variety of Federal, State, and local agencies. The potential permits or approvals that are expected to be required include:

Federal

- Incidental Take Permit (Endangered Species Act, Section 10(a)(1)(B))
- Federal Aviation and Administration (FAA) Determination of No Hazard to Air Navigation
- Federal Communications Commission (FCC) License
- National Environmental Policy Act (NEPA) Compliance

State

- Endangered Species Incidental Take License and Habitat Conservation Plan
- Request for Use of State Lands
- Conservation District Use Permit
- Forest Reserve System Special Use Permit
- Noise Permit
- Coastal Zone Management Act (CZMA) Federal Consistency Determination
- State Historic Preservation Division (SHPD) Notification and Review
- Operate or Transport Oversize and/or Overweight Vehicles and Loads Permit
- National Pollutant Discharge Elimination System (NPDES) Construction Permit
- Power Purchase Agreement (PPA)

City and County of Honolulu

- Conditional Use Permit (minor)
- Conditional Use Permit (minor) for a Joint Development Agreement
- Grading/Grubbing/Stockpiling/Building and Other Construction Permits

TABLE ES-1
Summary of Potential Impacts and Proposed Mitigation Measures

Resource Area	Proposed Action	Communication Site Layout Alternative	No Action Alternative
Climate	Construction: Construction of the project would not affect local weather conditions, such as temperature, rainfall, and humidity. Operation: Operation of the project would not affect local weather conditions. Relative to global climate change, operation of the project would have a beneficial effect by providing renewable energy to be used in place of fossil fuel-generated energy, thereby reducing emissions of greenhouse gases.	The construction and operation impacts of this alternative would be the same as those associated with the Proposed Action.	There would be no change in existing conditions and no reduction of greenhouse gas emissions.
Air Quality	Construction: Construction of the project would generate fugitive dust from earthmoving activities, as well as exhaust emissions from construction equipment and vehicles travelling to and from the project site. To mitigate impacts such that there is not discharge of visible fugitive dust beyond the property lot line, standard best management practices (BMPs) would be implemented. Because emissions would be temporary, relatively small, and would be minimized through implementation of BMPs, impacts to air quality are expected to be minimal. Operation: Once operational, the proposed project would result in minor emissions of air pollutants due to employee vehicle use, periodic use of cranes, and operation of the electrical substation and BESS. These emissions would be very low and would not result in adverse long-term impacts to air quality.	A very small amount of ground disturbance would occur for excavation of the tower footings at the Mt. Ka`ala communication sites; in general, the construction and operation impacts of this alternative would be commensurate with those associated with the Proposed Action.	There would be no change in existing conditions and no impacts to air quality.
Geology, Topography and Soils	Construction: Construction of the project would result in ground disturbance, particularly as a result of grading for the turbine foundations and new access roads. A total of approximately 306.4 acres would be disturbed, of which, approximately 22.0 acres would be within the permanent project footprint. Impacts to major topographic features (including the gullies and streams) would be avoided, and BMPs would be implemented to prevent and minimize erosion associated with ground disturbing activities. No ground disturbance would occur at the Mt. Ka`ala communication sites. Operation: Following construction, BMPs would be implemented to prevent and minimize erosion. In particular, all temporarily impacted areas will be revegetated to stabilize exposed soils.	A very small amount of ground disturbance would occur for excavation of the tower footings at the Mt. Ka`ala communication sites; in general, the construction and operation impacts of this alternative would be commensurate with those associated with the Proposed Action.	There would be no change in existing conditions and no impacts to geology, topography and soils.

TABLE ES-1
Summary of Potential Impacts and Proposed Mitigation Measures

Resource Area	Proposed Action	Communication Site Layout Alternative	No Action Alternative
Hydrology and Water Resources	Construction: Construction of the project components would require minimal subsurface work, all of which would occur well above the water table; therefore, no direct interaction with groundwater is anticipated. Surface water features have been excluded from the maximum project envelope to the greatest extent possible. The only surface water features within the envelope are waterways that intersect with the existing onsite roads; these are generally culverted under the roads and road improvements would be conducted to avoid impacts to these features. One unculverted crossing occurs within the project envelope at Laniakea Stream, where it washes over Cane Haul Road. Road improvements, if required in this location, would be conducted within the existing footprint of the road. Increased sediment and other pollutants in stormwater runoff could affect water quality in receiving waters. BMPs would be implemented to prevent and minimize water quality potential impacts. No surface water features are present within the Mt. Ka`ala communication sites. Operation: Following construction, BMPs would be implemented as needed to prevent and minimize erosion that could affect receiving waters. In particular, all temporarily disturbed areas will be revegetated to stabilize exposed soils.	The construction and operation impacts of this alternative would be the same as those associated with the Proposed Action.	There would be no change in existing conditions and no impacts to hydrology and water resources.
Biological Resources (Flora)	Construction: No State or Federally listed threatened, endangered, or candidate plant species occur within the wind farm or Mt. Ka`ala communication sites, and no areas have been designated as critical habitat for any listed species. Vegetation in areas that would be disturbed consists of predominantly non-native species that are common throughout O`ahu and the main Hawaiian islands. Where native trees do occur, they would be avoided to the extent possible; if native trees are removed, at least an equal number of native trees would be replanted in surrounding areas of the property. No ground disturbance would occur at the Mt. Ka`ala communication sites. Operation: Mechanical methods would be used to clear vegetation in some areas during operation. Non-native species are expected to establish in these areas; therefore, no significant adverse impacts to botanical resources would be expected.	A very small amount of ground disturbance would occur for excavation of the tower footings at the Mt. Ka`ala communication sites, but these areas have been previously disturbed and do not support any protected species or habitats. Construction and operation impacts of this alternative would be commensurate with those associated with the Proposed Action.	There would be no change in existing conditions and no impacts to botanical resources.
Biological Resources (Fauna)	Construction: The impact on non-listed wildlife species would be minor. Incidental take of Federally and/or State listed species could occur as a result of collision with the turbines, equipment, vehicles, and other project components. Seven listed species could be impacted; these include: Newell's shearwater, Hawaiian duck, Hawaiian stilt, Hawaiian coot, Hawaiian moorhen, Hawaiian short-eared owl, and Hawaiian hoary bat. The proposed project includes measures to avoid, minimize, and mitigate take of these species as outlined in the Habitat Conservation Plan (HCP).	The height of the proposed towers at the communication sites would be no greater than that of the existing structures and, as such, would not expected to	There would be no change in existing conditions and no impacts to wildlife.

TABLE ES-1
Summary of Potential Impacts and Proposed Mitigation Measures

Resource Area	Proposed Action	Communication Site Layout Alternative	No Action Alternative
	Operation: Impacts during operation are similar to those described above, except that once operational, the turbines would have greater potential to affect listed species. The proposed project includes measures to avoid, minimize, and mitigate take of these species during operation as outlined in the HCP.	create a significant collision hazard to any of the covered species, if they should happen to transit these locations. Construction and operation impacts of this alternative would be commensurate with those associated with the Proposed Action.	
Historic, Archaeological, and Cultural Resources	Construction: To date, resources identified within the project area all date from the historic period and were likely associated with either former military operations or former plantation activities. Given the extent of previous disturbance within the site, it is likely that any earlier archaeological features have either been significantly impacted if not completely destroyed. To the extent possible, impacts will be avoided as part of construction of the project. However, in the event that impacts are unavoidable, it is expected that a reasonable and adequate amount of information has been collected to warrant a no further work requirement, and thus a no historic properties affected determination for these sites, subject to SHPD concurrence. It is anticipated that additional archaeological resources, if identified, would be similar in type and significance to those already identified. No archaeological or historic resources are known to occur within either of the Mt. Ka`ala communication sites. A Cultural Impact Assessment is currently being conducted to identify any cultural practices and beliefs associated with either the wind farm or Mt. Ka`ala communication sites; the complete findings of this assessment will be provided in the Final EIS. The project would not preclude or limit access to the area by cultural practitioners beyond the existing conditions. Operation: Same as above.	A very small amount of ground disturbance would occur for excavation of the tower footings at the Mt. Ka`ala communication sites. However, no archaeological or historic resources are known to occur. The project would not preclude or limit access to the area by cultural practitioners beyond the existing conditions.	There would be no change in existing conditions and no impacts to historic, archaeological, and cultural resources.
Visual Resources	Construction: During construction, visible components of the project would include construction equipment, and transport and assembly of project components, including the turbines. In general, these activities would be minor and temporary in nature. Operation: Once operational, the most visible component of the project would be the turbines, as they are taller and bulkier than the other structures (e.g., electrical substation, BESS, overhead collector lines). In general, the greatest number of wind turbines would be potentially visible from viewpoints located further away from the wind farm site. For viewpoints located closer to the wind farm, the turbines would be more visually prominent, but a fewer number of turbines would be potentially visible. In many cases, views of the wind turbines would be blocked by vegetation, existing structures, and topographical features.	Given the distance of the site and the small size of the equipment, the towers at the Mt. Ka`ala site would not be readily visible from any public vantage points. They would be visible from the Mt. Ka`ala summit access road and the	There would be no change in existing conditions and no impacts to visual resources.

TABLE ES-1
Summary of Potential Impacts and Proposed Mitigation Measures

Resource Area	Proposed Action	Communication Site Layout Alternative	No Action Alternative
		nearby hiking trails; however, the equipment is visually consistent with the existing communication facilities.	
Sound	<u>Construction:</u> Construction of the proposed project would produce short-term noise within the project area as a result of the operation of graders, excavators, trucks, and other heavy equipment. A noise permit would be obtained from HDOH; this permit would restrict the time of day when construction activities may emit noise. Other BMPs (e.g., use of noise barriers, mufflers on diesel and gasoline engines, and proper maintenance of machines) would be implemented to mitigate construction noise, as needed. <u>Operations:</u> Following construction, the only project components expected to generate sound on a regular basis would be the wind turbines. Turbine noise would not be expected to exceed the HDOH maximum permissible noise limits in areas that are zoned for agriculture. Noise levels would likely exceed the limits where the project site borders preservation land, and may require a variance. Noise from the wind turbines is expected to be less than the ambient levels measured in the communities surrounding the project site and would not likely be audible at these locations.	Construction and operation impacts of this alternative would be commensurate with those associated with the Proposed Action.	There would be no change in existing conditions and no impacts relative to sound.
Land Use	<u>Construction:</u> The project has been sited to avoid areas that are currently in agricultural production and, as such, no impacts to current agricultural operations are anticipated. Approximately 22.0 acres are within the permanent project footprint, and would no longer be available for agricultural purposes; however, given the amount of land available for cultivation in this area, this is not expected to significantly affect future agricultural production. Kamehameha Schools is currently pursuing agricultural operations within undeveloped portions of the wind farm site. The current and anticipated future uses of the Mt. Ka`ala sites are for communication facilities and as such the proposed project would not have a land use impact. <u>Operations:</u> Same as above.	Construction and operation impacts of this alternative would be the same as those associated with the Proposed Action.	There would be no change in existing conditions and no impacts relative to land use.
Transportation and Traffic	<u>Construction:</u> The major components of the wind farm, such as the blades, towers, and nacelles, would be transported by sea and offloaded at Kalaeloa Harbor. The equipment will be handled as general containerized cargo and is not expected to place an unusual demand on the harbor facilities. Delivery of the turbine components and other project equipment would require the use of existing State and County roadways by oversized vehicles. The proposed routes have been evaluated and the existing infrastructure is expected to be of sufficient capacity and dimension to accommodate the oversized loads. Potential impacts include traffic delays and delays in emergency services caused by periods where traffic flow must be stopped to allow oversized	Construction and operation impacts of this alternative would be commensurate with those associated with the Proposed Action.	There would be no change in existing conditions and no impacts relative to transportation and traffic.

TABLE ES-1
Summary of Potential Impacts and Proposed Mitigation Measures

Resource Area	Proposed Action	Communication Site Layout Alternative	No Action Alternative
	trailers to navigate turns. To mitigate these impacts, police escorts would be used and hours of transport would be restricted to those hours when traffic is typically light. Other project-related traffic would be associated with delivery of other project-related equipment and employee trips. These activities would increase traffic levels during project construction, but in general, the impacts would be short-term and localized in nature. <u>Operations:</u> Most of the vehicular traffic associated with operation of the proposed wind farm would be employees reporting to or leaving the facility and service trips by HECO maintenance personnel. The amount of vehicular traffic during operation would be minimal and the proposed project is not anticipated to noticeably increase traffic volumes on Kamehameha Highway or roadways in the area over the long-term.		
Military Operations	<u>Construction:</u> The eastern portion of the wind farm site overlaps with a Tactical Flight Training Area (TFTA), which is used by several services of the Department of Defense (DoD). To address concerns of the wind farm's impacts on military training, the DoD services formed a working group composed of the affected DoD services, First Wind, and the site's landowner, Kamehameha Schools. Construction-related impacts to military operations and training have not yet been identified by the Regional Mission Compatibility Review Team (RMCRT). It is anticipated that the group will develop measures to mitigate impacts, such as scheduling of construction activities and placement of construction equipment so as not be in conflict with military training. <u>Operations:</u> Potential impacts associated with operation of the project have been identified by the local RMCRT, and include: (1) effects on training, (2) use of airspace over the wind farm, (3) lighting and markings on the turbines, and (4) radar and electromagnetic interference. Operation and maintenance activities of the wind farm are being addressed by the RMCRT; efforts to date have resulted in changes to the project layout. Information on the progress of the RMCRT will be provided in the Final EIS. Access to, as well as radar and communications activities within the Mt. Ka`ala area are managed by the multi-agency Ka`ala Joint Use Coordination Committee (JUCC), which includes representatives from the U.S. Armed Services. Similar to that conducted for the Kahuku wind farm project for microwave equipment at the Hawaiian Telcom site, siting approval would be obtained from the Ka`ala JUCC for the microwave antennas for the Kawailoa Wind Farm project.	Construction and operation impacts of this alternative would be commensurate with those associated with the Proposed Action.	There would be no change in existing conditions and no impacts relative to military operations.
Hazardous Materials	<u>Construction:</u> No hazardous material or hazardous wastes are known to be present within the proposed wind farm project site. Construction would involve the use, transportation, or storage of small amounts of several hazardous materials that require special handling and storage. These would be identified, along with measures for containment and spill prevention, in a Spill Prevention, Countermeasure, and Control (SPCC) Plan. Potentially adverse impacts would be minimized by requiring the contractor to follow BMPs. A UST release was previously reported at the existing Hawaiian Telcom facility; therefore,	Construction and operation impacts of this alternative would be commensurate with those associated with the Proposed Action.	There would be no change in existing conditions and no impacts relative to hazardous

TABLE ES-1
Summary of Potential Impacts and Proposed Mitigation Measures

Resource Area	Proposed Action	Communication Site Layout Alternative	No Action Alternative
	measures will be taken to identify and mitigate potential issues that could arise during construction if residual contamination is encountered. Mitigation measures could include BMPs to minimize exposure of workers to contaminants during construction, and measures to store excavated materials using methods that would prevent release of potentially hazardous chemicals to the environment. Operations: Operation of the facility would require onsite use and storage of several materials that require special handling including common lubricants, petroleum products, or other chemical cleaning products. Implementation of the SPCC Plan, including BMPs, would minimize the risk of potential adverse impacts.		materials.
Socioeconomic Characteristics	Construction: Potentially beneficial effects of the proposed project include increased employment, business activity, and lease and tax revenue. During the construction phase, Kawailoa Wind may employ an average of 40 people per day, with an anticipated maximum level of 150 employees. No adverse impacts are anticipated. Operations: The project is not expected to result in new residents moving to the area due to increased energy availability and would therefore not be considered growth inducing. Operation would result in employing a regular staff of four to eight people and generating ongoing expenditures for materials and outside service No disproportionate adverse health or environmental impacts would occur to any low-income or minority population.	Construction and operation impacts of this alternative would be commensurate with those associated with the Proposed Action.	There would be no change in existing conditions and therefore no social or economic benefits associated with increased employment and revenues.
Natural Hazards	Construction: Neither construction nor operation of the proposed project is expected to affect the incidence rate of a natural hazard, with the exception of an increased potential for wildfires associated with use of vehicles and electrical equipment in the project area. To address the risk of wildfire, the site would be supported by an external fire hydrant, supplied from two water tanks. Although the occurrence rate is very low, construction and operation of the project could be adversely affected by a natural hazard, such as a hurricane or earthquake, should one occur. Operations: Same as above.	Construction and operation impacts of this alternative would be commensurate with those associated with the Proposed Action.	There would be no change in existing conditions and no impacts relative to natural hazards.
Public Safety	Construction: During construction, ignition sources for accidental fires include errant sparks from a variety of vehicles, equipment and tools, and discarded matches and cigarette butts. These are of limited intensity, and under most conditions are unlikely to spark a grass or other fire. To address fire risk, the site would be supported by an external fire hydrant, supplied from two water tanks, and fire-fighting equipment would be maintained in work vehicles. Operations: The wind farm facilities are greater than 1 mile away from the nearest residence, and are not publicly accessible. As such, the unlikely event of a tower collapse, blade throw or stray voltage significantly impacting public safety is minimal. The results of a shadow flicker	Construction and operation impacts of this alternative would be commensurate with those associated with the Proposed Action.	There would be no change in existing conditions and no impacts relative to public safety.

TABLE ES-1
Summary of Potential Impacts and Proposed Mitigation Measures

Resource Area	Proposed Action	Communication Site Layout Alternative	No Action Alternative
	analysis for the project indicated that areas of potential shadow flicker effect extend 1,395 meters from each turbine. Because the project is located in an agricultural area, no residences are located within the areas within which detectable shadow flicker would be created. The Mt. Ka`ala communication sites are isolated from any populated areas, and would not be expected to present any risk to public safety.		
Public Infrastructure and Services	Construction: The project has little potential to adversely affect utilities and public services during construction. Operations: The proposed project would place no additional burden on public services. It would consume only small amounts of electrical power, while potentially generating 70 MW of power. All of the water needed for the facility would be obtained from onsite water tanks, and an onsite septic tank system would be constructed to handle wastewater.	Construction and operation impacts of this alternative would be commensurate with those associated with the Proposed Action.	There would be no change in existing conditions and no impacts relative to public infrastructure and services.
Cumulative Impacts	Construction: The cumulative contribution of impacts that the Proposed Action would make on the various resources is expected to be minor. Operations: Same as above.	Cumulative impacts of this alternative would be commensurate with those associated with the Proposed Action.	There would be no cumulative impacts.

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Table of Contents

FIGURES

TABLES

APPENDICES

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Acronyms and Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
$\mu g/m^3$	micrograms per cubic meter
AC	alternating current
ALISH	Agricultural Lands of Importance to the State of Hawai`i
APLIC	Avian Power Line Interaction Committee
ARC	Ashley Road Corridor
ARSR	Air Route Surveillance Radar
ASL	above sea level
AST	aboveground storage tank
AWEA	American Wind Energy Association
BESS	Battery Energy Storage System
BLM	U.S. Bureau of Land Management
BLNR	Board of Land and Natural Resources
BMP	best management practice
BWS	Honolulu Board of Water Supply
CAA	Clean Air Act
CAES	compressed air storage
CDP	Census Designated Place
CFR	*Code of Federal Regulations*
CH_4	methane
CHRC	Cane haul Road Corridor
CIA	Cultural Impact Assessment
CO	carbon monoxide
CO_2	carbon dioxide
CWA	Clean Water Act
CWRM	Commission on Water Resource Management
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DAR	Division of Aquatic Resources
dB	decibel
dBA	A-weighted decibel
DBEDT	Hawai` i Department of Business, Economic Development, and Tourism
DC	direct current
DEM	digital elevation model
DLAA	D.L. Adams Associates, Ltd.

DLNR	Department of Land and Natural Resources
DoD	Department of Defense
DOE	U.S. Department of Energy
DOFAW	Division of Forestry and Wildlife
DP	Development Plan
DPP	(City and County of Honolulu) Department of Planning and Permitting
E	endangered
En	endemic
EIS	environmental impact statement
EISPN	Environmental Impact Statement Preparation Notice
ELG	effluent limitations guidelines
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
ESRC	Endangered Species Recovery Council
FAA	Federal Aviation Administration
FAC	facultative
FACU	facultative upland
FCC	Federal Communications Commission
FE	Federally endangered
FEMA	Federal Emergency Management Agency
FT	Federally threatened
ft	feet
ft^2	square feet
FIRM	Flood Insurance Rate Map
First Wind	First Wind, LLC
GE	General Electric
GPS	global positioning system
H-Power	Honolulu Project of Waste Energy Recovery
HAAQS	Hawai`i ambient air quality standards
HAR	Hawai`i Administrative Rules
HBRC	Hawai`i Bat Research Cooperative
HC	hydrocarbons
HCEI	Hawai`i Clean Energy Initiative
HCP	Habitat Conservation Plan
HDOH	State of Hawai`i Department of Health
HECO	Hawaiian Electric Company
HELCO	Hawai`i Electric Light Company
Hg	mercury
HRS	Hawai`i Revised Statutes
Hz	hertz

IPCC	Intergovernmental Panel on Climate Change
IRS	Interconnect Requirement Study
ISO	International Standards Organization
ITL	Incidental Take License
ITP	Incidental Take Permit
Kawailoa Wind	Kawailoa Wind, LLC
KOP	key observation point
kph	kilometers per hour
KRC	Kawailoa Road Corridor
KTA	Kawailoa Training Area
kV	kilovolt
kW	kilowatt
kWh	kilowatt hours
LSB	Land Study Bureau
Leq	equivalent sound pressure level
LUC	Land Use Commission
LUO	Land Use Ordinance
LWSC	low wind speed curtailment
m/s	meters per second
MARAMA	Mid-Atlantic Regional Air Management Association
MBTA	Migratory Bird Treaty Act
MECO	Maui Electric Company
mm/year	millimeters per year
MOU	Memorandum of Understanding
mph	miles per hour
MRI	Midwest Research Institute
msl	mean sea level
MW	megawatts
MWh	megawatt hours
NAAQS	National Ambient Air Quality Standards
NAR	Natural Area Reserve
NARS	Natural Area Reserve System
NaS	sodium-sulfur
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act of 1966
NN	non-native permanent resident
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NSPS	new source performance standards

NWCC	National Wind Coordination Collaborative
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
O&M	operations and maintenance
OCCL	(DLNR) Office of Conservation and Coastal Lands
OEG	Obstruction Evaluation Group
OEQC	(HDOH) Office of Environmental Quality Control
PM	particulate matter
POI	point of interconnection
PPA	power purchase agreement
PUC	Public Utilities Commission
RFP	Request for Proposal
ROH	Revised Ordinances of Honolulu
rpm	rotations per minute
RPS	Renewable Portfolio Standard
SCP	Sustainable Community Plan
SE	State endangered
ST	State threatened
SHPD	Hawai`i State Historic Preservation Division
SHPO	State Historic Preservation Office
SLDA	Site Lease Development Agreement
SMA	Special Management Area
SMES	superconducting magnetic energy storage
SO_2	sulfur dioxide
SPCC	Spill Prevention, Countermeasure, and Control
SWCA	SWCA Environmental Consultants
T	threatened
TFTA	Tactical Flight Training Area
TMK	Tax Map Key
TNW	traditional navigable waters
UH	University of Hawai`i
UPL	obligative upland
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
V	volt
WEOP	Wildlife Education and Observation Program

WRCC	Western Regional Climate Center
WTA	Western Tableland Array
ZVI	zone of visual influence

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1.0 Purpose and Need

1.1 Project Overview

Kawailoa Wind, LLC (Kawailoa Wind) is proposing to construct, operate, and maintain a wind farm at the former Kawailoa Plantation, located on the north shore of the island of O`ahu, Hawai`i. The project would generate approximately 70 megawatts (MW) of clean, renewable power that would be provided to Hawaiian Electric Company (HECO) under the terms of a power purchase agreement (PPA), to be approved by the Public Utilities Commission (PUC).

Specific project components would include wind turbine generators (turbines), underground and overhead electrical collector lines to carry the electrical power from each wind turbine generator to an electrical substation, a battery energy storage system (BESS), two interconnection facilities, two communication towers, an operations and maintenance (O&M) building and laydown area, meteorological monitoring equipment, and onsite roads to enable access to each of these components. The project would also include installation of additional communication equipment at two existing Hawaiian Telcom facilities near the summit of Mt. Ka`ala; the purpose of this equipment would be to provide a dedicated communication link between the wind farm and existing HECO substations in Waialua and Wahiawā. A variety of studies and evaluations has been conducted (and in some cases, are ongoing) to thoroughly characterize the site conditions and constraints; based upon these, a project layout was developed, thus defining the Proposed Action. To the extent possible, the project components have been sited to maximize energy production, while minimizing site disturbance and adverse impacts on existing vegetation and agricultural use of the land. The specific conditions and constraints and the resulting layout of the project facilities is discussed in detailed in Section 2.0.

The project would require several actions, including the use of State lands and a request for a Conservation District Use Permit that would trigger the requirement for compliance with the State's environmental review process, in accordance with Hawai`i Revised Statutes (HRS) Chapter 343 and Title 11, Chapter 200 of the Hawai`i Administrative Rules (HAR). This Environmental Impact Statement (EIS) has been prepared in compliance with these law and rules. Pursuant to HRS Chapters 343 and 201N, the Hawai` i Department of Business, Economic Development, and Tourism (DBEDT) is the accepting authority for the EIS.

1.1.1 Applicant Background

Kawailoa Wind was formed by First Wind, LLC (First Wind), a Boston-based wind energy company, for the express purpose of developing a wind power facility at the former Kawailoa Plantation. First Wind is a leading independent wind energy company exclusively focused on the financing, construction, ownership, and operation of utility-scale wind projects in the United States (U.S.). First Wind currently has seven projects in operation across the U.S. with a total generating capacity of more than 500 MW, as well as a considerable pipeline of prospective projects under development.

In Hawai`i, First Wind is currently operating Kaheawa Wind Power I on Maui (Hawai`i's largest wind farm) and has begun construction of Kaheawa Wind Power II. First Wind's Kahuku Wind Power on O`ahu was recently constructed and is in the process of being commissioned for connection to HECO's electrical grid. First Wind is also pursuing the development of additional wind power projects elsewhere in the State.

1.2 Project Purpose and Need

1.2.1 Project Need

As one of the world's most remote island chains, with no fossil fuel resources of its own, Hawai`i is the most dependent on imported energy of all the U.S. states. In 2005, approximately 95 percent of Hawai`i's primary energy was derived from imported fossil fuels (such as petroleum and coal) (Global Energy Concepts, 2006). Consequently, Hawai`i's consumer energy prices are some of the highest in the nation and the State is exceedingly vulnerable to fluctuations in resource availability. The importance of increasing Hawai`i's energy security has recently gained momentum throughout the State, resulting in various regulations and initiatives relative to renewable energy.

Specifically, the State established Renewable Portfolio Standards (RPS) (HRS §269-92), which require HECO and its affiliates, Hawaii Electric Light Company (HELCO) and Maui Electric Company (MECO), to generate renewable energy equivalent to 10 percent of their net electricity sales by the end of 2010, 15 percent by the year 2015, 20 percent by 2020, and 40 percent by 2030. In addition, the Global Warming Solutions Act of 2007 requires that Hawai`i's greenhouse gas emissions be reduced to levels at or below 1990 levels by January 2020. On January 28, 2008, the State also signed a Memorandum of Understanding (MOU) with the U.S. Department of Energy (DOE) that established the Hawai`i Clean Energy Initiative (HCEI). A subsequent agreement (the Energy Agreement) signed in October 2008 between the State and the Hawaiian Electric companies specified that the parties would work together to help Hawaiian Electric companies achieve as much as 40 percent renewable energy by 2030. In April 2010, the HCEI Program was added to State law, as HRS Chapter 196.

Collectively, these regulations and initiatives reflect the State's commitment to move away from petroleum-based energy generation and expand its portfolio of renewable energy projects, thus establishing an overwhelming need for the development and implementation of renewable energy projects throughout the State.

1.2.2 Project Purpose

The purpose of the proposed project is to generate electrical energy from wind, thereby providing clean, renewable energy for the State of Hawai'i. Implementation of the project would contribute to the State's portfolio of renewable energy projects, as well as provide environmental and economic benefits to the State and the local community.

As currently proposed, the project would provide 70 MW of wind-generation capacity, which is enough to power up to approximately 14,500 homes on O`ahu. This would help to meet the State's established regulatory requirements and initiatives, as well as diversify O`ahu's power supply and contribute to the State's energy independence and security, mitigating potential volatility in the fossil fuel supply. Production of wind-generated energy would replace a portion of the State's electricity that is currently generated by burning fossil fuels, thus reducing greenhouse gas emissions and other forms of pollution that are detrimental to the environment and human health. The energy potentially generated by the project would eliminate the use of approximately 304,200 barrels of oil, which in turn would reduce emissions of carbon dioxide (CO_2) by more than 134,400 tons. Other air pollutants for which emissions would be reduced include sulfur dioxide (SO_2), nitrogen oxides (NO_x), and mercury (Hg).

The proposed project would also result in economic benefits, as it would contribute to the local economy, generate new jobs, and provide a stable, long-term source of tax revenue for the State and County. Furthermore, power generated by the wind farm is expected to be sold under a long-term, fixed-price contract and, as such, the proposed project would also provide long-term price stability for energy production.

1.3 Objectives of the Proposed Action

Given the statutory need for renewable energy projects in the State of Hawai`i and the purpose of the proposed project, the following objectives have been identified for the Proposed Action, pursuant to HAR §11-200-17(e)(2):

- Bring on-line at the earliest possible date a wind farm with a generating capacity of up to 70 MW on the island of O`ahu to increase the portion of O`ahu's energy derived from indigenous renewable sources and reduce dependencies on fossil fuels;
- Ensure that the size and operating characteristics of the new wind farm are compatible with HECO's overall system requirements to facilitate integration into the existing grid;
- Locate the wind farm in an area with compatible land uses, and allow for continued agricultural activities; and
- Maintain overall environmental quality and contribute to stabilizing future energy prices.

These project objectives were used to define the range of project alternatives, evaluate and eliminate those alternatives that were not practicable, and identify and refine the Proposed Action, as further discussed in Section 2.0.

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2.0 Proposed Action and Alternatives Considered

This chapter describes the Proposed Action, as well as the range of alternatives identified as part of the planning process. Section 2.1 provides a detailed description of the Proposed Action, including a discussion of the project background, site planning efforts, construction, operation and maintenance activities, and a general project schedule. Section 2.2 describes the range of reasonable alternatives that satisfy the objectives of the Proposed Action (as identified in Section 1.3) and have been be evaluated in detail. Finally, Section 2.2.3 describes those alternatives that were identified through the planning process, but have been eliminated from further consideration.

2.1 Proposed Action

2.1.1 Background and History

In 2008, Kamehameha Schools conducted a master planning effort to develop a framework for sustainable management for all its land holdings on the north shore of O`ahu. The resulting plan identified a range of development concepts, including outdoor education, diversified agriculture, and renewable energy, all of which were developed with community input and reflect the vision and mission of Kamehameha Schools. Seven catalyst projects were described in the Master Plan, one of which was a wind energy project on lands that were historically part of Kawailoa Plantation, a sugar cane plantation operated by Waialua Sugar Company (Kamehameha Schools, 2008).

In May 2008, following presentation of the development concept in the Master Plan, Kamehameha Schools solicited proposals from wind farm developers in anticipation of a formal renewable energy project selection process by HECO. Preliminary wind modeling conducted as part of the proposal effort indicated that the wind resources were strongest in the northern portion of the Kawailoa Plantation lands; thus, project development was focused in this area. Subsequently, HECO issued a Request for Proposals (RFP) for Renewable Energy Projects for the Island of O`ahu (dated June 2008). In 2009, the project was selected by HECO to be one of several projects included in their renewable energy portfolio, which established the rights to negotiate a PPA. Following selection, Kawailoa Wind acquired the rights to develop the project.

In terms of wind resource availability and constructability, the former Kawailoa Plantation is believed to be one of the last remaining areas on O`ahu that is suitable for development of a large-scale wind energy project. In general, the relatively flat topography of the former agricultural fields allows for conventional construction methods, with most project activities occurring in previously disturbed areas. The existing cane haul roads can generally accommodate the necessary construction vehicles. Two existing HECO 46 kilovolt (kV) sub-transmission lines traverse the project site, providing access to the existing electrical grid without major upgrades to HECO facilities. In addition, the site is located in an area that is designated by the State of Hawai`i as an agricultural district, and is zoned by the City and

County of Honolulu as AG-1 Restricted Agriculture (with the exception of a very small area that is zoned as P-1, Restricted Preservation).[1] Wind energy projects are compatible with agricultural uses, as specified in the State Land Use law (HRS §205-4.5) and the City and County of Honolulu Land Use Ordinance (Revised Ordinances of Honolulu [ROH] Section 21-10.1).

2.1.2 Project Location

The proposed wind farm site is located approximately 5 miles northeast of Hale`iwa town, on the north shore of the island of O`ahu. It is comprised almost entirely of Kawailoa Plantation lands, which are owned by Kamehameha Schools. The existing onsite access roads traverse several small properties owned by other entities. Kamehameha Schools currently has reciprocal agreements with these other landowners for access through their properties; it is anticipated that these rights would be extended to Kawailoa Wind for construction and operation of the project. Communication equipment needed to link the communication equipment on the wind farm site to HECO's existing substations, thereby allowing wind farm outputs to be matched to electrical grid demands, would also be installed at two existing communication sites located approximately nine miles southwest of the wind farm, near the summit of Mt. Ka`ala. The proposed communication sites are located entirely on land owned by the State of Hawai`i and leased by Hawaiian Telcom.

Figure 1 shows the general project location for both the proposed wind farm and the proposed Mt. Ka`ala communication sites. A representative view of the proposed wind farm site is shown in Figure 2. The tax map keys (TMKs) for both the wind farm and the Mt. Ka`ala communication sites are listed in Table 1; those for the proposed wind farm site are shown in Figure 3.

---

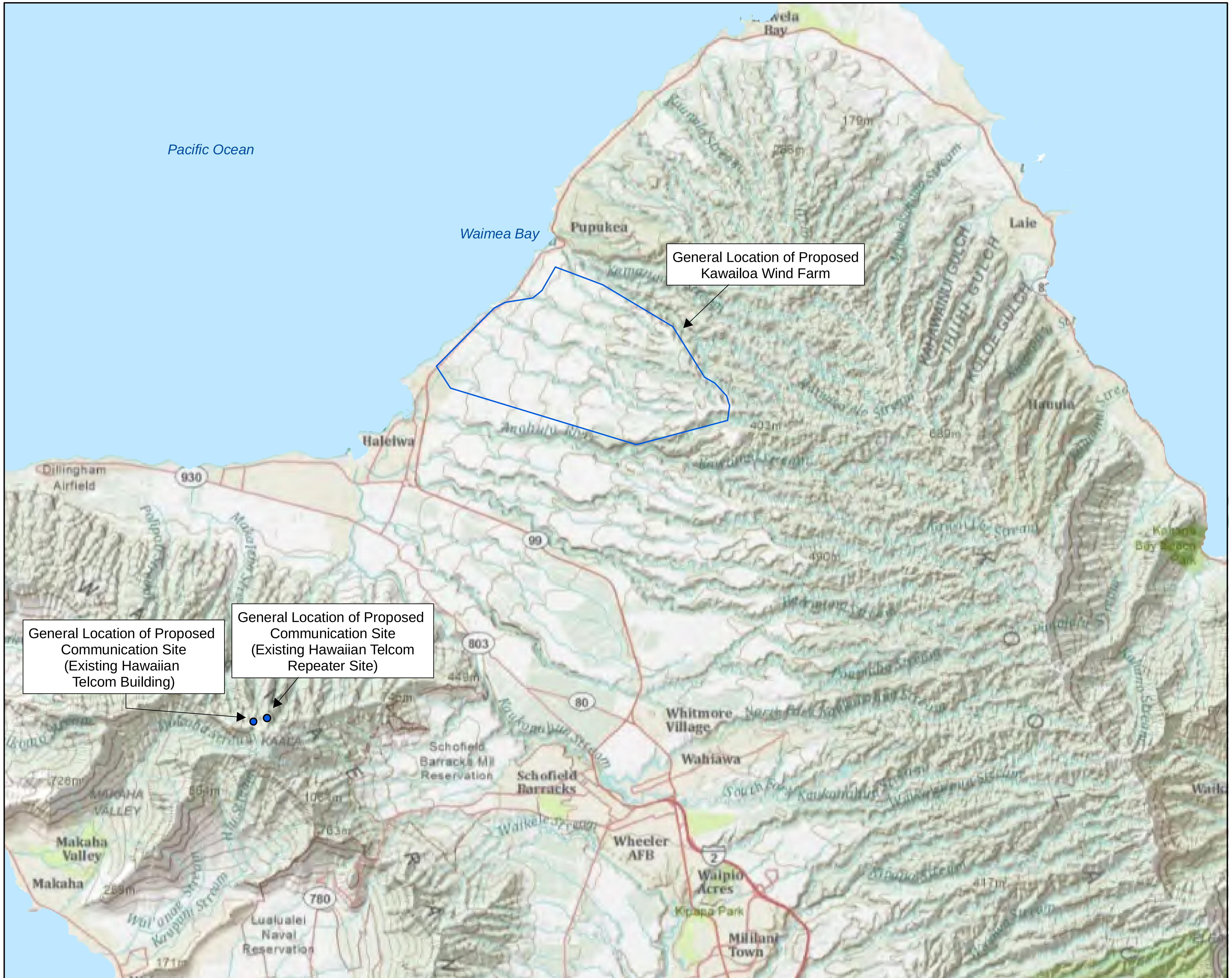
[1] Under the City and County of Honolulu Land Use Ordinance (LUO), regulatory authority within the P-1 District is delegated to the appropriate State agency. The area identified as P-1 District is within the State Agricultural District.

TABLE 1
Parcel Information for the Kawailoa Wind Farm Project

Project Component	Landowner(s)	Tax Map Key (TMK)
Wind Farm Site	Kamehameha Schools	61005001
	Kamehameha Schools	61006001
	Kamehameha Schools	61007001
	Kamehameha Schools	62009001
	Kamehameha Schools	62011001
Traversed By Existing Onsite Access Roads [a]	Gordon M. Saker	61005003
	Kamehameha Schools	61005007
	Kamehameha Schools	61005014
	Kamehameha Schools	61005015
	Kamehameha Schools	61005016
	Kamehameha Schools	61005019
	Kawailoa Mauka Ranches (Condo Master) Sean Ginella/Kawailoa Mauka LLC	61005020
	Kamalani Ranch Company LLC	61005021
	Steve T. Watanabe Trust	61005022
	Kamehameha Schools	61008025
	Kamehameha Schools	62002001
	Dole Food Co Inc., James K. Pollock, Lily A. Ahia, William K. Ahia III, Sam K. Ahia Trust, Alfred A.D. Ahia, Robert K. Ahia	62002002
	Harrison P. Thurston Trust	62002003
	Kamehameha Schools	62002025
Mt. Ka`ala Communication Sites	State of Hawai`i	67003024

NOTES:

[a] Kamehameha Schools currently has reciprocal agreements with these landowners for access through their properties; it is anticipated that these rights would be extended to Kawailoa Wind for construction and operation of the project.



LEGEND

Major Road

0 0.75 1.5 3
Miles

N

Figure 1
General Location of Proposed Kawailoa Wind Farm Project
Kawailoa Wind Farm Project
Oahu, Hawaii

CH2MHILL

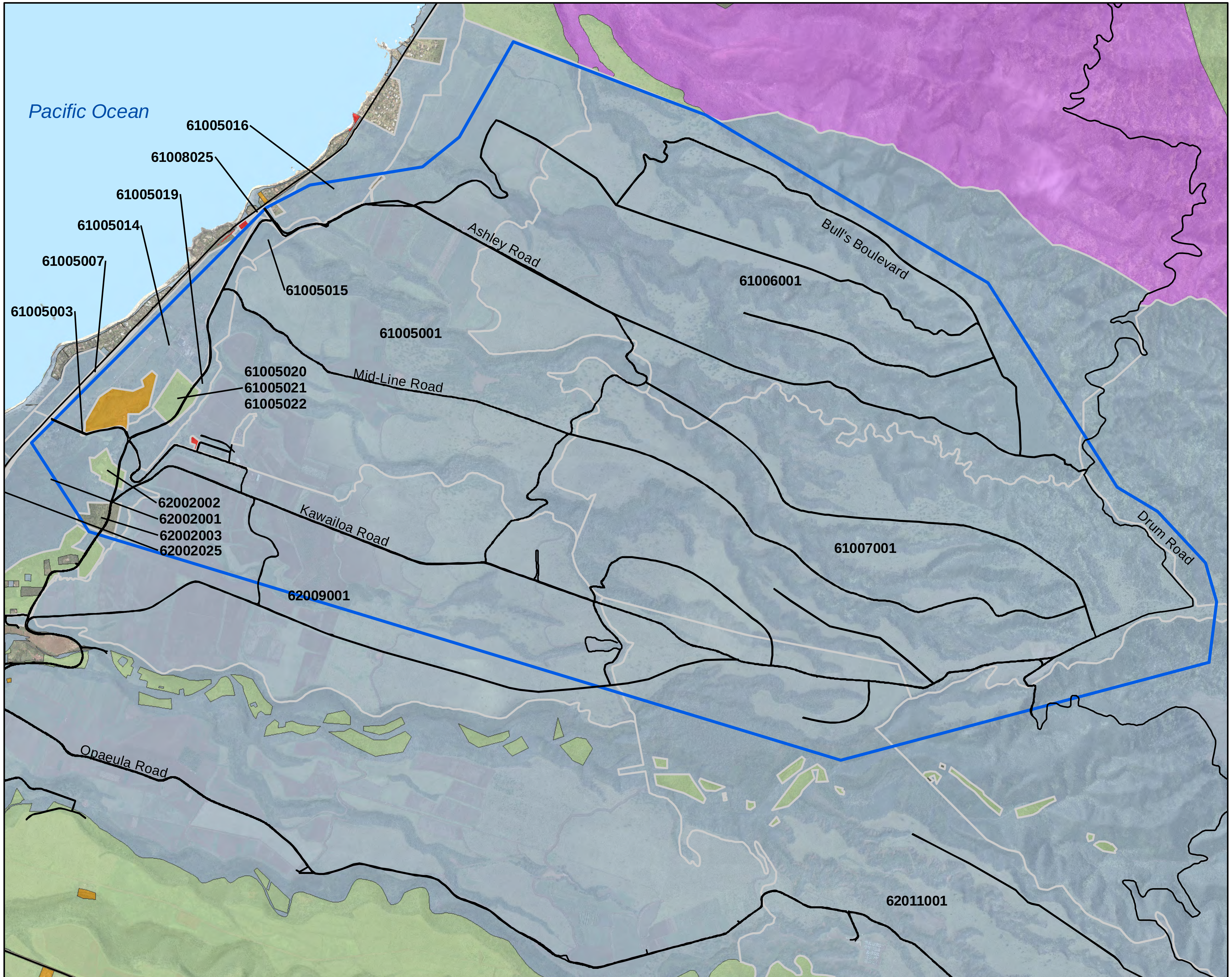
FIGURE 2
Representative View of the Proposed Kawailoa Wind Farm Site (Looking east, up Kawailoa Road)

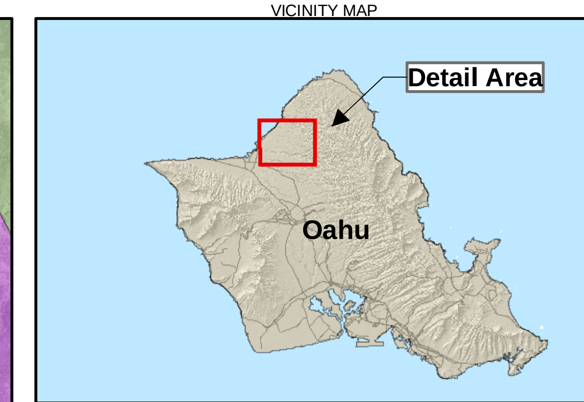
2.1.2.1 Proposed Land Use Agreement

Kawailoa Wind has obtained a Letter of Intent from Kamehameha Schools for use of the proposed wind farm site at the former Kawailoa Plantation and is currently negotiating the lease terms. Kawailoa Wind is also applying for a license agreement with Hawaiian Telcom and will coordinate with the State of Hawai`i Division of Land and Natural Resources (DLNR) Land Division for use of lands at the proposed Mt. Ka`ala communication sites.

2.1.3 Project Description

The proposed project would involve construction, operation, and maintenance of wind turbine generators and other appurtenant facilities required for the wind farm. The following facilities would be located at the Kawailoa wind farm site: wind turbine generators, electrical collector lines, an electrical substation, a BESS, two interconnection facilities, two communication towers, an O&M building and laydown area, meteorological monitoring equipment, and onsite access roads to enable access to each of these components. The project would also include installation, operation, and maintenance of communication equipment at two existing Hawaiian Telcom facilities near the summit of Mt. Ka`ala. A summary of these facilities and preliminary estimates of the associated area of disturbance is summarized in Table 2.





LEGEND

Existing Roads
General Project Location
TMK Parcel
Ocean

Land Ownership

Hi'ipaka LLC
Other Private Entities
City and County of Honolulu
State Government
Kamehameha Schools

Source:
Project Facilities - First Wind
Existing Hawaiian Electric Lines - First Wind
Basemap - Hawaii Statewide GIS Program (http://hawaii.gov/dbedt/gis)

N
0 0.25 0.5 1
Miles

Figure 3
Land Ownership and Tax Map Keys
Kawailoa Wind Farm Project
Oahu, Hawaii

HNL \\NALA\PROJ\FIRSTWINDLLC\398315KAWAILOA\GIS\MAPFILES\EIS\FIG3_KAWAILOA_TMKOWNERS.MXD LSHARIQ 2/7/2011 12:27:58

CH2MHILL

TABLE 2
Areas of Disturbance Associated With Each Project Component (All Areas Are Approximate)

Project Component	Quantity	Description of Area to be Disturbed (ft = feet, ft^2 = square feet)	Total Extent of Disturbance	Long-Term Vegetation Management	Permanent Footprint of Facilities
WIND FARM SITE					
Wind turbine generators	30 turbines	Wildlife search areas = 9.9 acres per turbine (370 foot radius) [a] Temporary work area = 2.9 acres per turbine (200 foot radius) Permanent foundation = 2,800 ft^2 per turbine (30 foot radius)	251.0 acres [a]	249.1 acres	1.9 acres
Electrical collector lines [b]	5.6 miles of overhead lines [c] (approximately 80 poles)	Corridor width = 25 feet Footprint = 5 ft x 5 ft (25 ft^2) per pole	6.85 acres	6.8 acres	0.05 acre
	6.1 miles of underground lines	Corridor width = 3 feet	2.2 acres	--	--
Electrical substation	1	175 ft x 250 ft = 43,750 ft^2 (1.0 acre)	1.0 acre	--	1.0 acre
Battery energy storage system	1	108 ft x 130 ft = 14,040 ft^2 (0.32 acre)	0.3 acre	--	0.3 acre
Interconnection facilities (each includes a control house and communication tower)	2	200 ft x 200 ft = 40,000 ft^2 (0.9 acre)	1.8 acres	--	1.8 acres
O&M building	1	70 ft x 100 ft = 7,000 ft^2 (0.2 acre)	0.2 acre	--	0.2 acre
Laydown area	1	175 ft x 350 ft = 61,250 ft^2 (1.4 acres)	1.4 acres	--	0.2 acre [d]
Meteorological monitoring equipment	4 towers	Wildlife search areas = 0.18 acre per tower (50 foot radius) Foundation = 35 ft x 35 ft (1,225 ft^2)	0.7 acre	0.6 acre	0.1 acre
Onsite access roads	9.8 miles of existing access roads to be improved [e]	Width of straight sections = 20 - 36 ft Width around turns ≤ 85 ft Permanent width = 20 ft	28.4 acres	--	9.5 acres
	2.8 miles of new access roads	Width of straight sections = 36 ft Width around turns ≤ 85 ft Permanent width = 20 ft	12.4 acres	--	6.9 acres
Subtotal			**306.4 acres**	**256.5 acres**	**22.0 acres**

TABLE 2
Areas of Disturbance Associated With Each Project Component (All Areas Are Approximate)

MT. KA`ALA SITE					
Communication equipment at existing Hawaiian Telcom building	Up to 2 microwave antenna dishes	Dish mounted on existing tower	--	--	--
Communication equipment at existing Hawaiian Telcom repeater station	Up to 2 microwave antenna dishes	Dish mounted on existing tower	--	--	--
Subtotal			**0 acre**	**0 acre**	**0 acre**
ENTIRE PROJECT					
Total			**306.4 acres**	**256.5 acres**	**22.0 acres**

NOTES:

[a] Based on a radius of 370 feet for the search plot around each turbine, the total area of disturbance associated with the turbines would be approximately 296.2 acres. However, approximately 45.2 acres is considered to be unsearchable due to steep topography; therefore, the total area within the search plots is anticipated to be approximately 251.0 acres.

[b] The electrical connector lines running from the substation to the two POIs are quantified as part of this category.

[c] Of the 5.6 miles of overhead collector lines, approximately 3.35 miles would be located along access roads or existing electrical lines, and presumably would fall within the footprint of those features. The calculation of total area disturbed by the overhead lines is based only on the remaining 2.25 miles of lines that are not located along access roads or existing electrical lines.

[d] The permanent footprint of the laydown area would include the parking area for the O&M building, water tank storage, and the septic system.

[e] The calculation of total area disturbed by the onsite access roads assumes the average width of the existing onsite roads is 12 feet, and the average width of the new and improved roads would be 36 feet. Therefore, the total area disturbed by improved roads would be equal to the road length (9.8 miles) multiplied by an average increase in width of 24 feet (36 feet minus 12 feet). The permanent footprint for the improved roads would be equal to the road length (9.8 miles) multiplied by an average increase in the footprint of 8 feet (20 feet minus 12 feet).

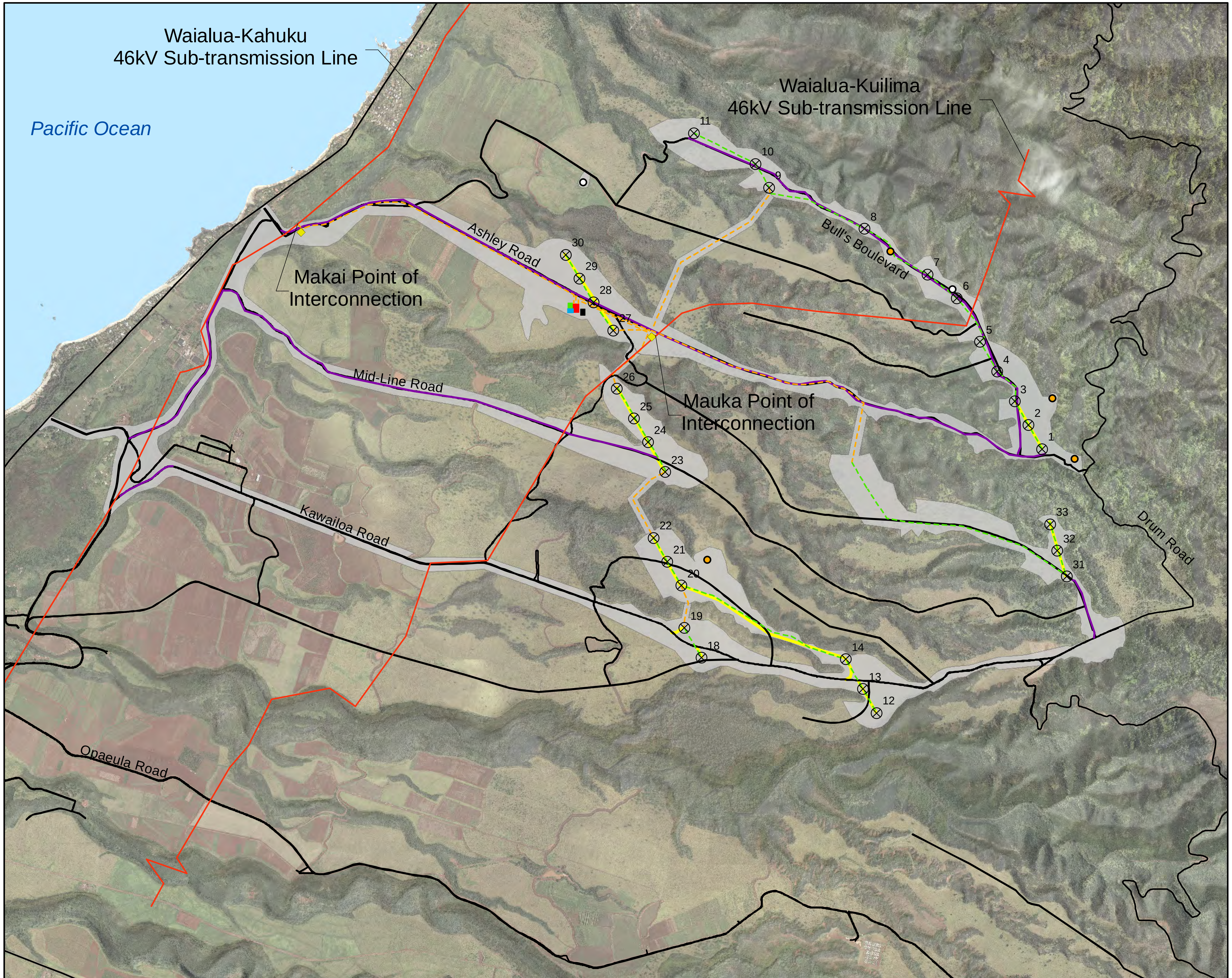
Overall, construction of the project facilities would occur over approximately an approximately 12-month period, following which the project would be interconnected to HECO's existing system and operation of the project would commence following a testing and commissioning period. Based on the terms of the PPA, the project is expected to have an operational life of 20 years, with provisions for an extension. The project facilities would be regularly maintained over the lifetime of the project; at the completion of operational phase, each of the components would be decommissioned, removed from the project site, and disposed of in accordance with applicable regulations. Following is a discussion of the layout of these components, as well as a description of the associated construction, operations, and maintenance activities.

2.1.3.1 Site Layout

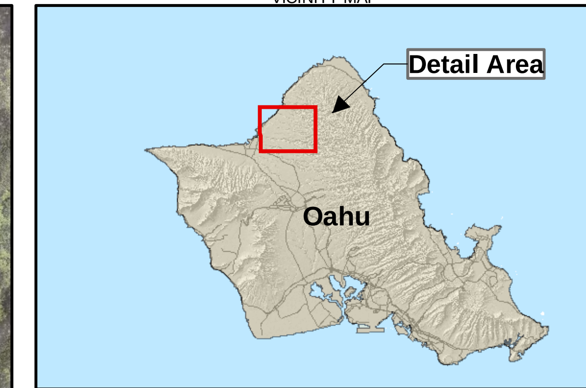
To assist with the development of a site layout, a variety of site conditions and constraints were considered relative to the key project components. Beginning in 2009, temporary meteorological monitoring towers were permitted and installed at the proposed wind farm site to obtain in-depth information about the distribution of onsite wind resources. The results to date indicate that the wind regime is strongest along the northeastern edge of the property, and decreases toward the south and west.

The most notable site constraint relates to airspace associated with approaching flight lines and a helicopter training area, both of which are used in military operations and training. In particular, the eastern portion of the wind farm site overlaps with a Tactical Flight Training Area (TFTA). Based on ongoing consultations with representatives of the military, portions of the Kawailoa property were constrained for the siting of wind turbine generators. Site topography was also identified as a constraint, primarily in terms of precluding access for delivery of large turbine components and construction equipment. Previous management of the site for agriculture has resulted in a series of well-defined, relatively flat fields, which could readily support construction of the project components. However, the fields are separated by steep gulches that are generally not suitable for construction and, in some cases, restrict access by construction vehicles to other portions of the property. As such, the site topography was evaluated to identify those areas that should be excluded from consideration because they are either too steep for construction or cannot be reasonably accessed.

Based on the distribution of wind resources and the site constraints, those portions of the Kawailoa parcel that are acceptable locations to site the project components were identified, resulting in the delineation of a series of corridors which cumulatively represent the maximum project envelope. Within this envelope, the wind turbine generators were sited to optimize productivity while allowing for adequate spacing. The electrical substation and the BESS were sited to be proximate to the existing HECO sub-transmission lines, to facilitate interconnection. The O&M building was sited to be central to the other project components, and adjacent to an existing access road. The network of onsite roads was then defined to ensure access to each project component, relying on existing access roads to the extent possible. In addition, the system of collector lines was defined to provide an electrical connection between each turbine and the substations. The roads and collector lines were sited to minimize site disturbance and avoid known cultural and biological resources. The site layout was then iteratively reviewed; the resulting site layout is shown in Figure 4.



VICINITY MAP



LEGEND

- Turbine
- Existing Meteorological Tower
- Proposed Meteorological Tower
- Substation
- Battery Energy Storage System (BESS)
- O&M Building
- Laydown Area
- Interconnection Facility
- Existing HECO 46kV Sub-transmission Line
- Overhead Collector Line
- Underground Collector Line
- Existing Roads
- Existing Roads to be Improved
- New Roads
- Maximum Project Envelope
- Ocean

Source:
Project Facilities - First Wind
Existing Hawaiian Electric Lines - First Wind
Basemap - Hawaii Statewide GIS Program (http://hawaii.gov/dbedt/gis)

0 0.25 0.5 1
Miles

Figure 4
Proposed Wind Farm Layout
Kawailoa Wind Farm Project
Oahu, Hawaii

HNL \\NALA\PROJ\FIRSTWINDLLC\398315KAWAILOA\GIS\MAPFILES\EIS\FIG4_PROJECTLAYOUT.MXD LSHARIQ 12/22/2010 13:57:16

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It is expected that, based on ongoing site evaluations, additional micrositing will be conducted, resulting in minor modifications to the site layout. Minor modifications could include adjustments in the location of project components within the same general vicinity, but no changes to the maximum project envelope. These modifications would be presented as part of the Proposed Action in the Final EIS.

2.1.3.2 Project Components

The project components located at the wind farm site would collectively function to generate and transmit electricity to HECO's existing grid. Specifically, the electricity generated by the turbines would be carried by a series of underground and overhead electrical collector lines to a BESS, which would be used to partially store, regulate and stabilize the energy output. From the BESS, electricity would be transmitted to an adjacent substation, where the voltage would be increased to sub-transmission (46 kV) levels. Overhead 46 kV connector lines would then carry the electricity to interconnection facilities at two separate points of interconnection (POI) with the existing HECO 46 kV sub-transmission lines) at which the wind-generated electricity would be integrated into the existing HECO grid. A dedicated communication link between the wind farm site and the HECO grid would be provided via microwave communication equipment located at each of the interconnection facilities and at two offsite locations at existing Hawaiian Telcom facilities near Mt. Ka`ala. Other appurtenant facilities, including an O&M building, needed to house the wind farm management system, would also be constructed on the wind farm site. In addition, meteorological equipment would be used to monitor the wind resources. The majority of these project components are located adjacent to existing roads, some of which would require widening or other improvements to accommodate turbine delivery and construction vehicles. Several short segments of new roadways would also be constructed to facilitate access to the turbine sites.

Wind Turbine Generators

Several different turbine models were evaluated for constructability, reliability, performance, and availability. Based upon these factors and the meteorological data collected to date, the Siemens SWT-2.3-101 turbine was selected for use. Like most wind turbine generators, the Siemens turbine consists of three basic elements: a tower, rotor, and nacelle (Figure 5). The exterior of these elements would be painted a shade of white, in accordance with industry standards worldwide.

As specified in an FAA-approved lighting plan, a flashing red light would be installed on the nacelle of designated turbines and meteorological towers to improve nighttime visibility for aviation. Following recommendations by the U.S. Army, lights would be installed on all turbines that overlap with the TFTA. These lights would by synchronized to flash simultaneously.

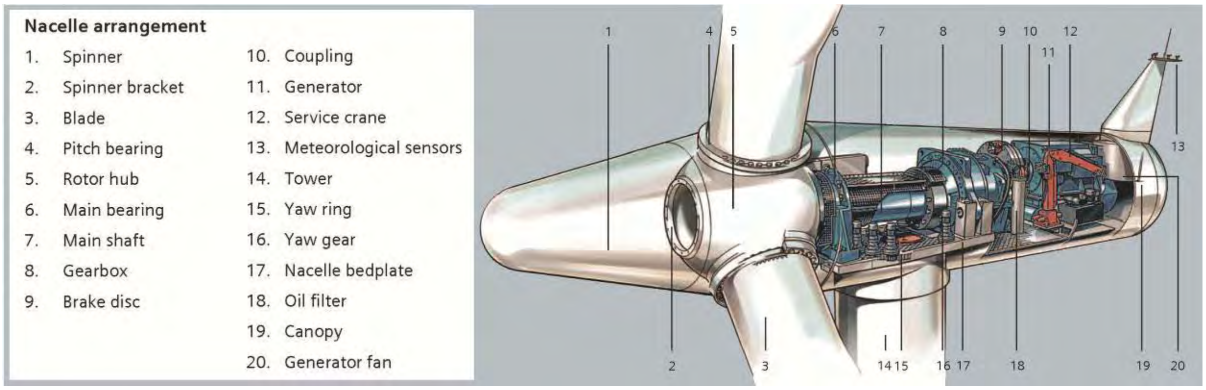

FIGURE 5
Elements of a Siemens Turbine

The tower is a conical steel tube that serves to elevate the rotor and nacelle above the ground. In general, wind speeds increase with height and taller towers can allow for more energy to be captured. The tower for the Siemens turbine is approximately 328 feet (100 meters) high, ranging in width from 15 feet (4.6 meters) at the base to 10 feet (3 meters) at the tip. Each tower would contain an internal safety ladder that allows access and a load-lifting system that would allow work equipment and parts to be hoisted from the ground to the nacelle. The nacelle sits atop each tower, and contains the gear box, low- and high-speed shafts, generator, controller, and brake. The rotor includes the hub and blades and is attached to the nacelle. The rotor of the Siemens turbine has a diameter of approximately 332 feet (101 meters). When the blade is at the top of its arc, the tip extends approximately 493 feet (150.5 meters) above the ground.

The nacelle is mounted on the tower in a manner that enables 360-degree horizontal rotation and is equipped with sensors that monitor wind speed and direction. When the wind speed increases to within operating range, the sensors cue the turbine to orient itself to face the wind, and switch the rotor from a dormant to an active position. The system is generally activated when wind speeds reach approximately 8 miles per hour (mph) and shuts down when winds exceed 55 mph, as high wind speeds can damage the equipment. As the blades are activated, the rotor turns the low-speed shaft. The gear box connects the low-speed shaft to a high-speed shaft, which increases the rotational speed from 6 to 16 rotations per minute (rpm) to about 1000 to 1800 rpm, which is the rotational speed required to produce electricity.

The electricity generated by the turbine would be transmitted to a small (approximately 4-foot-wide, 6-foot–long, and 6–foot-tall) pad-mounted transformer located immediately adjacent to the base of each tower. The transformer would increase the voltage of the electricity produced by the turbine from 575 volts (V) to 23 kV, the voltage required for the collector system.

The key characteristics of the Siemens turbine are summarized in Table 3.

TABLE 3
Key Dimensions of Siemens SWT-2.3-101 Turbine

Description	Measurement
Power Generation	2,300 kilowatts (2.3 MW)
Tower Height	328 feet (100 meters)
Rotor Diameter	332 feet (101 meters)
Total Height (Tower + ½ Rotor)	493 feet (150.5 meters)
Rotor Swept Area	8,000 square meters
Rotor Speed	6 – 16 rotations per minute
Minimum Operational Wind Speed	4 m/s (8 mph)
Maximum Operational Wind Speed	25 m/s (55 mph)

NOTES:

kW = kilowatt
m/s = meters per second
mph = miles per hour

Construction Activities. The turbine components would be transported to Kalaeloa Harbor via ship, offloaded, then transported to the site via long-bed trucks on existing State and County roadways, using appropriate road safety precautions and scheduled to minimize any disruptions to normal traffic patterns. It is anticipated that a total of 150 trips would be required to transport the turbine components.

A work area would be cleared and graded at each turbine location to provide space for delivery and laydown of turbine components, crane access, and foundation and turbine construction. Clearing and grading would be conducted using bulldozers, excavators, compactors, graders, front-end loaders, trenching equipment, and a drill rig (for possible probe and grout activities). A rock crusher and screener may be used if a significant amount of rock must be excavated. Based on experience gained from other projects, the size and shape of each work area would vary depending on the terrain and construction requirements, but is generally expected to be approximately 200 feet in radius. Water trucks would be used to provide moisture for compaction as well as dust control during construction.

A turbine foundation would be constructed within each work area, each with a radius of approximately 30 feet (Figure 6). The exact foundation depth would depend upon the results of geotechnical tests conducted at each final tower location and final structural engineering, but is expected to be approximately 10 feet below finished grade. Ready-mix concrete trucks may deliver concrete for the turbine foundations; alternatively, a temporary concrete batch plant may be set up at the wind farm site during construction. Once the foundations have been constructed, the turbines would be assembled and erected using cranes (Figure 6).

FIGURE 6
Installation of Turbine Foundation (left) and Assembly of Turbine Using Crane (right) at the Kaheawa Wind Power Facility

Following construction, a 20-foot-wide gravel perimeter would be installed around the base of each foundation to facilitate access and maintenance. Geotextile material would be used beneath the gravel as dictated by the geotechnical engineer where required for road stability. The portions of the work area outside the gravel perimeter would be scarified and hydromulched to stabilize the soil and facilitate revegetation. An area with a radius of approximately 370 feet (75 percent of the total turbine height) around each turbine (including the revegetated work area) would be periodically maintained over the life of the project, as practicable, to facilitate ongoing wildlife search activities.[2]

Operation and Maintenance Activities. Wind turbines typically operate automatically, without the need for a centralized operator. However, preventative maintenance and troubleshooting activities would be routinely performed on each turbine. These activities would generally include an inspection and servicing of all major mechanical components, lubrication systems, gearboxes, generators, blades, and electrical components. Routine servicing typically does not require heavy equipment such as large cranes,[3] but does require small truck access. However, in the event of a major component replacement (for example, blades or gearboxes), heavy equipment (similar to that used during construction) would be required.

Electrical Collector System

As described above, electrical power generated by the turbines would be transmitted to a transformer located at the base of each tower, where the voltage would be increase from 575 V to 23 kV. The 23 kV power would be carried from each turbine to an onsite substation via an electrical collector system, comprised of a network of underground and overhead collection circuits. In general, most of the collector lines would be located underground; only those lines that cross gulches would be located overhead.[4] The overhead lines would be installed on 45-foot-high wooden poles, typically spaced at 100- to 200-foot intervals. The

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[2] Areas that are considered unsearchable, such as the gulches, will be excluded from these search plots. Additional detail regarding searches for downed wildlife and other HCP mitigation measures are provided in Section 3.5.

[3] The nacelles are constructed to include equipment used to facilitate operations and maintenance activities.

[4] The 46kV sub-transmission lines that would deliver the wind-generated energy from the substation to the POIs would also be located overhead.

underground lines would be direct-buried in trenches, each approximately 3 feet wide and 4 feet deep; once backfilled, these areas would be hydromulched to stabilize the soil and facilitate revegetation. The collector system lines would also accommodate fiber optic cable to facilitate communication between the individual turbines and other project components.

The electrical collector cables would be routinely monitored, inspected, and maintained by qualified personnel and maintenance technicians over the lifetime of the project. These activities would be accomplished with small trucks; heavy construction or excavation equipment would only be required if an underground cable needed replacement.

Electrical Substation

An electrical substation would transform the voltage of electricity to allow integration into the existing 46 kV HECO sub-transmission system. Two HECO sub-transmission lines currently cross the site: the Waialua-Kuilima and Waialua-Kahuku 46 kV sub-transmission lines. These lines each have an available transmission capacity of 50 MW and 20 MW, respectively. It is anticipated that the substation would be located along Ashley Road, near the Waialua-Kuilima sub-transmission line. One set of overhead 46 kV connector lines would be constructed from the substation to the POI for the Waialua-Kuilima line, which would be located at the intersection with Ashley Road, just east of the substation. A second set of overhead 46 kV connector lines would run from the substation, west along Ashley Road to the POI for the Waialua-Kahuku line sub-transmission line. These higher-voltage connector lines would be installed on approximately 75-foot-high wooden or steel poles, as specified by HECO, and would be spaced at an average interval of approximately 200 feet. Both lines would also accommodate fiber optic cable to facilitate communications, as well as a low-voltage secondary line to provide power to the control house at each switching station.

The substation would be an open switchrack design, with free-standing steel structures up to a maximum height of approximately 50 feet. It would have a gravel base and a fully fenced perimeter, with a maximum footprint of approximately 175 feet by 250 feet, for a total area of 1.0 acre (43,570 square feet). The substation would provide for the termination of the 23 kV collection lines, a 46/23 kV main step-up power transformer, and connection for the 46 kV lines that would deliver the energy to the respective POI.

Construction Activities. Before construction of the substation, the site would be surveyed and staked, then cleared and grubbed. The area would be graded and any excess material would be staged in an approved onsite area. The foundation (as well as the below-grade raceway [for example, conduit, ductbank, or trench] and ground grid) would be put in place, then covered with a sub-layer of crushed rock surfacing. The following equipment would then be installed: substation steel structures, control enclosures, electrical equipment (such as circuit breakers, transformers, and disconnect switches), above-grade ground stingers, substation bus conductors and jumpers, control/relay and communication materials, and secondary control/power cables and terminations. Following installation of all equipment, the final layer of crushed rock surfacing would then be placed and a perimeter fence would be erected. Substation testing and commissioning would be conducted before energizing the facility.

Operation and Maintenance Activities. During the operations phase of the project, the collector substation would be managed by qualified personnel and maintenance technicians.

Maintenance activities would include routine inspections and monitoring of the equipment and electronics, according to the manufacturer's recommendations and in accordance with regulatory requirements. Routine maintenance of the collector substation would not typically require heavy construction equipment. However, if a major component needed replacement (for example, a main transformer), appropriate construction equipment would be required.

Battery Energy Storage System (BESS)

Because of the technical requirements of interconnecting to the HECO system, the project includes a BESS to stabilize energy output during extreme wind fluctuations. The BESS provides short-term storage (essentially charging during periods of sustained wind and discharging into the grid when the wind falls off suddenly), thereby mitigating variations in output and meeting HECO's operational requirements. The BESS would be sized according to the Interconnection Requirement Study (IRS) currently being conducted by the utility, and may have a capacity of approximately 20 MW with 14 megawatt hours (MWh) of energy storage capability.

The BESS would be installed immediately adjacent to the substation and would be enclosed in a four-wall structure with an angled pitched roof, up to 25 feet in height and totaling approximately 14,000 square feet (0.32 acre) in area. The BESS enclosure would house the power cell components and electrical equipment, including control and switching panels, direct current/alternating current (DC/AC) inverters, and external pad-mounted transformers to connect to the substation. Figures 7 and 8 show a plan view and elevation view of a typical BESS enclosure, respectively.

Similar to the electrical substation, construction of the BESS would involve clearing and grubbing, then excavation and grading for the foundation. All belowground equipment would be installed and the foundation would be constructed, following which the enclosure would be erected and all aboveground equipment would be installed. Once the system is activated, the BESS enclosure would not be regularly occupied. Maintenance activities would include routine inspections and monitoring of the equipment, in accordance with the manufacturer's recommendations and regulatory requirements.

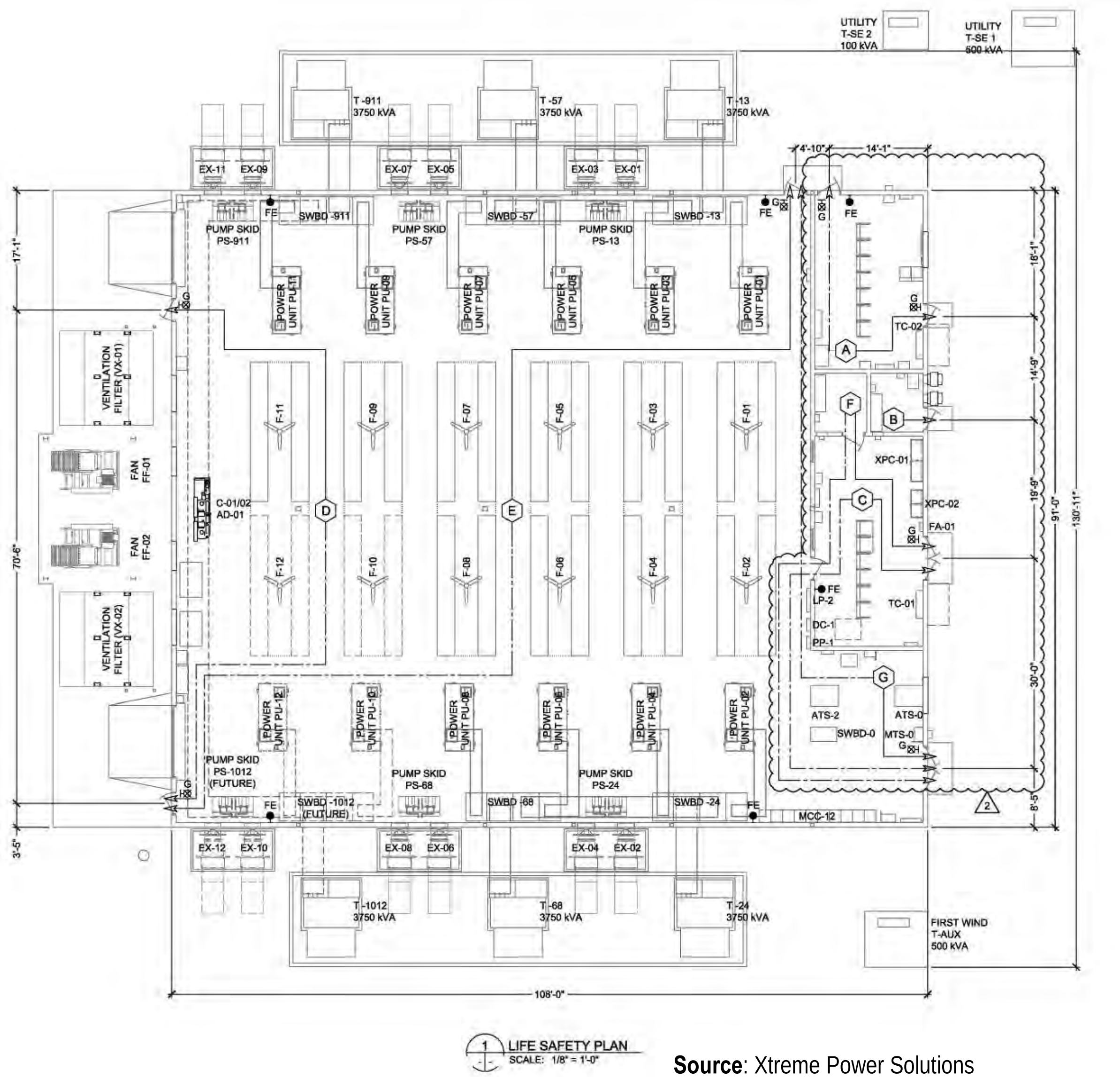


FIGURE 7
Plan View of Typical Battery Energy Storage System (Not to Scale)

Source: Xtreme Power Solutions
Note: Detailed construction drawings for the Kawailoa Wind Farm facilities have not yet been developed. This figure shows the battery energy storage system for First Wind's Kahuku Wind Farm project, which is expected to be representative of that used for the Kawailoa Wind Farm project.

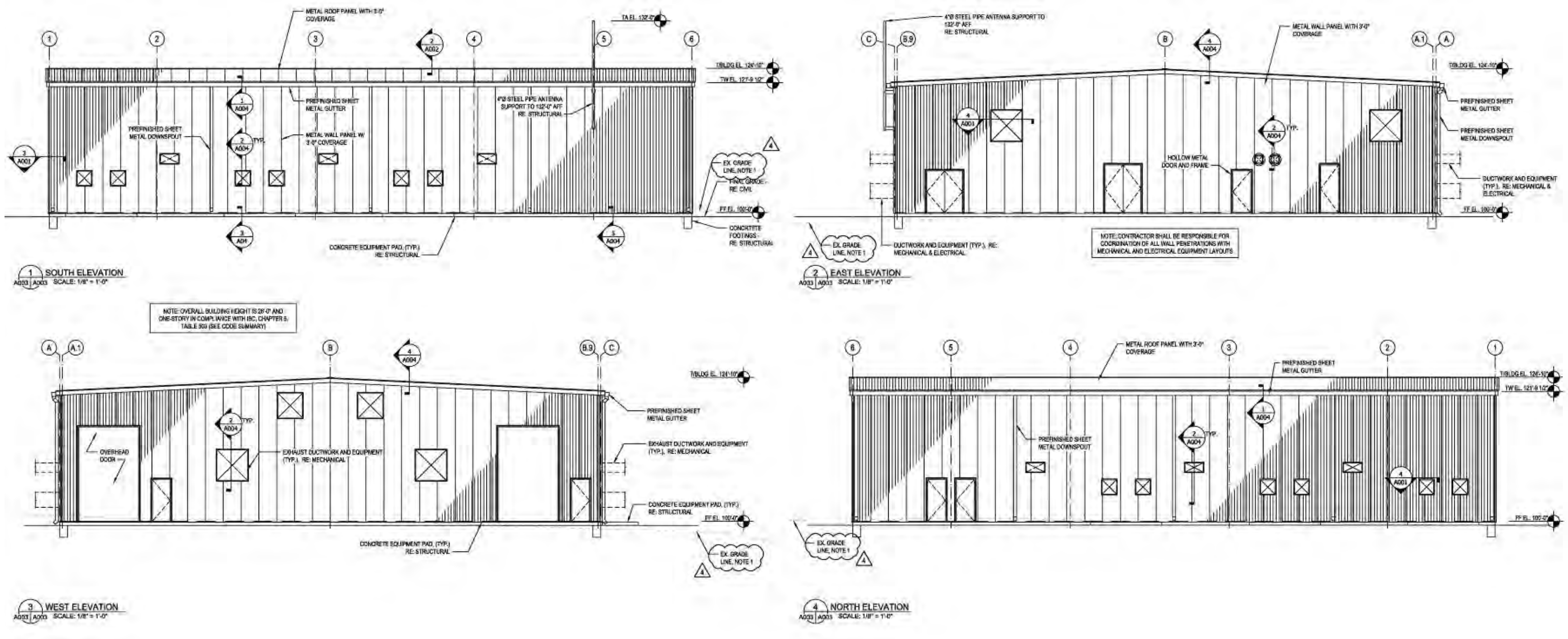


FIGURE 8
Elevation View of Typical Battery Energy Storage System (Not to Scale)

Source: Xtreme Power Solutions
Note: Detailed construction drawings for the Kawailoa Wind Farm facilities have not yet been developed. This figure shows the battery energy storage system for First Wind's Kahuku Wind Farm project, which is expected to be representative of that used for the Kawailoa Wind Farm project.

Interconnection Facilities

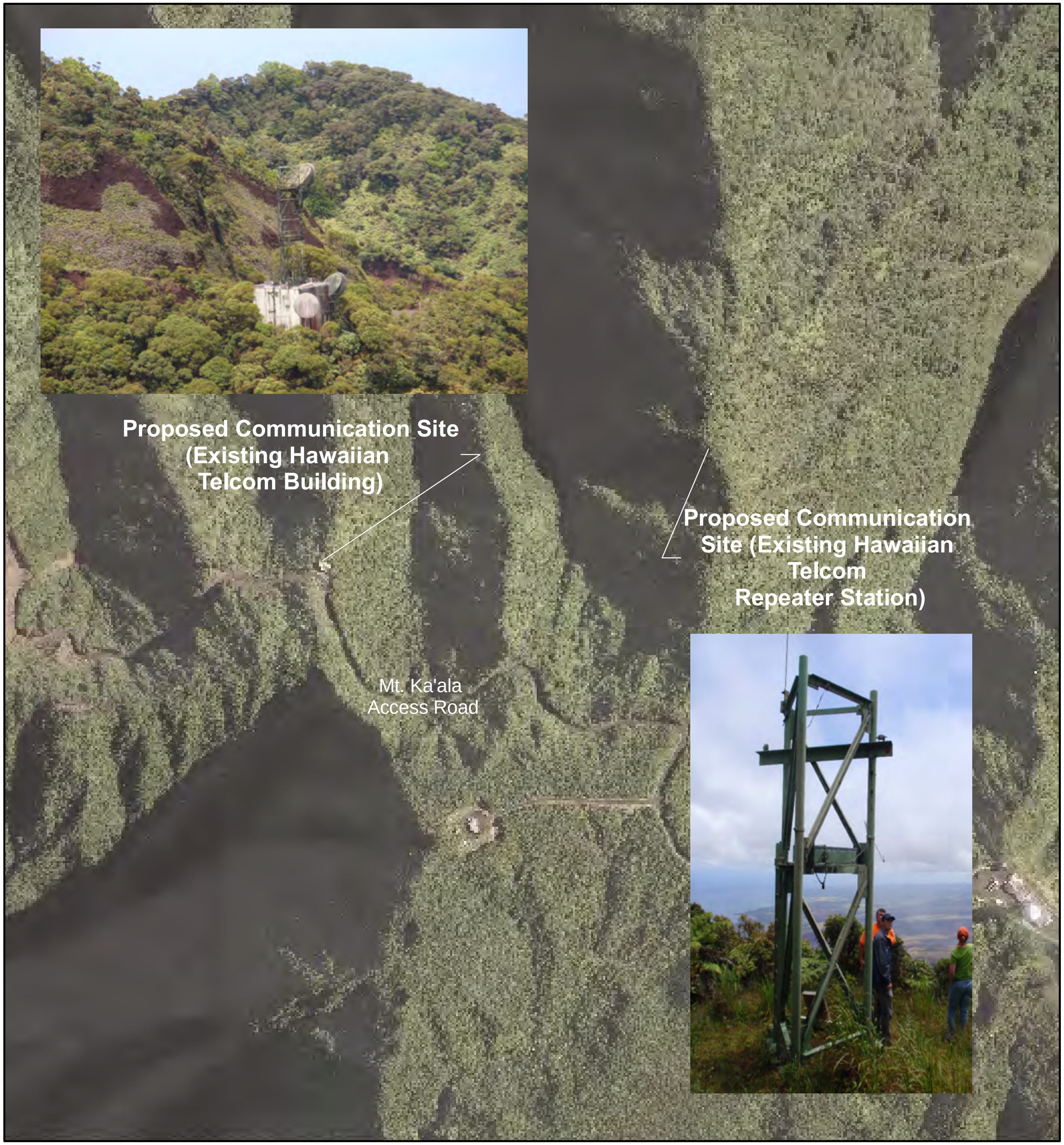
At each of the two POIs, the required interconnection facilities would be constructed to connect the 46 kV connector lines to the existing 46 kV HECO sub-transmission lines. A fenced yard would contain steel switchrack structures, utility poles and both overhead and underground electrical lines; the construction methods would be similar to those described for the electrical substation. The yard would be a maximum of 200 feet by 200 feet and surfaced with gravel. Inside the yard, a pre-fabricated control room (approximately 10 feet by 20 feet) would house equipment for controls, metering and communication, all of which are required for interconnection of the wind farm. In addition, each yard would accommodate a communication tower with up to two microwave dish antennae, as further discussed below.

Communication Equipment

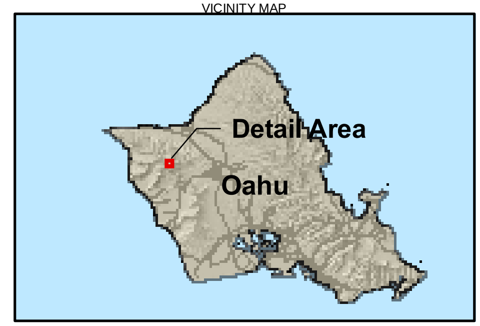
Communication equipment would be installed as part of the project to provide a secure high-speed communication link between the wind farm and the HECO substations that would be receiving the power. The communication equipment would include up to eight microwave dish antennas installed in four different locations. Two new towers would be installed at the Kawailoa wind farm site, one at each of the interconnection facilities. They would be lattice-type towers, each approximately 30 feet (9.1 meters) tall, with a concrete foundation approximately 144 square feet in area. Up to two antennae, approximately 11 feet (3.4 meters) in diameter, would be mounted horizontally on each tower.

The remaining antennae would be installed on existing structures at two different Hawaiian Telcom communication sites, both located on the north slope of Mt. Ka`ala, approximately 5 miles southwest of Waialua town (Figure 9). One of the sites would enable transmission to and from the existing HECO substation in Waialua; the other would enable transmission to and from the existing HECO substation in Wahiawā.

The two Hawaiian Telcom communication sites each include structures that have been in place for several decades. The first site has a small building and is adjacent to the paved access road at an elevation of approximately 3,600 feet (1097 meters). The building supports a metal scaffold tower and several antennae. The second site is located on an adjacent mountain ridge at an elevation of approximately 3,200 feet (975 meters), and is accessed from the paved road via an existing concrete stairway and trail (approximately 0.25 mile from the paved road). This site has two metal scaffold towers, each approximately 15 feet (4.5 meters) tall, one of which supports two dish antennae. Up to two new antennae (one for receiving and one for transmitting signals) would be installed on the existing structures at each of these sites. Similar to those currently in place, each antenna would be approximately 11 feet (3.4 meters) in diameter; the antennae at the Hawaiian Telcom building would be connected via waveguide cable to existing radio equipment inside the building. All four antennae would be transported to the Mt. Ka`ala communication sites via the existing paved access road, then carried and mounted to the existing structures by hand; no ground disturbance is expected.



VICINITY MAP



Source:
Basemap - Hawaii Statewide GIS Program
(http://hawaii.gov/dbedt/gis)

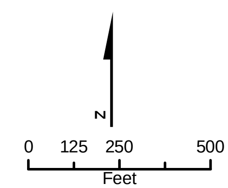


Figure 9
Overview of Mt. Ka’ala Communication Sites
Kawailoa First Wind Farm Project
Oahu, Hawaii

Operation and Maintenance Building and Laydown Area

The O&M building would be a prefabricated metal building, approximately 7,000 square feet (0.16 acre) and up to 30 feet (8 meters) in height. It would house the wind farm management system, which monitors the performance of the overall system and the operational status and performance of individual turbines and wind monitoring equipment. The facility would also provide for an indoor shop and a storage area for spare parts, as well as an office for the site manager and operations and environmental staff. Outdoor parking would be provided for five to eight vehicles. Figures 10 and 11 show a plan view and elevation view of a typical O&M building, respectively.

Open space in the vicinity of the O&M building would be used as a lay-down area for storage of large equipment (such as spare turbine blades and gear boxes). Following construction, most of the temporary lay-down area would be revegetated using a hydroseed mixture to stabilize the soil and prevent erosion.

The project facilities have very low onsite water requirements. As a result, it is not anticipated that a direct connection to the municipal water supply system would be required. However, up to three water tanks would be installed in the vicinity of the O&M building; these would be periodically filled with non-potable water trucked onto the site. One tank would have a capacity of approximately 5,000 gallons to supply water for plumbing for the restrooms in the O&M building; a septic tank would be used to collect the wastewater. The other two tanks would each have a capacity of approximately 60,000 gallons and would be used primarily to supply an exterior fire hydrant, as needed. Small amounts of bottled potable water and an eye wash station would be provided in the O&M building.

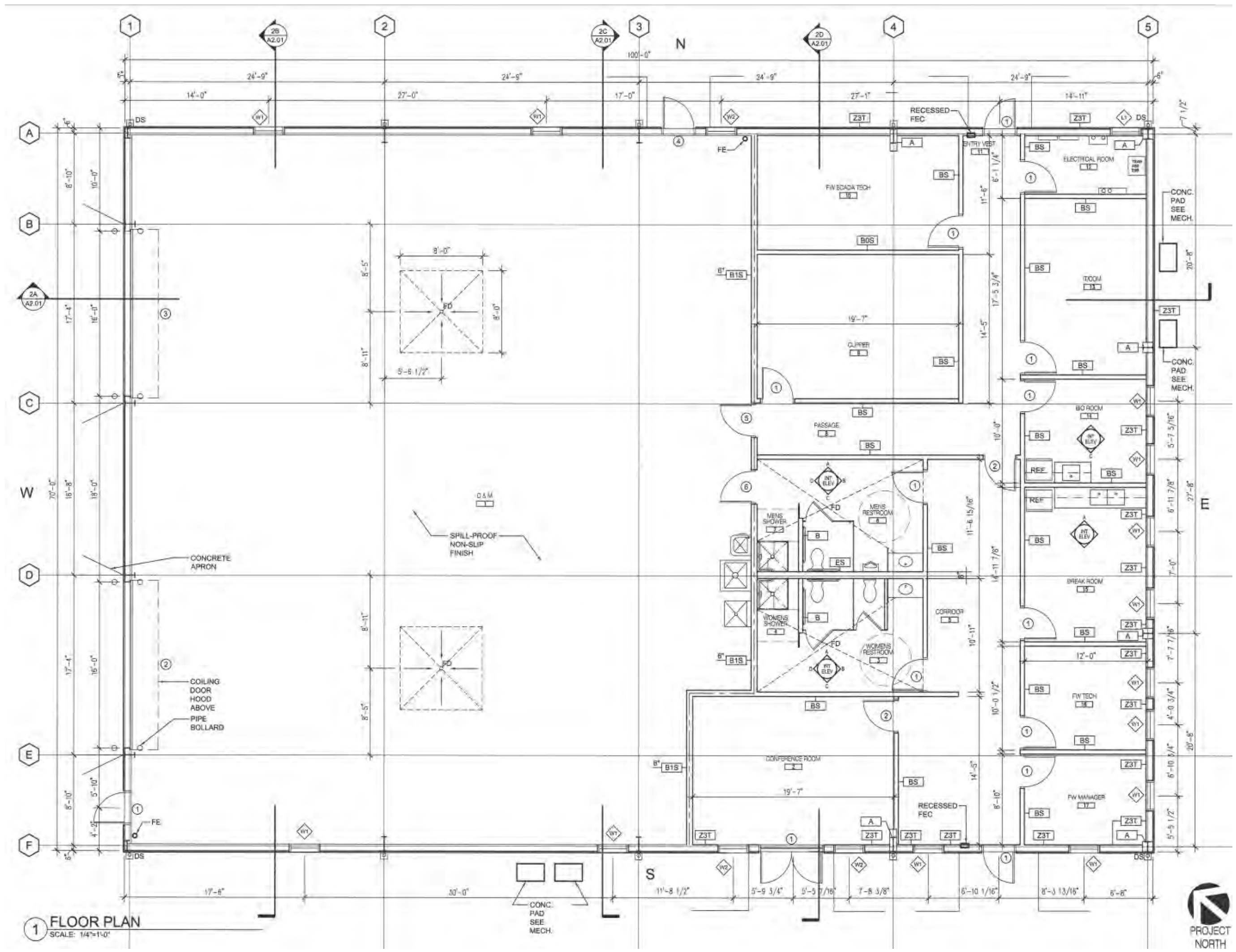


FIGURE 10
Plan View of Typical Operations and Maintenance Building (Not to Scale)

Source: Media5 Architecture
Note: Detailed construction drawings for the Kawailoa Wind Farm facilities have not yet been developed. This figure shows the Operations and Maintenance building for First Wind's Kahuku Wind Farm project, which is expected to be representative of that used for the Kawailoa Wind Farm project.

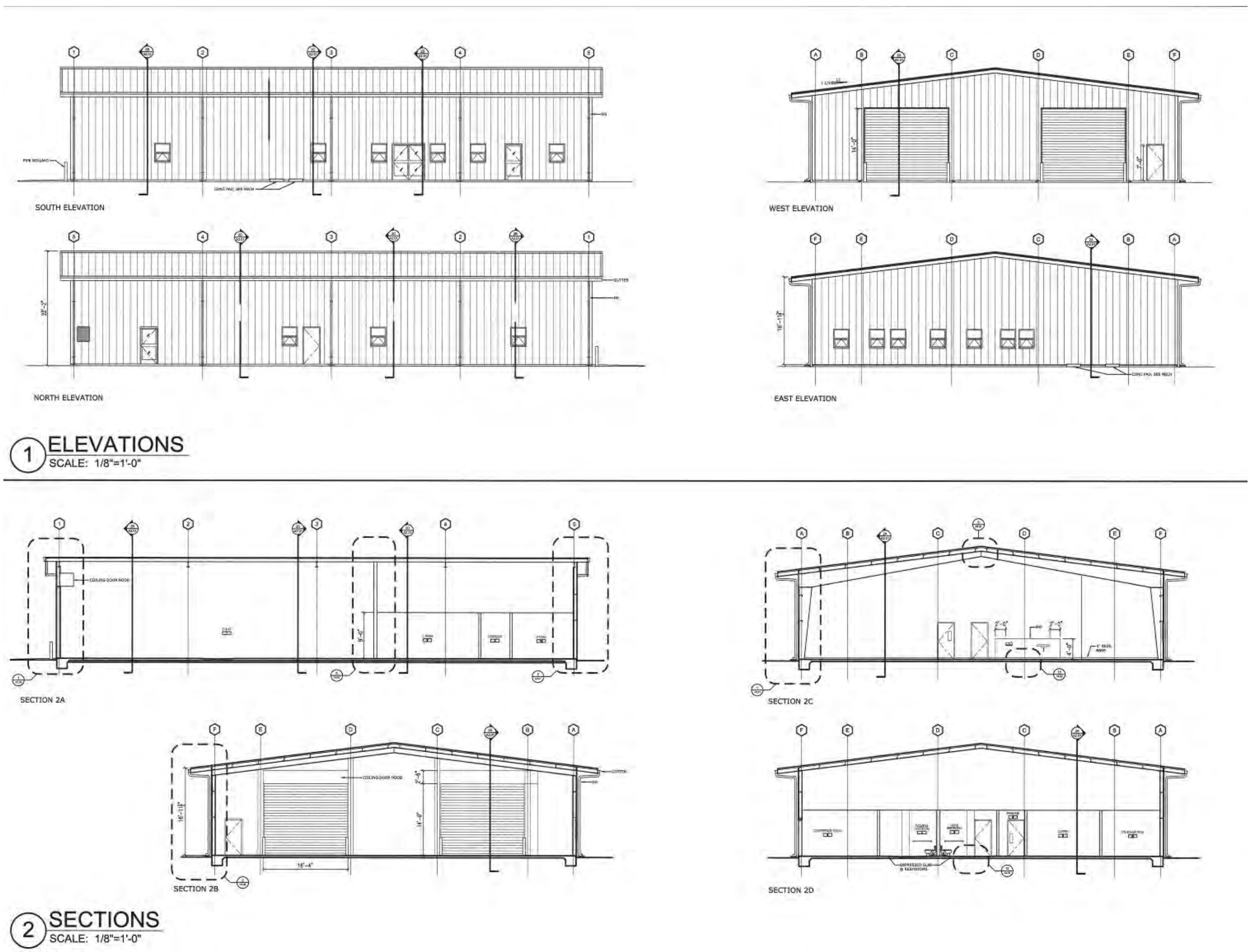


FIGURE 11
Elevation View of Typical Operations and Maintenance Building (Not to Scale)

Source: Media5 Architecture
Note: Detailed construction drawings for the Kawailoa Wind Farm facilities have not yet been developed. This figure shows the Operations and Maintenance building for First Wind's Kahuku Wind Farm project, which is expected to be representative of that used for the Kawailoa Wind Farm project.

Meteorological Monitoring Equipment

In 2009, four temporary 197-foot (60-meter) guy wire-supported meteorological towers were permitted and installed on the Kawailoa site to gather wind speed and direction information. Data collection at these towers is ongoing. Two of these towers have already been removed; the remaining towers would be removed before or during construction of the project.

To allow for monitoring during operation, up to four permanent meteorological towers would be installed and maintained for the life of the project. Each would be an unguyed lattice tower, approximately 328 feet (100 meters) in height, with a 35-foot-by-35-foot concrete foundation. The locations of the existing and proposed meteorological towers are shown in Figure 4; a photograph of typical meteorological tower is shown in Figure 12.

FIGURE 12
Typical Meteorological Tower Similar to that Proposed for the Kawailoa Wind Farm Site (actual dimensions will vary; tower in photograph is 262.5 feet tall)

Onsite Access Roads

A network of roads currently exists on the Kawailoa property, most of which were designed to accommodate large cane haul trucks. These include Kawailoa Road, Cane Haul Road, Ashley Road, Mid-Line Road and Bull's Boulevard. The site layout has been designed to focus access within the site along these roadways to the maximum extent possible. Other unnamed roads occur along or between the main onsite roads; use of these roads would generally be limited to periodic access by small construction and maintenance vehicles (for example, 4-wheel-drive pickup trucks). No improvements are planned along the unnamed roadways.

The primary access to the proposed facility would be via either Ashley Road or Kawailoa Road, both of which intersect with Kamehameha Highway. Other existing onsite roadways that would be used during construction and operation of the project are Cane Haul Road, Mid-Line Road, and Bull's Boulevard. Several sections of the existing roads do not currently have an adequate turning radius, width, or grade to accommodate the vehicles transporting the turbine equipment and would require modifications; these include the large hairpin turn on Kawailoa Road and segments of Cane Haul Road. Ashley Road, Mid-Line Road and Bull's Boulevard would also need improvements, including regrading and application of a gravel surface. Improvements would be implemented along approximately 9.8 miles of existing onsite roadways.

In addition, several segments of new onsite roadway would be constructed, as needed, to connect the turbines to the existing onsite access roads. Approximately 2.8 miles of new roads would be constructed; these would have a cleared and graded width of approximately 36 feet (11 meters). Of this width, approximately 16 to 20 feet would be a gravel surface, with 8- to 10-foot earthen shoulders on either side. This width is needed to accommodate the crawler crane used to erect the turbines; the crane would straddle the graveled portion of the road as it tracks to each turbine site. The road layout has been designed to avoid known cultural resources and the need for new crossings of gulches or ditches.

The roads would be cleared and graded using bulldozers and scrapers, followed by placement of gravel. Water trucks would be used as needed to apply water to minimize dust during construction. Stormwater runoff would be appropriately addressed through design features that incorporate best management practices (BMPs) that minimize the quantity and water quality impacts of the runoff. Following construction, the road shoulders would be hydromulched to stabilize the soils, and a permanent road width of approximately 20 feet would be maintained. The onsite roadways would be periodically inspected over the lifetime of the project, with repair and maintenance efforts conducted as needed. It is likely that minor amounts of surface dragging, blading, or grading would be required to remove vehicle ruts that may develop because of maintenance traffic or after periods of heavy rainfall.

The location of the existing and proposed roadways is shown in Figure 4.

2.1.4 Project Schedule

It is anticipated that construction of the project will begin in late 2011, with operation commencing in 2012. The estimated completion date of the significant permitting and construction milestones is listed in Table 4.

TABLE 4
Preliminary Project Schedule

Milestone	Estimated Completion Date
Obtain all necessary permits	December 2011
Begin construction	December 2011
Complete turbine installation	May 2012
Energize substation (begin commercial operation)	September 2012

2.1.5 Anticipated Project Costs

A rough order-of-magnitude estimate of the anticipated construction costs is provided in Table 5.

TABLE 5
Estimated Construction Costs

Project Component	Estimated Cost ($000)
Turbines	127,000
Civil Improvements / Foundations	28,000
Interconnection / Transmission	18,000
Collection System / Substation / BESS	44,000
Mobilization / Subcontracting / Management	24,000
TOTAL	**241,000**

2.2 Alternatives

2.2.1 Framework for Consideration of Alternatives

HAR §11-200-17 (a section in the Office of Environmental Quality Control's Environmental Impact Statement Rules) addresses the content requirements of draft and final EISs. Subsection §11-200-17(f) states:

> (f) *The Draft EIS shall describe in a separate and distinct section alternatives which could attain the objectives of the action, regardless of cost, in sufficient detail to explain why they were rejected. The section shall include a rigorous exploration of the environmental impacts of all such alternative actions. Particular attention shall be given to alternatives that might enhance environmental quality or avoid, reduce, or minimize some or all of the adverse environmental effects, costs, or risks. Examples of alternatives include:*
>
> *(1) The alternative of no action;*
>
> *(2) Alternatives requiring actions of a significantly different nature which could provide similar benefits with different environmental impacts;*
>
> *(3) Alternatives related to different designs or details of the proposed action which would present different environmental impacts;*
>
> *(4) The alternative of postponing action pending further study; and*
>
> *(5) Alternative locations for the proposed project.*
>
> *In each case the analysis shall be sufficiently detailed to allow a comparative evaluation of the environmental benefits, costs, and risks of the proposed action and each reasonable alternative.*

A range of alternative actions were considered through the project planning and site layout process; the project objectives (as listed in Section 1.3) were used to help identify those alternatives which warrant further evaluated. Section 2.2.2 describes the alternatives that will be evaluated in detail in the Draft EIS. Section 2.2.3 lists the alternatives that were considered but rejected, and provides the rationale for elimination.

2.2.2 Alternatives to be Evaluated in the EIS

The Proposed Action, as described above, represents the optimal locations of the project components within the maximum project envelope. It is expected that additional micrositing will be conducted, based on ongoing site evaluations, resulting in minor shifts in the location of project components. These modifications would be expected to fall within the range of impacts characterized for the Proposed Action, and would be described as such in the Final EIS.

In the event that there are substantial changes in component location, the modified site layout would be identified as a new alternative in the Final EIS and evaluated accordingly.[5] However, the maximum project envelope is relatively limited in area (because of the distribution of wind resources and extent of site constraints) and, given the siting requirements for each of the project components (for example, turbine spacing), very few (if any) alternative layouts for the wind farm site are expected to be feasible. An alternative layout for the communications facilities near Mt. Ka`ala has been identified. In addition, the No Action alternative will also be evaluated. These alternatives are briefly described below, and are summarized in Table 6.

2.2.2.1 Alternative Communications Site Layout

As described in Section 2.1, the project includes installation of up to eight microwave dish antennae in four different locations to provide a dedicated communication link between the wind farm and the HECO substations in Waialua and Wahiawā. Up to four antennae would be installed on two new towers at the Kawailoa wind farm site. The remaining antennae would be installed on existing structures at two different Hawaiian Telcom communication sites, both located on the north slope of Mt. Ka`ala.

In the event agreements cannot be made to use the existing structures, a new tower would be installed in an area adjacent to the existing structure at each site. The tower constructed adjacent to the Hawaiian Telcom building would be a 30-foot lattice steel tower supporting up to two antennae, which would be connected via waveguide cable to radio equipment inside the building. At the repeater site, a 20-foot lattice tower with up to two antennae would be constructed. Similar to the tower on the wind farm site, these would both have concrete foundations approximately 144 square feet in area (12 feet by 12 feet). The antennae, approximately 11 feet (3.4 meters) in diameter, would be mounted horizontally on the towers. The EIS will evaluate the impacts associated with the alternative of constructing a new tower at either one or both of the Mt. Ka`ala communication sites.

2.2.2.2 No Action Alternative

Under the "No Action" alternative, the Kawailoa wind farm would not be constructed. The No Action alternative does not provide a new source of renewable energy for the island of O`ahu, nor does it contribute to compliance with the State's RPS. Therefore, it does not fulfill the project's purpose and is not considered a feasible solution. However, pursuant to HAR § 11-200-17(f)(1), the No Action alternative will be evaluated in the EIS.

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[5] For example, it is possible that site layout constraints associated with airspace requirements could be partially resolved to allow turbines to be moved from other locations in the maximum project envelope to the eastern portion of the envelope. Similarly, the appurtenant facilities (for example, the substation, BESS, and O&M building) could be moved closer to one of the POI (such as adjacent the intersection of Ashley Road and the existing Waialua-Kuilima 46 kV sub-transmission line).

TABLE 6
Comparison of Proposed Action and Alternatives to Be Evaluated in the EIS

Project Component	Description of Proposed Action (Permanent Footprint)	Alternative	No Action Alternative
WIND FARM SITE			
Wind turbine generators	30 wind turbine generators (1.9 acres)	Same as Proposed Action	No wind turbine generators would be constructed
Electrical collector lines	5.6 miles of overhead lines (0.05 acre)	Same as Proposed Action	No overhead collector lines would be constructed
	6.1 miles of underground lines (0.0 acre)	Same as Proposed Action	No underground collector lines would be constructed
Electrical substation	1 electrical substation (1.0 acre)	Same as Proposed Action	No substation would be constructed
Battery energy storage system (BESS)	1 BESS (0.3 acre)	Same as Proposed Action	No BESS would be constructed
Interconnection facilities (each includes a control house and communication tower)	2 switchyards (1.8 acre)	Same as Proposed Action	No HECO interconnection facilities would be constructed
O&M building	1 O&M Building (0.2 acre)	Same as Proposed Action	No O&M building would be constructed
Laydown area	1 lay-down area (0.2 acre)	Same as Proposed Action	No laydown area would be constructed
Meteorological monitoring equipment	4 towers (0.1 acre)	Same as Proposed Action	No meteorological towers would be constructed
Onsite access roads	9.8 miles of existing access roads to be improved (9.5 acres)	Same as Proposed Action	No existing roads would be improved
	2.8 miles of new access roads (6.9 acres)	Same as Proposed Action	No new roads would be constructed
MT. KA`ALA SITE			
Communication equipment at existing Hawaiian Telcom Building	Up to 2 microwave dishes on an existing structure (0.0 acre)	1 tower with microwave antenna dishes (0.003 acre)	No communication equipment would be installed
Communication equipment at existing Hawaiian Telcom Repeater Station	Up to 2 microwave dishes on an existing structure (0.0 acre)	1 tower with microwave antenna dishes (0.003 acre)	No communication equipment would be installed
ENTIRE PROJECT			
Total Area of Permanent Footprint	**22.0 acres**	**22.0 acres**	**0.0 acre**

2.2.3 Alternatives Eliminated From Further Consideration

Additional alternatives were considered during the planning process but were eliminated from further consideration as they do not meet the project objectives or are otherwise not considered to be feasible. The following sections describe these alternatives and the reasons why they were eliminated.

2.2.3.1 Different Turbine Locations on Kamehameha School Property

As described in Section 2.1.3.1, in–depth wind monitoring has been conducted to assess the strength and distribution of wind resources across Kamehameha Schools' property. In combination with these data, several site constraints have been identified that affect project development. Cumulatively, these conditions were evaluated and used to determine which areas are suitable for project siting, resulting in the delineation of a series of corridors which cumulatively represent the maximum project envelope (Figure 4). As such, the areas owned by Kamehameha School but not within the maximum project envelope are not considered to be feasible locations for project development, and were therefore eliminated from consideration.

As part of this effort, Kawailoa Wind specifically evaluated placement of wind turbines along the *mauka* (mountain-ward) portion of Opaeula Ridge, located immediately south of the current Kawailoa project site, below Anahulu Gulch. Accessible via Opaeula Road, the land is currently owned by Kamehameha Schools and, like Kawailoa, was also formerly used primarily for agriculture. However, assessment of the existing wind resources on Opaeula Ridge indicated an inadequate wind regime to support development on a wind farm. Therefore, the Opaeula lands were excluded from the maximum project envelope and have been eliminated from consideration.

2.2.3.2 Different Turbine Models and Sizes

Utility-scale wind energy production is now employed by many countries around the world, and the most common wind turbine design, by far, is the upwind, horizontal-axis wind turbine generator with a three-blade rotor. This design is the current industry standard, and is used at all the commercial wind farms operating in Hawaii. Proposals to provide equipment were received from several manufacturers, and these were reviewed and evaluated over several months to determine the most effective make and model for the project.

First, prospective turbines were analyzed for their suitability to the onsite wind resources, based on wind data collected over several months. Responses were narrowed to four turbine models that could generate the most energy in the constructible area available at the site. Second, these four models were screened for their electrical compatibility with the HECO grid, as part of the ongoing interconnection study. Only two models appeared capable of providing the various control features that would facilitate interconnection with the least negative impact to the transmission system. The third criterion was the consideration of turbine size and impacts. Of the two final turbine models, the General Electric (GE) 1.6 MW and the Siemens 2.3 MW machines, the smaller GE model would have required 43 turbines to be installed to generate the equivalent amount of energy output as 30 of the Siemens turbines. Installing fewer turbines is generally preferable, as it typically results in less site disturbance and fewer impacts in terms of visual, biological, and soil resources. Consequently, the Siemens 2.3 MW turbine was selected as the best suited for the Kawailoa Wind project.

2.2.3.3 Decreased Generating Capacity

Reducing the generating capacity for the project would decrease the project's contribution to O`ahu's renewable energy portfolio and consequently reduce the benefits to the State. Furthermore, although requiring fewer turbines, a reduced capacity would not result in a proportionate reduction in permitting, construction and operation costs. The cost per megawatt increases as economies of scale are lost to fixed costs of transportation, logistics, mobilization, and other factors. Therefore, development of the project with a reduced generating capacity runs counter to the basic project objectives.

2.2.3.4 Increased Generating Capacity

The two existing HECO 46 kV sub-transmission lines that traverse the project site, the Waialua-Kahuku line and the Waialua-Kuilima line, have a combined available transmission capacity of 70 MW. Generating capacity exceeding 70 MW would require an additional POI to be established, possibly several miles away from the project site, requiring significantly more offsite infrastructure and improvements to the existing HECO system. Therefore, increasing the generating capacity of the Kawailoa wind farm to more than 70 MW has been eliminated from further consideration.

2.2.3.5 Wind Farm Development Elsewhere on O`ahu

As described in Section 2.1, HECO issued an RFP for renewable energy projects for the island of O`ahu in June 2008. A proposal was submitted to HECO that detailed the development of a 70 MW wind farm on the Kawailoa parcel of Kamehameha Schools' property; the proposal was subsequently selected by HECO to be one of several projects in its final award portfolio of renewable energy projects. Following the selection by HECO, Kawailoa Wind negotiated a Site Lease Development Agreement with Kamehameha Schools, allowing them exclusive rights to development of a wind farm at the site. As such, this is the only property on O`ahu that Kawailoa Wind has rights to, and HECO has selected for development. Furthermore, in terms of wind resource availability and constructability, the Kawailoa property is believed to be one of the last few remaining parcels on O`ahu that is suitable for development of a wind energy project. For these reasons, alternative sites on O`ahu, to the extent they exist and may be available, are not being considered for development of a wind farm project at this time.

2.2.3.6 Delayed Implementation of Project

As part of its June 2008 RFP, HECO required that all selected renewable energy projects for the island of O`ahu commence commercial operation between 2010 and 2014, with preference for those that achieve commercial operation before 2013. Kawailoa Wind's current agreement with HECO establishes a commercial operation date no later than December 2013. The parties are now engaged in power purchase negotiations and expect to submit the PPA to the State Public Utilities Commission in 2011. Consequently, Kawailoa Wind is not considering a delayed development schedule for the project.

2.2.3.7 Alternate Energy Storage Technologies

A variety of wind storage technologies can be used for wind farm projects; the effectiveness of each technology is typically dependent on site development and operation factors specific to the wind energy facility. As described above in Section 2.1.3.2, a BESS was selected as the preferred technology for use at the Kawailoa wind farm. This technology offers both environmental and electrical advantages. These include the use of non-toxic materials and a small footprint, as well as an instantaneous response time and a reasonably long cell life (thus allowing thousands of charge and discharge events).

Other energy storage technologies that were considered include pumped water storage, superconducting magnetic energy storage, compressed air storage, thermal energy storage and flywheel storage. A brief description of each technology is provided below, along with the rationale for why it is not being pursued as part of the project.

- ***Pumped Water Storage***. Pumped water storage (often called “pumped hydro”) is probably the best known large-scale technology. It consists of pumping water to a high storage reservoir using available power that is not immediately needed. The stored water is then released through turbo-generators to produce electricity when it is most needed (in this case when the wind is not blowing). Pumped water storage recovers 80 to 90 percent of the energy consumed by the pumps (that is, the electrical generator that is driven by the water released from the reservoir produces 80 to 90 percent as much electricity as is consumed by pumping water into the storage reservoir). The chief challenge with pumped water storage is that it typically requires an adequate water supply, and two reservoirs of sufficient size at considerably different elevations; there are few locations on O`ahu that are well-suited for water storage at this scale. Moreover, it often requires considerable capital expenditure and energy to pump the water, thus increasing the cost of the electricity that is produced. The lack of an available fresh water source combined with the lack of existing infrastructure precludes the use of pumped storage for this project.
- ***Superconducting Magnetic Energy Storage***. Superconducting magnetic energy storage (SMES) systems store energy in a magnetic field created by the flow of direct current in a superconducting coil that has been cooled to a temperature below the point at which it becomes a superconductor. A typical SMES system includes three parts: (i) a superconducting coil, (ii) a power-conditioning system, and (iii) a cryogenically cooled refrigerator. Once the superconducting coil is charged, the current does not decay and the magnetic energy can be stored indefinitely. The stored energy can be released back to the network by discharging the coil. An SMES system loses less electricity in the energy storage process than other methods of storing energy (less than 5 percent). The advantage of having low losses is offset by the high energy requirements for refrigeration and of the superconducting wire. Because of this, SMES is typically used for short duration energy storage, such as that needed to improve power quality. An SMES system is not suitable for the Kawailoa wind farm project because of the very high costs, the energy requirements for refrigeration, and the limits in the total amount of energy that can be stored.
- ***Compressed Air Storage***. A compressed air storage (CAES) plant stores electrical energy in the form of air pressure, then recovers this energy as an input for future power generation.[6] When applied to wind energy, this technology uses electricity

[6] Essentially, the CAES cycle is a variation of a standard gas turbine generation cycle. In the typical simple cycle gas fired generation cycle, the turbine is physically connected to an air compressor. Therefore, when gas is combusted in the turbine, approximately two-thirds of the turbine’s energy goes back into air compression. With a CAES plant, the compression cycle

from the wind turbines to compress air, which is then stored in airtight underground caverns. While it is a promising technology for some locations in the continental U.S., this technology is not suitable for O`ahu because of a lack of suitable underground storage conditions.

- ***Thermal Storage***. Several technologies are available that can store energy in a thermal reservoir for later reuse. The thermal reservoir may be maintained at a temperature above (hotter) or below (colder) than that of the ambient environment. The principal application today is the production of ice or chilled water at night which is then used to cool environments during the day. Thermal energy storage technologies are most useful for storing energy that originates as heat in an insulated repository for later use for space heating or for domestic or process hot water heating. They are generally not well suited for storing electrical energy and consequently are not considered to be viable energy storage options for the Kawailoa wind farm.
- ***Flywheel Storage.*** This form of storage uses electricity from the wind turbines to power an electric motor that accelerates a heavy rotating disc, which, in turn, acts as a generator on reversal, slowing down the disc and producing electricity. Mechanical inertia is the basis of this storage method, with electricity stored as the kinetic energy of the rotating disc. However, the range of power and energy storage technically and economically achievable with this technology are quite limited, making flywheel storage unsuitable for power system applications such as the Kawailoa wind farm.

None of the storage technologies listed above provides an effective and viable means of storing the large amount of wind-generated energy that would be produced by the Kawailoa wind farm, and therefore, will not be given further consideration in the Draft EIS.

2.2.3.8 Different Sources of Renewable Energy

The expertise of Kawailoa Wind is specific to wind energy generation. It has an extensive experience of implementing wind development projects in a cost-effective and environmentally friendly manner. The Kawailoa wind farm would not exclude or replace other renewable energy resources, but instead, would contribute to the growth and diversification of O`ahu's renewable energy portfolio. Under the competitive bidding framework ordered by the State Public Utilities Commission, HECO must issue a Request for Proposals for any alternative energy projects larger than 5 MW in capacity on Oahu. Other than the expansion of the Honolulu Project of Waste Energy Recovery (H-Power) facility, no other renewable energy projects larger than 10 MW will be constructed on Oahu until HECO issues an RFP. For these reasons, no other sources of renewable energy are being considered by Kawailoa Wind.

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is separated from the combustion and generation cycle. When the CAES plant regenerates the power, the compressed air is released from the cavern and heated through a recuperator before being mixed with fuel and expanded through a turbine to generate electricity. Because the turbine's output no longer needs to be used to drive an air compressor, the turbine can generate almost three times as much electricity as the same size turbine in a simple cycle configuration, using far less fuel per MWh produced. The stored compressed air takes the place of gas that would otherwise have been burned in the generation cycle and used for compression power.

3.0 Existing Environment, Potential Impacts and Mitigation Measures

This chapter describes the existing characteristics of the physical and human environment within the proposed project area to provide an understanding of the existing resources, as well as the baseline against which the potential impacts of the Proposed Action (and the alternatives to that action) can be assessed. This description is structured to clarify between the existing conditions at the wind farm site and the communications sites near Mt. Ka`ala. For both areas, the existing conditions are described for a range of social, environmental and cultural resources, including:

- Climate
- Air Quality
- Geology, Topography and Soils
- Hydrology and Water Resources
- Biological Resources
- Cultural Resources
- Visual Resources
- Noise
- Land Use
- Transportation and Traffic
- Hazardous Materials
- Socioeconomics
- Natural Hazards
- Public Safety
- Public Infrastructure and Services

In addition, the probable adverse and beneficial impacts of the Proposed Action (and alternatives to that action) are described relative to each resource. According to HAR §11-200-2, impacts include "ecological effects, aesthetic effects, historic effects, cultural effects, economic effects, social effects, or health effects, whether primary, secondary, or cumulative." Primary impacts are those caused by the action and occur at the same time and place. Secondary impacts are those which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Cumulative impacts are those that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Secondary and cumulative impacts are specifically addressed in Section 4.0. For most resources, the affected area is limited to the project area, including both the wind farm site and the Mt. Ka`ala communications site, as shown in Figure 4. In some cases, a broader geographic area could be affected, and is therefore described accordingly. Because of differences in type and duration, the analysis generally distinguishes between impacts associated with construction activities versus those associated with operations and maintenance activities.

To the extent possible, the project has been developed so as to avoid and/or minimize potential impacts; in those cases where impacts cannot be avoided or minimized, measures to mitigate the impact have been identified. The impact analysis for each resource includes a discussion of the steps taken to avoid and/or minimize impacts, as well as a description of anticipated mitigation measures, where appropriate.

3.1 Climate

Climate refers to the average weather conditions in a region over a long period of time. The climate of a location is affected by its latitude and terrain, as well as by the nearby ocean and its currents. Specific climate types can be described based on characteristics such as temperature and rainfall.

3.1.1 Existing Conditions

3.1.1.1 Current Climate

Hawai`i's climate is characterized by two seasons: summer (May through September) and winter (October through April). In general, the islands have relatively mild temperatures and moderate humidity throughout the year (except at high elevations), with persistent northeasterly trade winds and infrequent severe storms. However, summer is typically warmer and drier, with minimal storm events. The trade winds are prevalent 80 to 95 percent of the time during the summer months, when high-pressure systems tend to be located north and east of Hawai`i. During the winter months, the high-pressure systems are located farther to the south, decreasing the prevalence of the trade winds to about 50 to 80 percent of the time [Western Regional Climate Center (WRCC), 2010].

Despite the strong marine influence resulting from Hawai`i's insularity, some mountainous areas exhibit semi-continental conditions (especially on the islands of Hawai`i and O`ahu). Combined with the rugged and irregular topography, the result is diverse climatic conditions across the various regions of the state, including significant geographic differences in rainfall amounts, which range from 20 inches to 300 inches (WRCC, 2010).

Wind Farm

The proposed wind farm project area is located in a windward lowland region of O`ahu. Windward lowlands generally include those areas below 2,000 feet on the north and northeast sides of the islands. The area is moderately rainy, with frequent trade wind showers, and partly cloudy to cloudy days. Temperatures are more uniform and mild than in other regions (WRCC, 2010). Rainfall occurs primarily between the months of October and April. Based on data recorded between 1961 and 1990, the average annual rainfall in this vicinity is 38.94 inches, with monthly totals ranging between 1.17 inches (August) and 7.15 inches (March) (WRCC, 2010). In general, the lowlands have a narrow range of diurnal temperatures, with daytime temperatures from 70 degrees Fahrenheit (°F) to 89°F and nighttime temperatures from 60°F to 79°F. At elevations below 4,000 feet, the difference in the mean daily maximum and mean daily minimum temperatures from winter to summer is only about 4°F to 8°F (WRCC, 2010). The prevailing wind direction in the project area is from the east.

Mt. Ka`ala Communications Sites

The communications sites at Mt. Ka`ala are located in regions classified as rainy mountain slopes, along the windward sides of the island. In these areas, rainfall and cloudiness are very high, with considerable rain during both the winter and summer months. Temperatures are equable, and humidities are higher than in any of the other six Hawai`i climatic regions (WRCC, 2010).

3.1.1.2 Global Climate Change

According to the Fourth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC), global climate change is very likely caused by anthropogenic greenhouse gas concentrations (IPCC, 2007). Greenhouse gases, which include CO_2, methane (CH_4), and nitrous oxide (N_2O), are chemical compounds in the Earth's atmosphere that trap heat. Of these gases, CO_2 is recognized by the IPCC as the primary greenhouse gas affecting climate change (IPCC, 2007). Present atmospheric concentrations of CO_2 are believed to be higher than at any time in at least the last 650,000 years, primarily as a result of combustion of fossil fuels (IPCC, 2007). It is also very likely that observed increases in CH_4 are also partially caused by fossil fuel use (IPCC, 2007).

As a result of global climate change, temperatures on the Earth's surface have increased by an average of 1.33°F (0.74°Celsius [C]) over the last 100 years; this warming trend has accelerated within the last 50 years, increasing by 0.23°F (0.13°C) each decade (Solomon et al. 2007). An increase in the average temperature of the Earth may produce changes in sea levels, rainfall patterns, and intensity and frequency of extreme weather events. In addition, ocean acidification, which results from rising atmospheric carbon dioxide levels mixing with seawater, is expected to reduce the saturation state of carbonate minerals in the ocean beyond normal habitat limits, which could result in widespread loss of coral reefs (USFWS, 2009).

The maritime location of the Hawaiian Islands makes the archipelago relatively well buffered climatically (Benning et al., 2002). However, climatic changes have been documented throughout the State. Average air temperature increases of 0.3196°F (0.1776°C) per decade have been recorded in Hawai`i (Giambelluca et al., 2009), with higher elevations warming faster than lower elevations. Tide gauges at sea level at the Honolulu Harbor estimate that sea level has risen at 1.4 ± 0.3 mm/year over the past century (Caccamise et al., 2005). Some estimates project that a 3.3-foot (1-meter) rise in sea level is possible by the end of the century for Hawai`i (Fletcher, 2009). Sea surface temperatures near the islands have been increasing recently, showing an average 0.72°F (0.4°C) rise between 1957 and 1987 (Giambelluca et al., 1996). Temperatures are expected to rise at least another 2.7 to 3.6°F (1.5 to 2°C) by the end of the century (IPCC, 2007). Global increase in sea surface temperatures has been associated with causing more intense hurricanes in the Pacific and Atlantic (Webster et. al 2005, U.S. Climate Change Science Program 2009) and could result in higher peak wind speeds and heavier rainfall (IPCC, 2007).

Climate change also has the potential to impact a phenomenon known as the trade wind inversion layer. In Hawai`i, descending air in the Hadley cell warms as it is compressed, while moist air at the surface progressively cools as it rises. Where rising and sinking air meet, a layer is formed (the trade wind inversion layer) in which warm air overlies cool air (Juvik and Juvik, 1998). Typically, this layer occurs between 5,000 and 10,000 feet (1,500 and 3,000 meters); however, climate change may raise or lower the altitude at which the trade wind inversion layer currently occurs (Pounds et al., 1999; Still et al., 1999). The formation of the trade wind inversion strongly influences climate by altering precipitation inputs from mist and fog drip (Miller, 2008; Benning et al., 2002). Thus, changes in the inversion layer can result in hydrological and ecological changes (Giambelluca and Nullet, 1991). Studies show the trade wind inversion layer has already responded substantially to past climate changes (Benning et al., 2002).

3.1.2 Potential Impacts and Mitigation Measures

3.1.2.1 Proposed Action

Wind Farm

In general, construction and operation of the wind farm would not affect local weather conditions, such as temperature, rainfall, and humidity. Although turbines can potentially alter atmospheric mixing patterns as wind passes over a site, these effects are believed to occur only as a result of projects that include significantly more turbines than that proposed at Kawailoa.

At a regional level, the proposed project is expected to have a beneficial impact on the climate by reducing fossil fuel consumption and thus greenhouse gas emissions. Renewable electricity generated by the wind farm would be used in place of energy generated by burning fossil fuels, thereby reducing emissions of greenhouse gases. Specifically, the project would eliminate the use of approximately 304,200 barrels of oil annually. Eliminating the consumption of this amount of oil would reduce emissions of CO_2 by more than 134,400 tons. Other air pollutants for which emissions would be reduced include SO_2, NO_x, and Hg. Construction and operation of the facility (for example, manufacturing and transport of materials and employee vehicle use) would result in some greenhouse gas emissions (primarily CO_2), as detailed in Section 3.2; however, emission levels associated with these activities are expected to be very small in comparison to the reductions provided by the project. As such, the proposed wind farm would be expected to provide net benefits relative to greenhouse gas emissions and climate conditions; no mitigation measures are proposed.

Mt. Ka`ala Communications Sites

Because of the nature of the resource, the climate-related impacts associated with the communications site are considered as part of the wind farm, as described above.

3.1.2.2 Alternative Communications Site Layout

This alternative would involve installation of new communications towers in previously disturbed areas adjacent to the existing Hawaiian Telcom structures. Implementation of this alternative would still involve construction of the wind farm site, thus resulting in a net benefit relative to greenhouse gas emissions and climatic conditions, similar to that described for the Proposed Action.

3.1.2.3 No Action Alternative

Under the No Action alternative, the project would not be constructed and thus would not contribute to the reduction of greenhouse gas emissions.

3.2 Air Quality

Under the authority of the Clean Air Act, the U.S. Environmental Protection Agency (EPA) has established nationwide air quality standards to protect public health and welfare. These federal standards, known as National Ambient Air Quality Standards (NAAQS), represent the maximum allowable atmospheric concentrations for six criteria pollutants: carbon monoxide (CO), NO_2, SO_2, ozone, lead, and particulate matter (respirable particulate matter less than or equal to 10 micrometers in diameter [PM_{10}] and respirable particulate matter less than or equal to 2.5 micrometers in diameter [$PM_{2.5}$]). The NAAQS are based primarily on evidence of acute and chronic (or short-term and long-term) health effects, and apply to outdoor locations to which the general public has access.

The Clean Air Branch of the State of Hawai`i Department of Health (HDOH) is responsible for implementing air pollution control in the State and has established Hawai`i ambient air quality standards (HAAQS), which in some cases are more stringent than the comparable Federal standards or address pollutants that are not covered by the Federal standards. The HAAQS are based primarily on health effects data, but also reflect other considerations, such as protection of crops, protection of materials, or avoidance of nuisance conditions (such as objectionable odors). The Federal and State ambient air quality standards are listed in Table 7.

TABLE 7
Federal and State Ambient Air Quality Standards

Air Pollutant	Averaging Time	Ambient Air Quality Standards	
		Hawai`i State Standard (μg/m³)	Federal Primary Standard (μg/m³)
Carbon Monoxide	1-Hour	10,000	40,000
	8-Hour	5,000	10,000
Nitrogen Dioxide	1-Hour	--	188
	Annual	70	100
Sulfur Dioxide	1-Hour	--	196
	3-Hour	1300	—
Ozone	8-Hour	157	157
PM_{10}	24-Hour	150	150
	Annual	50	—
$PM_{2.5}$	24-Hour	—	35
	Annual	—	15
Lead	Calendar Quarter	1.5	1.5
	3-Month Rolling Average	--	0.15
Hydrogen Sulfide	1-Hour	35	—

SOURCE: Hawai`i Administrative Rules, Chapter 59 and *Code of Federal Regulations* (CFR), Title 40, Part 50.

3.2.1 Existing Conditions

In general, air quality in the state of Hawai`i is some of the best in the nation, primarily because of consistent trade winds and limited emission sources. Consistent with this trend, the existing air quality in the vicinity of the wind farm project is considered to be relatively good because of low levels of commercial development, and exposure to consistently strong winds which help to disperse any emissions. The main sources of pollutant air emissions within or directly adjacent to the wind farm site are associated with fuel combustion emissions from vehicles on Kamehameha Highway and the agricultural operations on the lower elevations of the Kawailoa property. There are no significant emissions sources known near the Mt. Ka`ala communications site, with the exception of motor vehicles using the Mt. Ka`ala summit access road.

HDOH and EPA maintain a network of air quality monitoring stations throughout the islands. Overall, the data collected from these monitoring stations indicate that criteria pollutant levels remain well below the Federal and State ambient air quality standards (HDOH, 2009; HDOH, 2010). The closest air quality monitoring station to the wind farm and communications sites is the Pearl City Station, located in the Leeward Health Center near Pearl Harbor, approximately 15 miles south of the proposed wind farm site. The areas surrounding this station are predominantly commercial, residential and light industrial. The only measurements collected at the Pearl City Station are $PM_{2.5}$ and PM_{10}, speciation, and air toxics (HDOH, 2009). With the exception of lead, there are no ambient air quality standards for the individual components of speciated $PM_{2.5}$, and there are no ambient air quality standards for air toxics.

The most recent measurements reported by HDOH for $PM_{2.5}$ and PM_{10}were recorded in 2008 (HDOH, 2009). The 24-hour PM_{10} readings in 2008 ranged between 7 and 73 micrograms per cubic meter ($\mu g/m^3$). The 24-hour $PM_{2.5}$ readings ranged between 2 and 26 $\mu g/m^3$. The annual averages of PM_{10} and $PM_{2.5}$ reported at the Pearl City Station for 2008 were 18 $\mu g/m^3$ and 4.5 $\mu g/m^3$, respectively. In March 2008, a vent opening on Kilauea Volcano (located on the Big Island of Hawai`i) increased emissions of SO_2 and $PM_{2.5}$, with occasional exceedances of the NAAQS for those pollutants.

One of the following three EPA designations indicates compliance with the NAAQS for specific areas and specific pollutants: attainment, non-attainment, or maintenance. EPA considers the volcano to be a natural, uncontrollable event and therefore the State requested exclusion of these NAAQS exceedances from attainment/non-attainment determination. The State of Hawai`i is designated as having attainment status for all criteria pollutants (HDOH, 2009).

3.2.2 Potential Impacts and Mitigation Measures

3.2.2.1 Proposed Action

Wind Farm

Construction and operation of the Proposed Action could potentially affect air quality. Following is a discussion of the potential impacts, and related measures to reduce those impacts, for the construction and operation phases of the project.

Construction

Construction of the project would require a variety of ground disturbing activities, including road improvements and construction, site preparation and grading, and trenching for the underground collection lines. Use of heavy equipment and earthmoving operations conducted as part of these activities will generate temporary fugitive dust and internal combustion engine emissions, resulting in temporary impacts on local air quality. Potential air pollutants associated with these emissions include hydrocarbons (HC), CO, NO_2, CO_2, SO_2, PM_{10}, and $PM_{2.5}$. The estimated quantity of emissions for these pollutants is summarized in Table 8.

TABLE 8
Estimated Emissions of Criteria Pollutants During Project Construction (Tons Per Year)

Emission Source	PM_{10}	$PM_{2.5}$	HC	CO	NO_2	CO_2	SO_2
Construction Equipment [a]	0.2	0.2	0.6	16.0	3.5	544.3	0.04
Fugitive Construction Dust [b]	128.7	27.0	--	--	--	--	--
Haul Truck Exhaust [c]	0.03	0.02	0.05	0.19	0.68	185.36	0.002
Worker Commute Exhaust [d]	0.008	0.004	0.464	4.081	0.168	121.726	0.002
Total	**128.9**	**27.2**	**1.1**	**20.3**	**4.4**	**851.4**	**0.04**

NOTES:
[a] Construction emission factors were generated from the EPA NONROAD2008 model for the 2011 calendar year.
[b] Fugitive dust emission factor of 20 pounds PM_{10}/acre-day suggested by California Air Resources Board (CARB). (http://www.arb.ca.gov/ei/areasrc/fullpdf/full7-7.pdf) based on 306.4 acres of land of disturbance.
[c] Haul truck emission factors were generated using EPA MOBILE6.2 highway vehicle emission factor model, and assume heavy duty diesel vehicle type.
[d] Worker commute emission factors were generated using EPA MOBILE6.2 highway vehicle emission factor model. Emission factors represent greatest emissions from either light duty gas vehicle or light duty gas truck.

In general, these emissions would be temporary and intermittent and localized in nature. In comparison to overall emission in the region, the contribution by the Proposed Action is relatively small and would not be expected to affect attainment of the Federal or State ambient air quality standards. Furthermore, construction would be conducted in compliance with HAR Title 11 Chapter 60.1 (Air Pollution Control), which specifies that the best practical operation or treatment be implemented such that there is not discharge of visible fugitive dust beyond the property lot line. To comply with these requirements and to minimize any other adverse affects of air quality, the following BMPs would be implemented during construction:

- Maintain all construction equipment in proper tune according to manufacturer's specifications.
- Fuel all off-road and portable diesel powered equipment, including but not limited to bulldozers, graders, cranes, loaders, scrapers, backhoes, generator sets, compressors, auxiliary power units, with motor vehicle diesel fuel.
- Maximize to the extent feasible the use of diesel construction equipment meeting the latest certification standard for off-road heavy-duty diesel engines.
- Minimize the extent of disturbed area where possible.
- Use water trucks or sprinkler systems (with no chemical additives) in sufficient quantities to minimize the amount of airborne dust leaving the site.
- Cover or continuously wet dirt stockpile areas (water with no chemical additives) containing more than 100 cubic yards (76.5 cubic meters) of material.
- Implement permanent dust control measures identified in the project landscape plans as soon as possible following completion of any soil disturbing activities.
- Stabilize all disturbed soil areas not subject to revegetation, paving, or development, using approved chemical soil binders, jute netting, or other methods.

- Lay building pads and foundations as soon as possible after grading unless seeding or soil binders are used.
- Limit vehicle speed for all construction vehicles moving on any unpaved surface at the construction site to 15 mph or less.
- Cover all trucks hauling dirt, sand, soil, or other loose materials.

Because emissions during construction would be temporary, relatively small and would be minimized through implementation of the BMPs listed above, construction of the project is not expected to significantly affect air quality.

Operations

Operation of the project (including environmental monitoring), would result in minor air emissions from staff and vendor vehicles. It is estimated that there would be a maximum of 16 one-way vehicle trips per day during operation. There would also be minor emissions associated with infrequent use of cranes used for maintenance of the project components. In addition to the maintenance equipment and vehicle emissions, operation of the electrical substation and BESS equipment would result in minor indirect emissions as a result of fossil fuel energy use for electricity. The estimated quantity of emissions for these pollutants is summarized in Table 9.

TABLE 9
Estimated Emissions of Criteria Pollutants During Project Operations (Tons Per Year)

Emission Source	PM_{10}	$PM_{2.5}$	HC	CO	NO_2	CO_2	SO_2
Maintenance Equipment[a]	0.001	0.001	0.002	0.008	0.03	3.314	0.00003
Vehicle Traffic[2] (non-construction equipment)	0.002	0.0008	0.09	0.82	0.03	24.35	0.0004
Facility Electricity Usage[3]	--	--	--	--	--	78.4	--
Total	0.003	0.002	0.09	0.83	0.06	106.1	0.0004

NOTES:

[a] Assumes quarterly heavy overhaul/maintenance requiring 1 day of crane activity for 8 hours.
[b] Vehicle emission factors were generated using EPA MOBILE6.2 highway vehicle emission factor model. Emission factors represent greatest emissions from either light duty gas vehicle or light duty gas truck.
[c] Based on estimated fossil fuel use for the electrical substation and BESS equipment. Values estimated based on 14,400 kwh/month electricity usage.

These emission levels are very low, and similar to those associated with construction, would not be expected to significantly affect air quality. At a broader scale, as discussed in Section 3.1, the project would provide a substantial net benefit to global climate conditions by replacing energy generated by burning fossil fuels with renewable energy, thereby reducing emissions of greenhouse gases.

Mt. Ka`ala Communication Sites

Installation of the communication equipment at the existing Hawaiian Telcom facilities on Mt. Ka`ala would result in a very small amount of air pollutant emissions, primarily associated with gasoline and diesel fuel combustion of the construction vehicles; a total of 20 vehicle trips are expected. Installation of the antennas and appurtenant equipment on the existing structures would not require any ground disturbance. Similar to construction, operation of the project would result in an extremely minor amount of emissions in association with maintenance vehicles; a total of approximately 4 vehicle trips per year are expected. BMPs, as described above, would be implemented as part of these activities to minimize any adverse air quality impacts.

Collectively, the emissions associated with construction and operation of the communications sites is extremely low, and in combination with the wind farm site, would not be expected to significantly affect air quality.

3.2.2.2 Alternative Communications Site Layout

Similar to the Proposed Action, construction and operation of the Mt. Ka`ala communication facilities under this alternative would result in a very small amount of emissions associated with construction and maintenance vehicles. In addition, a small amount of ground disturbance would be required for excavation of the tower foundations (approximately 144 square feet per tower). BMPs, as described in Section 3.2.2.1, would be implemented as part of these activities to minimize any adverse air quality impacts.

Collectively, the emissions associated with construction and operation of the alternative communications site layout is extremely low, and similar to the Proposed Action, would not be expected to significantly affect air quality.

3.2.2.3 No Action Alternative

If the project is not constructed and operated, no new emissions or changes in air quality over the baseline conditions would occur. Furthermore, the No Action alternative would decrease the potential to replace energy derived from burning fossil fuels with renewable energy. As such, the air quality benefits from reduced greenhouse gas emissions of greenhouse gases and other air pollutants would not be realized.

3.3 Geology, Topography and Soils

Geologic resources consist of the earth’s surface and subsurface materials. Topography refers to an area’s surface features, including its shape, height, and depth. Soils are unconsolidated surface materials that form from underlying bedrock or other geologic material. Soil drainage, texture, strength, shrink/swell potential, and rates of erosion affect the suitability of the ground to support manmade structures and facilities. In combination with other factors (for example, climate and terrain), these characteristics are also important considerations in terms of soil productivity and suitability for agriculture.

3.3.1 Existing Conditions

3.3.1.1 Wind Farm

Geology

The island of O`ahu was formed by two shield volcanoes that are now considered extinct: the Waianae Volcano formed the western portion of the island, and the Ko`olau Volcano formed the eastern portion. Lava flows from the Ko`olau volcano flowed up against the Waianae volcano, with the comingled Ko`olau lavas and alluvium originating from the Waianae range forming the central plain of O`ahu. Both the Ko`olau and Waianae volcanoes have been extensively eroded, and the remnants comprise the existing Waianae and Ko`olau mountain ranges. Both mountain ranges have been deeply dissected through erosion, resulting in large valleys, gullies and gulches, separated by steep ridges. Small streams and tributaries originating in the upper reaches of the mountain ranges often converge in valley lowlands to form streams or rivers (such as the Waimea River, located north of the project site). The mountain ridges consist of basaltic rock overlain by residual soil and recent alluvium (derived from the weathered basalt), typically silty clays. The alluvial soils are gradually removed by sheet erosion and transported by surface runoff, accumulating in the lowlands as thick alluvial and colluvial deposits.

The proposed wind farm site is located on the northern flank of the Ko`olau mountain range. The geomorphology within the proposed wind farm site consists of broad flat areas with shallow alluvial silty clay soils, dissected by shallow gulches and gullies. Within the gulches and gullies are alluvial and fluvial deposits; in some areas, basalt bedrock is exposed along the sloped sides of the gullies or gulches. Intermittent streams are present within some of the gulches and gullies, and are discussed further in Section 3.4. A bluff exists near the north edge of the project site; below this bluff along the coast, shallow subsurface materials include marine sediments intermingled with terrigenous sediment.

Topography

The wind farm site encompasses a range of topographical conditions from relatively flat or moderately sloping agricultural lands to steep gullies and intermittent streams (Figure 13). Elevations range from 200 feet above sea level (ASL) at the western edge of the Kawailoa wind farm property to 1,280 feet ASL, which equates to an average grade of approximately 7 percent. However, slopes as steep as 60 percent may be present along the edges of gulches or gullies.

Soils

The U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) is responsible for classifying and mapping soils throughout the United States. These maps provide information relating to soil resources, including interpretations of soil taxonomy. They also provide information regarding the predominant soil series present within specific geographic areas, and include an interpretation of the boundaries between various soil series within the mapped areas. The NRCS maps were used in the evaluation of the soils present at the site.

Multiple soil types are present within the wind farm site; these are listed in Table 10 and are shown in Figure 14. The primary soils present at the site range from clays to silty clays, with varying percentages of weathered basalt gravel and cobbles. Weathered basalt (saprolite) may be present at depth, and rock outcrops are exposed along steeper slopes associated with gullies or gulches. The predominant soils at the site are in the Lahaina, Leilehua, Paaloa, and Wahiawā Series, all of which are typically well-drained soils derived from weathered basalt. Silty clay soils in the Helemano Series are predominant within the gullies and gulches (Foote et al., 1972). The characteristics of the predominant soils at the wind farm site are presented in Table 11.

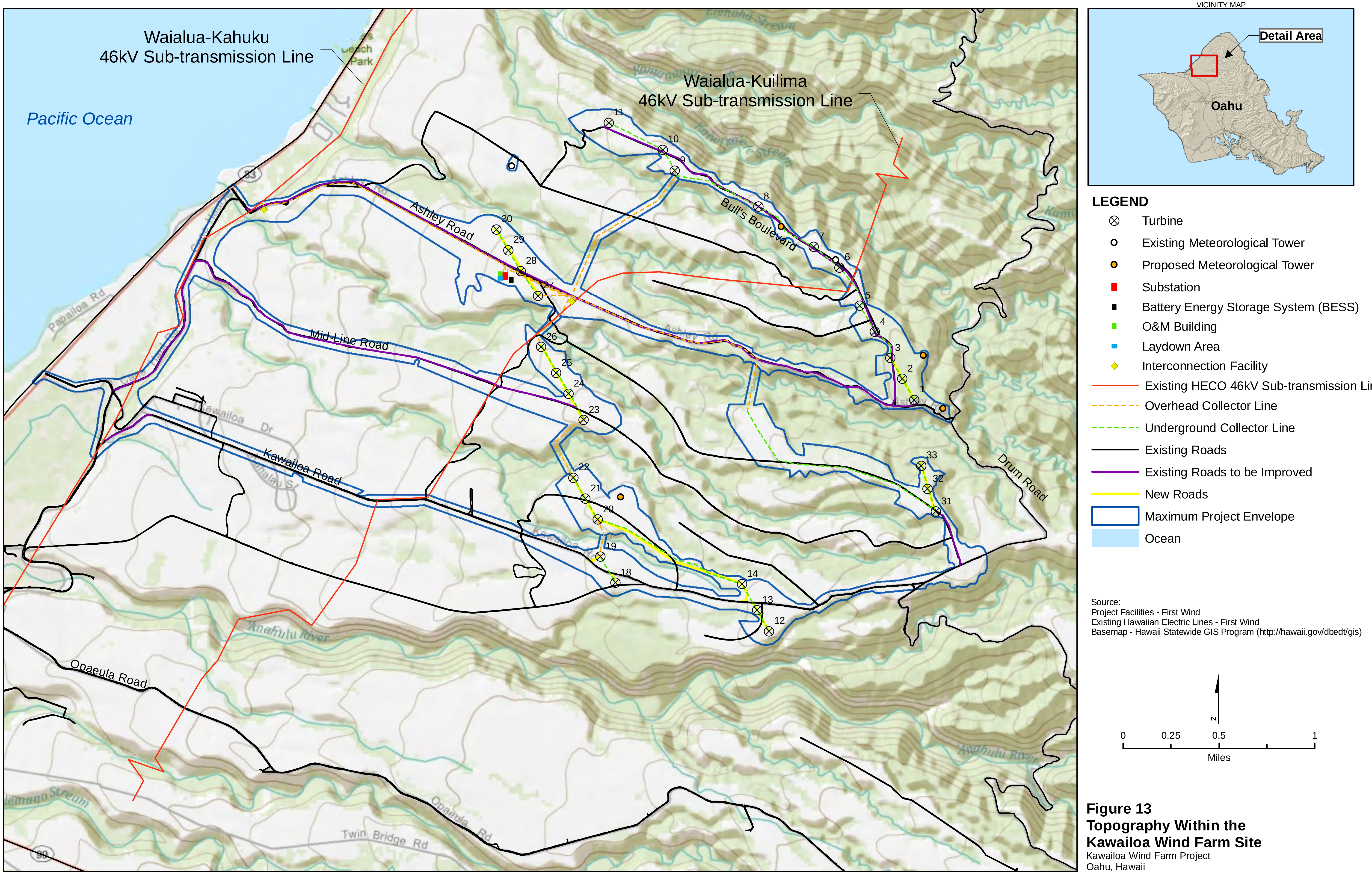

Figure 13
Topography Within the Kawailoa Wind Farm Site
Kawailoa Wind Farm Project
Oahu, Hawaii

TABLE 10
Soil Series Within the Kawailoa Wind Farm Site

Map Unit Symbol	Map Unit Name
EwC	Ewa stony silty clay, 6 to 12 percent slopes
HeA	Hale`iwa silty clay, 0 to 2 percent slopes
HLMG	Helemano silty clay, 30 to 90 percent slopes
KlaB	Kawaihapai stony clay loam, 2 to 6 percent slopes
KlbC	Kawaihapai very stony clay loam, 0 to 15 percent slopes
KlB	Kawaihapai clay loam, 2 to 6 percent slopes
LaB	Lahaina silty clay, 3 to 7 percent slopes
LaC	Lahaina silty clay, 7 to 15 percent slopes
LaC3	Lahaina silty clay, 7 to 15 percent slopes, severely eroded
LeB	Leilehua silty clay, 2 to 6 percent slopes
LeC	Leilehua silty clay, 6 to 12 percent
MoB	Manana silty clay loam, 2 to 6 percent slopes
PaC	Paaloa silty clay, 3 to 12 percent slopes
PbC	Paaloa clay, 2 to 12 percent
rRK	Rock land
rRT	Rough mountainous land
W	Water > 40 acres
WaA	Wahiawā silty clay, 0 to 3 percent slopes
WaB	Wahiawā silty clay, 3 to 8 percent slopes
WaC	Wahiawā silty clay, 8 to 15 percent slopes
WaD2	Wahiawā silty clay, 15 to 25 percent slopes, eroded
WkA	Waialua silty clay, 0 to 3 percent slopes
WkB	Waialua silty clay, 3 to 8 percent slopes
WlB	Waialua stony silty clay, 3 to 8 percent slopes

TABLE 11
Characteristics of the Predominant Soil Types Within the Kawailoa Wind Farm Site

Soil Type	Slope (%)	Permeability	Runoff	Erosion Hazard	Land Uses
Lahaina silty clay	0-15	Moderately Rapid	Slow to Medium	Slight to Moderate	Agricultural, pasture, woodland, & wildlife habitat
Leilehua silty clay	2-12	Moderately Rapid	Slow to Medium	Slight to Moderate	Agricultural, pasture, woodland, & wildlife habitat
Wahiawā silty clay	3-15	Moderately Rapid	Slow to Medium	Slight to Moderate	Agricultural, pasture
Paaloa silty clay	3-12	Moderately Rapid	Slow to Medium	Slight to Moderate	Agricultural, pasture

Source: General Soil Survey of Hawai`i, Foote et al. 1972 (U.S. Soil Conservation Service).

Various portions of the proposed wind farm site have been previously and/or currently used to support agricultural activities. A discussion of the classification of the soils within the site relative to agricultural productivity is provided as part of Section 3.9 (Land Use).

3.3.1.2 Mt. Ka`ala Communication Sites

The proposed communications sites are located on two different steep mountainous ridges near the summit of Mt. Ka`ala, the highest peak in the Waianae mountain range. Much of the area surrounding the communication sites consists of rocky lands that are steeply sloped. Soils at both sites consist of clay and silty clay soils, which have strong structure and high bulk density, overlying saprolite and basalt. The topography of each site includes a narrow ridge, with steep (in some areas, nearly vertical) slopes immediately adjacent to each side of the ridge. The two sites are close to the summit of Mt. Ka`ala, where organic mucky peat soil is present; however this type of soil is not expected to be present at either of the communications sites.

The predominant soil types present are mapped as Tropohumults-Dystrandepts Association (Table 12 and Figure 15). Tropohumults occur on narrow ridgetops at the higher elevations along the Waianae range, and are strongly acidic silty clays that are well drained and underlain at shallow depth by basalt or saprolite. Dystrandepts occur on steep side slopes and narrow ridge tops along the Waianae range, and are strongly acidic silty clays that are well drained and formed in volcanic ash and colluvium. The characteristics of these soils are presented in Table 13.

TABLE 12
Soil Series Within the Mt. Ka`ala Communications Site

Map Unit Symbol	Map Unit Name
rTP	Tropohumults-Dystrandepts, 30 to 90 percent slopes
rRK	Rock Land, 25 to 90 percent slopes
rAAE	Alakai Mucky Peat, 0 to 30 percent slopes

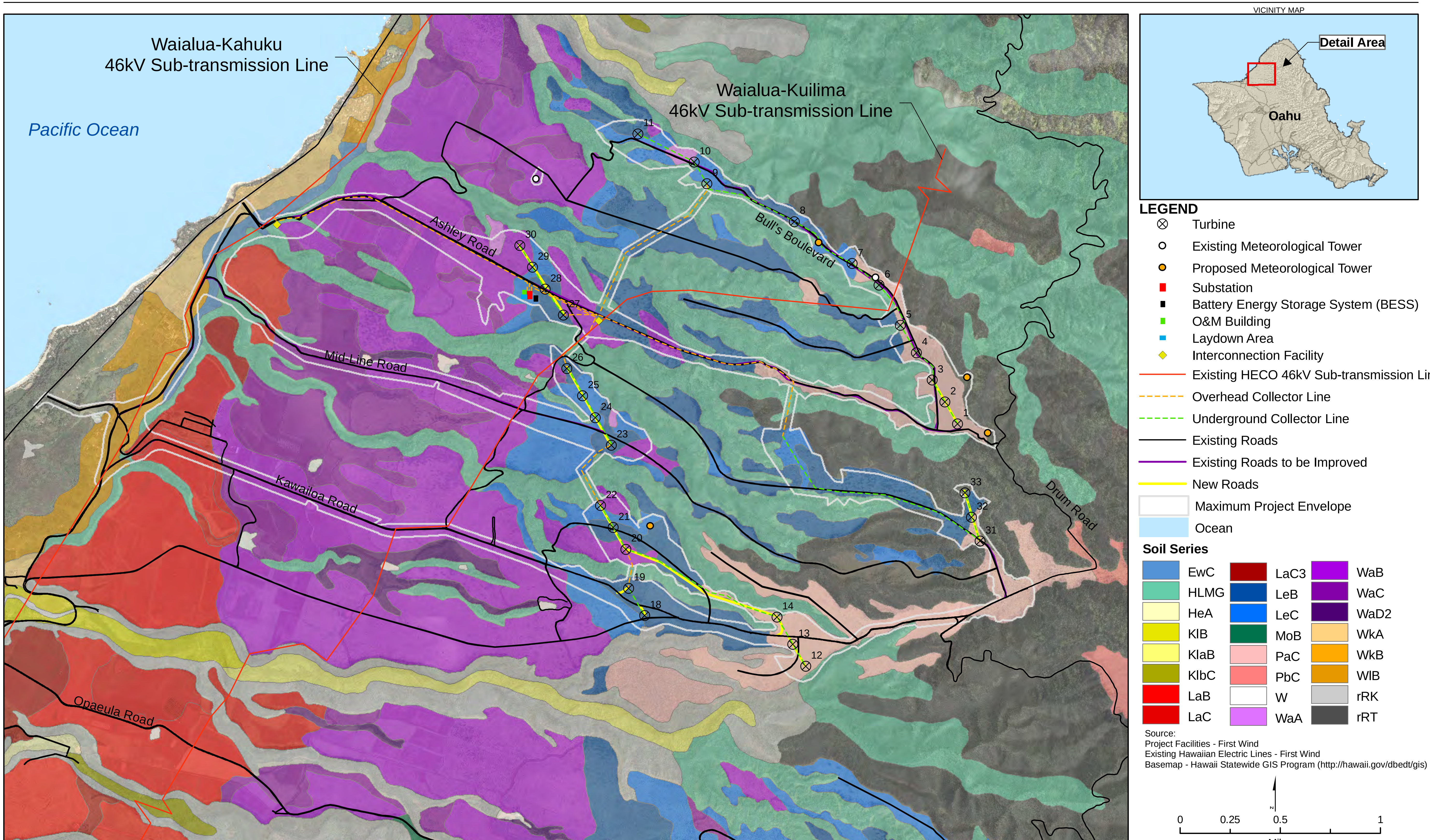

Figure 14
Soil Series Within Proposed Kawailoa Wind Farm Site
Kawailoa Wind Farm Project
Oahu, Hawaii

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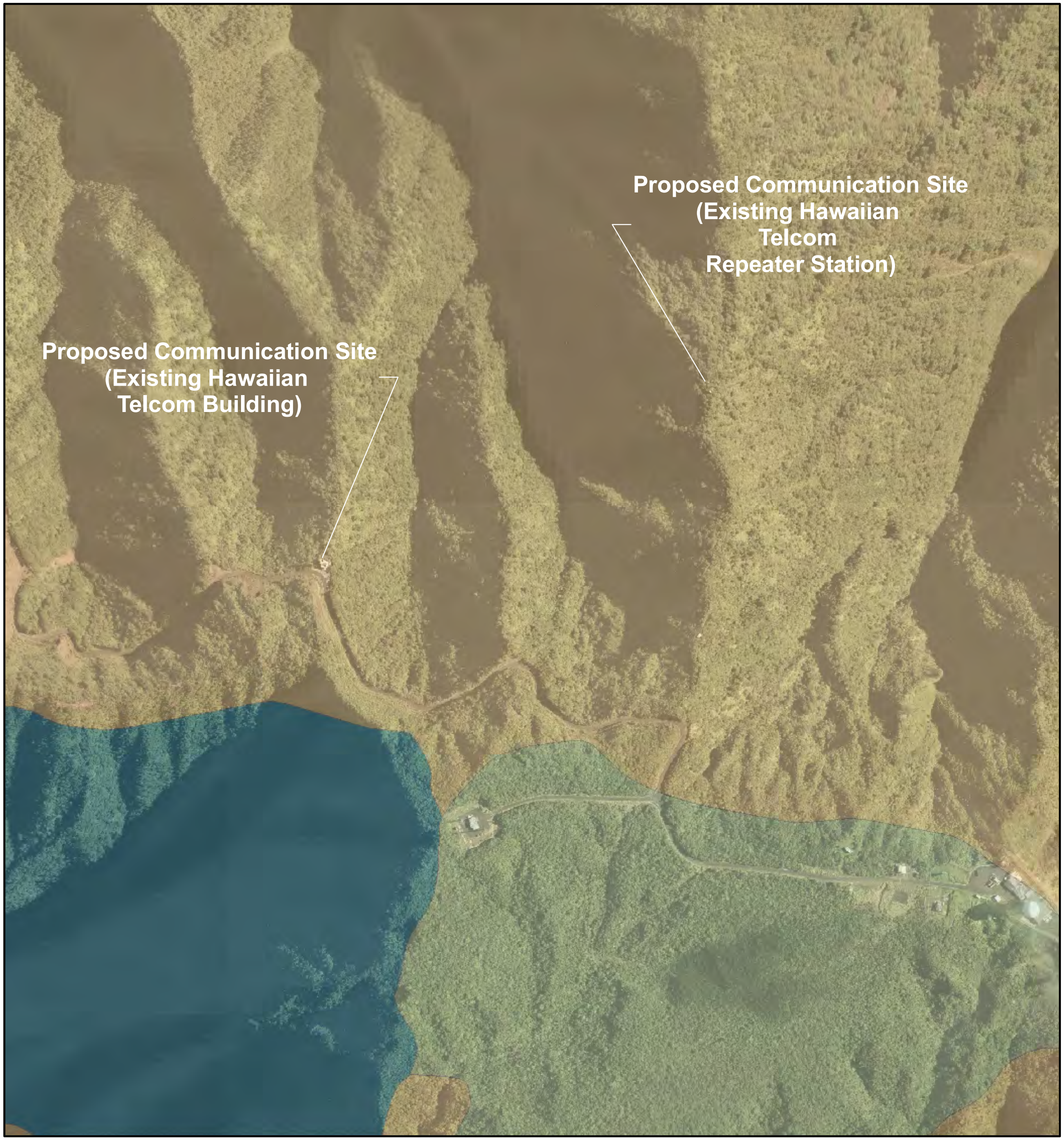
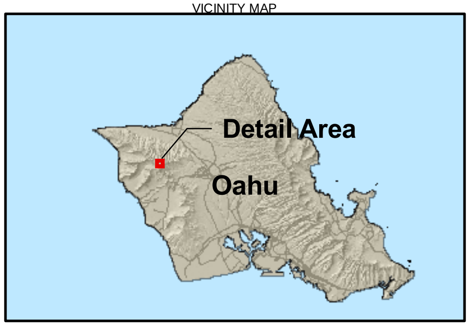


VICINITY MAP



LEGEND

Soil Series

- rAAE
- rRK
- rTP

Source:
Basemap - Hawaii Statewide GIS Program
(http://hawaii.gov/dbedt/gis)

N

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Feet

Figure 15
Soils Series Within the Mt. Ka'ala Communication Sites
Kawailoa Wind Project
Oahu, Hawaii

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TABLE 13
Characteristics of the Predominant Soil Types within the Mt. Ka`ala Communications Site

Soil Type	Slope (%)	Permeability	Runoff	Erosion Hazard	Land Uses
Tropohumults-Dystrandepts Association	30-90	Moderately Rapid	Medium to Very Rapid	Severe to Very Severe	Watershed
Alakai Mucky Peat	0-30	Moderately Rapid	Slow	Slight	Water supply, wildlife habitat

Source: General Soil Survey of Hawai`i, Foote et al. 1972 (U.S. Soil Conservation Service).

3.3.2 Potential Impacts and Mitigation Measures

3.3.2.1 Proposed Action

Wind Farm

Construction of the project would require grading for both temporary and permanent project features. Temporary features that would require grading include the equipment lay down areas adjacent to each turbine location. Permanent structures that would require grading include the wind turbine generators, substation and BESS facility, the electrical collector system, the O&M building, HECO interconnection facilities, meteorological towers, the communication tower, and onsite access roads. The site civil design is still being developed; however, the preliminary estimate of the total area of disturbance is approximately 306.4 acres, of which 22.0 acres would be permanent, as summarized in Table 2. During the operations and maintenance phase of the project, grading is expected to be limited to replacement of the underground collector lines and/or maintenance of the onsite access roads. These events are expected to occur infrequently.

Ground-disturbing activities would be conducted using graders, multiple cranes, dump trucks, concrete mix trucks, front end loaders, bulldozers, excavators, and heavy haul trucks. In general, grading would be limited to areas that have been extensively disturbed through repeated discing and grading as part of former agricultural activities. In some cases, shallow bedrock may be disturbed. To the extent possible, the earthwork would be designed to minimize cut and fill, and to avoid impacts to the major topographic features (including the gullies and streams); some components of the project may result in localized topographic changes and increased potential for erosion. The BMPs outlined below would be implemented to avoid and minimize erosion associated with ground disturbing activities:

- Sequence construction activities to minimize the exposure time of cleared areas.
- Minimize the extent of disturbed areas, where possible.
- To avoid fugitive dust emissions, cover soil stockpile areas containing more than 100 cubic yards of material, or keep continuously wet.
- Stabilize all disturbed soil that is not subject to re-vegetation, paving, or development, using approved chemical soil binders, jute netting, or other methods.

- Lay building pads and foundations as soon as possible after grading, unless seeding or soil binders are used.
- Cover all trucks hauling dirt, sand, soil, or other loose materials.
- Install erosion and sediment control measures (for example, silt fences) before initiating earth moving activities, and properly maintained throughout the construction period.
- Minimize the extent of clearing and grubbing to only what is necessary for grading, site access, and equipment operation.
- Properly implement all stormwater runoff and erosion control BMPs, as specified in the Construction Stormwater Permit approved by HDOH.
- During dry periods, inspect BMP features once weekly and repair as necessary. Inspect and repair features as needed within 24 hours after a rainfall event of 0.5 inches or greater in a 24-hour period. During periods of prolonged rainfall, inspect daily would occur.
- Maintain records for all inspections and repairs, on site.
- Apply permanent soil stabilization (that is, graveling or re-planting of vegetation) as soon as practical after final grading.

Given that the majority of the site has been extensively disturbed as part of previous site activities and that no major existing topographic features are expected to be affected (including the gullies and intermittent streams), construction and subsequent operation of the project is not expected to result in significant impacts to geology and topography. With implementation of BMPs, impacts to soils would be minimal.

Mt. Ka`ala Communication Sites

The communication equipment on Mt. Ka`ala would be installed on existing Hawaiian Telcom structures by crews on foot with access via existing roadways or trails, and would not result in any ground disturbance. As such, no impacts to geology, topography and soils would be expected to occur.

3.3.2.2 Alternative Communication Site Layout

Under this alternative, a new communication tower would be installed at either one or both of the Mt. Ka`ala communication sites in previously disturbed areas adjacent to the existing Hawaiian Telcom structures; access would be via existing roads and trails. Installation of each tower would require minor excavation for the tower foundations (approximately 144 square feet per tower).Construction would not result in significant changes in the topography of the site, and BMPs (as described in Section 3.3.2.1) would be implemented to avoid and minimize erosion associated with ground disturbance. As such, impacts to geology, topography, and soils are expected to be minimal.

3.3.2.3 No Action Alternative

Under the No Action alternative, the project facilities would not be constructed at either the wind farm or Mt. Ka`ala communication sites, and therefore, no changes to the geologic features, topography, or soils in these areas would occur.

3.4 Hydrology and Water Resources

Hydrology and water resources include both groundwater and surface water features. Groundwater refers to the subsurface hydrologic resources, which often are described in terms of depth to the aquifer or water table, water quality, and surrounding geologic composition. Surface water features include lakes, rivers, streams, and wetlands.

3.4.1 Existing Conditions

3.4.1.1 Wind Farm

Groundwater

Groundwater is a critical resource, as it is the primary water supply source for the island of O`ahu (Macdonald et al., 1983; Lau and Mink, 2006). The State Water Code (HRS §174C) defines groundwater as "any water found beneath the surface of the earth, whether in perched supply, dike-confined, flowing, or percolating in underground channels or streams, under artesian pressure or not, or otherwise." Groundwater generally occurs within portions of geologic formations (aquifers) that are favorable for receiving, storing, and transporting water.

The northern aquifer on the island of O`ahu includes three sub-aquifers: Mokuleia in the Wai`anae formation, as well as the Waialua and Kawailoa in the Ko`olau formation. The wind farm site is located over the north hydrologic sector of the Kawailoa aquifer system (DLNR, 2010). In general, these aquifers are underlain by a deep wedge of sedimentary caprock that creates thick basal lenses (Hunt, 1996). However, the Hawai`i Stream Assessment (CWRM, 1990) notes that the Kawailoa aquifer system lacks an effective caprock, thus allowing free movement of groundwater to the ocean (Oki et al., 1999). The depth to water table at the project site is generally in excess of 200 feet (61 meters) for all soil types (Foote et al., 1972).

Surface Water

The wind farm site includes a variety of surface water features, including several streams and gulches, reservoirs, and wetland features.

Several large streams are located in the vicinity of the wind farm site, including Waimea River, Anahulu River, Opaeula Stream and their respective tributaries. These are shown on Figure 16 and are briefly described below:

- **Waimea River.** Waimea River and its four tributaries – `Elehaha, Kaiwiko`ele, Kamananui, and an unnamed tributary - flow near the northern boundary of the wind farm site and discharge into Waimea Bay (U.S. Army Environmental Command, 2008).
- **Anahulu River.** Anahulu River and its two tributaries – Kawainui and Kawai`iki streams - run near the southern boundary of the wind farm site and discharge into Waialua Bay. Each of these tributaries is diverted once, supplying water to the Kaiwainui Ditch System (Division of Aquatic Resources [DAR], 2008; SWCA Environmental Consultants [SWCA], 2008), which includes several reservoirs. Two of the reservoirs are located on Anahulu River at elevations of approximately 970 feet (295 meters) and 780 feet (238 meters) (SWCA, 2008).

- **`Opae`ula Stream.** `Opae`ula Stream flows south of Anahulu River and is joined by Helemano Stream before flowing into Kaiaka Bay. `Opae`ula Stream is diverted once, at an elevation of approximately 1,200 feet (366 meters), and feeds into the ditch from the Kawai`iki diversion on the Anahulu River (SWCA, 2008).

Of these, only the unnamed tributary of Waimea River is located within the project boundary. Several smaller waterways are located on the wind farm site, including Ka`alaea, Kawailoa, Laniakea, and Loko Ea (Figure 16). These features are primarily dry throughout most of the year. In addition to these natural features, a network of agricultural ditches and ponds serve to convey irrigation water throughout the Kawailoa property. These ditches and ponds are all constructed in upland areas, and do not directly connect to (or impound) natural water features.

A former Hawaiian fishpond, `Uko`a Pond, is situated just to the west of the wind farm site, near the intersection of Kawailoa Road and Kamehameha Highway. Loko Ea is the influent gulch flowing into `Uko`a Pond, as well as the waterway that historically drained the pond to the sea at Hale`iwa Harbor (Miller et al., 1989). The extent of this basal-spring-fed pond was reduced because of expansion of the old Kawailoa Landfill (Elliott and Hall, 1977; Miller et al., 1989).

Jurisdictional Waters of the U.S. (Including Wetlands)

Wetlands and waters of the U.S. are regulated by the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act (CWA). In general, the following are considered to be jurisdictional waters subject to regulatory authority:

- Traditional navigable waters (TNW)
- Wetlands adjacent to TNW
- Non-navigable tributaries of TNW that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally
- Wetlands that directly abut such tributaries

Following the *Rapanos v. United States* decision in 2006, waters are also considered jurisdictional if they have a "significant nexus" with a TNW. A significant nexus exists if the flow characteristics and function of the tributary, and the functions performed by wetlands adjacent to the tributary, significantly affect the chemical, physical, and biological integrity of the downstream TNW.

In the late 1970s, the U.S. Fish and Wildlife Service (USFWS) Division of Ecological Services used USGS 7.5-minute quadrangle maps and georectified orthophotos to spot check and map wetlands in Hawai'i as part of the National Wetlands Inventory (NWI) Program (Cowardin et al., 1979). The NWI maps classified the features within the project area as Freshwater Pond (PUBH, PUBHh, PUBHx), Riverine (R4SBCx), Freshwater Emergent Wetland (PEM1Cx), and Freshwater Forested/Shrub Wetland (PFO3C).

To confirm which of the features within the project area may be subject to USACE jurisdiction, SWCA conducted a preliminary jurisdictional delineation on July 1, 8, and 9, and September 23, 2010. Investigations were performed in accordance with the 1987 USACE Wetland Delineation Manual and the 2007 joint EPA-USACE guidance on wetland jurisdictional determinations (post-*Rapanos*). The Draft Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Hawai`i and Pacific Island Region (draft for peer review and field testing dated June 20, 2009) was also consulted, along with additional references and standards for Hawai`i soils and wetland vegetation.

Contrary to the NWI mapping, the results of the investigation indicate that there are no wetland features within the project site that meet the three established criteria (hydrophytic vegetation, hydric soils, and wetland hydrology) for jurisdictional wetlands. `Uko`a Pond, located outside of the wind farm site, is expected to be considered a jurisdictional wetland.

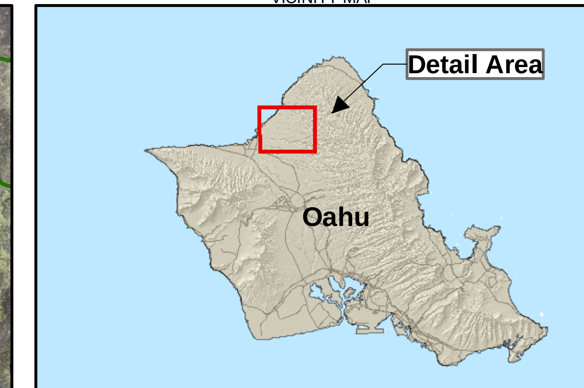
The intermittent waterways within the project site (Loko Ea [above `Uko`a Pond], Laniakea, Kawailoa and Ka`alaea) do not typically have continuous or seasonal flow, and therefore are not relatively permanent waters. However, these features would likely be subject to USACE jurisdiction following *Rapanos v. United States* because of their "significant nexus" with `Uko`a Pond and the Pacific Ocean. The unnamed, southernmost tributary of the Waimea River appears to be a naturally interrupted stream without perennial flow and may be considered to be relatively permanent. Therefore, it would also be subject to jurisdiction following *Rapanos v. United States* because of its significant nexus with Waimea Bay.

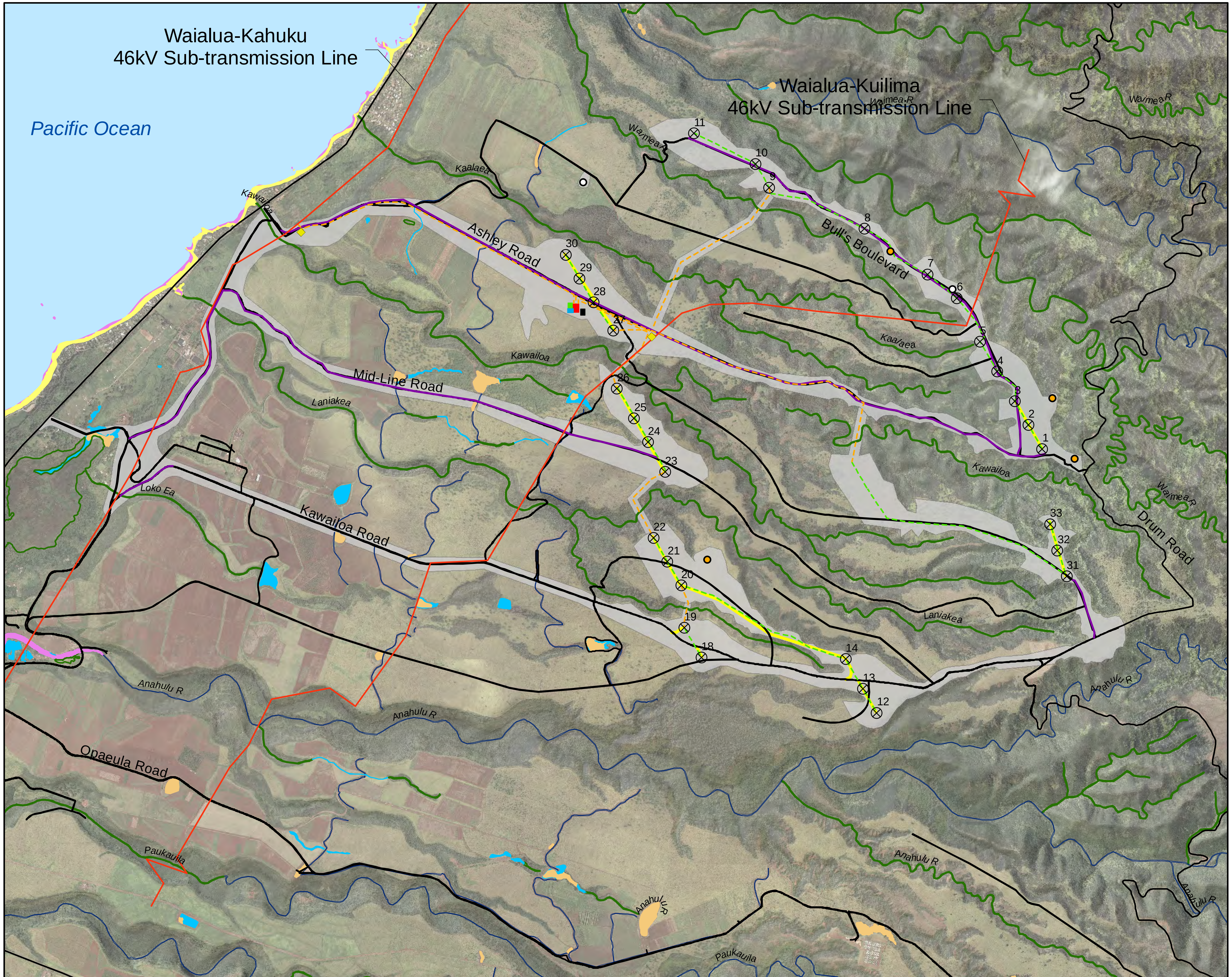
3.4.1.2 Mt. Ka`ala Communication Site

The Mt. Ka`ala communication site is located over the Mokuleia aquifer system. Relative to surface water, there are three major drainage systems surrounding Mt. Ka`ala: the Wahiawā system to the east, the Waialua-Hale`iwa system to the north, and the Ewa-Waianae-Waipahu system to the southwest (CH2M HILL, 2003). A permanent surface water feature exists on the summit plateau of Mt. Ka`ala in the form of a large bog. Other hydrologic features in the vicinity of Mt. Ka`ala include intermittent streams, ditches, and small standing pools.

A field inspection of the Mt. Ka`ala communication site was conducted on July 30, 2010. No surface water features were identified within the boundaries of the site. A review of the NWI maps indicated that there are no wetlands designated at the site.

VICINITY MAP





LEGEND

- Turbine
- Existing Meteorological Tower
- Proposed Meteorological Tower
- Substation
- Battery Energy Storage System (BESS)
- O&M Building
- Laydown Area
- Interconnection Facility
- Existing HECO 46kV Sub-transmission Line
- Overhead Collector Line
- Underground Collector Line
- Existing Roads
- Existing Roads to be Improved
- New Roads
- Maximum Project Envelope
- Ocean

National Wetland Inventory

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Riverine

Source:
Project Facilities - First Wind
Existing Hawaiian Electric Lines - First Wind
Basemap - Hawaii Statewide GIS Program (http://hawaii.gov/dbedt/gis)

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Miles

Figure 16
Surface Water Features
Kawailoa Wind Farm Project
Oahu, Hawaii

3.4.2 Potential Impacts and Mitigation Measures

3.4.2.1 Proposed Action

Wind Farm

Groundwater

Construction of the project components would require minimal subsurface work, with the maximum depth of excavation expected to be approximately 10 feet. These depths are well above the water table, and therefore, no direct interaction with groundwater is anticipated. Other types of impacts to groundwater that could result from construction and/or operation of the project include reductions in recharge, availability, or quality. Specific to groundwater recharge, the project would increase the total impervious surface across the property by approximately 22.0 acres; however, these surfaces would only comprise a very small percentage of the overall area, and there is still sufficient open space such that groundwater recharge is not expected to measurably decrease. Total water consumption would be minimal (for example, watering roads and stockpiles), and would be addressed using water tanks that would be periodically filled with water trucked onto the site. As such, the project is not expected to adversely affect groundwater availability.

Finally, construction and operation activities would require the use of some hazardous materials, which if handled inappropriately, could affect groundwater quality. However, appropriate management practices, including preparation and implementation of a Spill Prevention, Countermeasure, and Control (SPCC) Plan, would be in place throughout construction and operation to avoid and minimize impacts associated with these materials, as described in Section 3.11. With implementation of these measures, no impacts to groundwater quality are expected.

Surface Water

The maximum envelope for the project has been designed to exclude potentially jurisdictional features to the maximum extent possible; these features include Loko Ea, Laniakea, Kawailoa, Ka`alaea, and the unnamed tributary to Waimea River.

The only locations where potentially jurisdictional features occur within the envelope are those areas where they intersect with the existing onsite roads. In general, the waterways are culverted under the roads, and road improvements would be conducted so as to avoid impacts to these features. The only unculverted road crossing within the project envelope is along Laniakea Stream, an intermittent waterway, where it washes over Cane Haul Road. Road improvements may be required in this location to achieve the specifications for the turbine delivery vehicles; no work would be conducted outside the existing footprint of the road. Potential permitting requirements associated with these activities are currently being evaluated and will be addressed accordingly.

Ground disturbing activities during construction also have the potential to increase the amount of sediment and other pollutants in stormwater runoff, which could adversely affect the water quality in these waterways. To address this, general BMPs would be implemented as part of construction to avoid and minimize these impacts, as described in Section 3.3.2.1. Specific measures to avoid and minimize the input of pollutants to water features are listed below in Table 14. In addition, a Notice of General Permit Coverage for construction-related stormwater runoff will be obtained, pursuant to National Pollutant Discharge Elimination

System (NPDES) regulations. With implementation of these measures, impacts to surface water quality are expected to be insignificant.

TABLE 14
Potential Pollutants from Construction Activities and Proposed Avoidance and Minimization Measures

Pollutant	Source/Activity	Control Measure (BMP)
Vegetation/Rock	Excavation, grubbing, grading, stockpiling	Install silt fencing; temporary soil stabilization
Soil/Sediment	Excavation, grading, stockpiling, watering for dust control	Install silt fencing; protection of stockpiles; natural vegetation; sand bags; temporary soil stabilization; geotextile mats (internal access road slopes); avoid excess dust control watering
Oil and Gas	Construction equipment, vehicles	Regular vehicle and equipment inspection; prohibition of onsite fuel storage; drip pan for onsite tanker fueling; spill kits
Construction Waste	Construction debris, select fill, paint, chemicals, etc.	Protection of stockpiles; onsite dumpsters; periodic waste removal & disposal; compaction & swales (for rock fill); containment pallets (for chemicals)
Concrete Wash Water	Pouring of turbine foundations	Containment in wash water pits; install silt fences
Equipment & Vehicle Wash Water	Construction equipment	Containment berms around equipment washing area; offsite vehicle washing
Sanitary Waste	Portable toilets or septic tank	Sanitary/septic waste management

Note: BMPs are adopted from and defined in the City and County of Honolulu's "Best Management Practices Manual for Construction Sites in Honolulu" (May 1999).

Mt. Ka`ala Communication Sites

Installation of the communication equipment near Mt. Ka`ala would use existing Hawaiian Telcom structures, and would not require excavation or ground disturbance. As such, these activities are not expected to affect the recharge, availability or quality of the groundwater. No surface water features are present within either of the communications sites, so no impacts to surface water would occur.

3.4.2.2 Alternative Communication Site Layout

Under this alternative, installation of the communication towers would require a minimal amount of excavation and ground disturbance (approximately 144 square feet per tower). These activities are not expected to affect the recharge, availability or quality of the groundwater.

No surface water features are present within either communications site, so no direct impacts would occur. The tower footings would only slightly increase the impervious surfaces at each site and, with implementation of BMPs, indirect impacts to surface water quality would be insignificant.

3.4.2.3 No Action Alternative

Under the No Action alternative, no changes would occur to the existing groundwater or surface water conditions.

3.5 Biological Resources

Biological resources consist of plants and animals, and their habitats. Species that are Federally listed as threatened or endangered, and areas that have been designated as "critical habitat" for those species are protected under the Endangered Species Act of 1973 (ESA) 16 U.S.C. 1531-1544) as amended. Threatened and endangered species are further protected in accordance with Hawai`i State law (HRS §195D-4).

3.5.1 Historical Conditions

3.5.1.1 Wind Farm

In pre-Contact times, the sloping uplands at the wind farm location were likely forested with native 'ohi'a (*Metrosideros polymorpha*) and koa (*Acacia koa*) trees, with a dense understory of smaller native trees, shrubs, ferns and vines. The gulches were likely vegetated with an even denser growth of shade-loving species.

In the late 1800s, the area was cleared and converted to sugar cane agriculture. Over the following 100 years, the fields were plowed, burned, harvested and planted in continuous cycles. Some of the broader gulches were used to pasture plantation horses and mules. These uses greatly reduced the number and overall diversity of native plants, which were gradually replaced by increasing numbers of non-native agricultural and pasture plants. A number of different tree species were planted along the edges of fields to serve as windbreaks. Other species deemed to be useful or ornamental were also planted in gulches and along ditches. Many of these have proliferated, with some becoming invasive. Feral pigs have spread throughout the area, negatively impacting native vegetation. Pigs are also an important vector for the spread of weed species throughout the forests.

Today, little remains of native plant diversity in the wind farm project area. A few native species persist on steep gulch slopes in the upper parts of the property, but most of the area is vegetated with a few invasive non-native species, as further discussed in Section 3.5.2.1.

3.5.1.2 Mt. Ka`ala Communication Sites

The upper slopes of Mt. Ka`ala are one of the best examples of intact wet native forest on O`ahu. Numerous species of rare plants inhabit its steep terrain. The Mt. Ka`ala Natural Area Reserve (NAR), comprised of approximately 1,100 acres, provides enhanced levels of protection from destructive ungulates, such as pigs and goats. While many of the native plants that grow on the lower slopes of the Wai'anae Mountains have been heavily impacted and have suffered endangerment, those species that extend into the upper slopes have fared better. The existing repeater site is directly adjacent to the NAR; both sites are within the Mokuleia Forest Reserve.

The ridge that supports the two existing scaffold towers has been used as a hiking trail (known as the Dupont Trail) for many years, and as a result, a number of non-native weeds are scattered along its length; however, the slopes on either side are nearly weed-free. Likewise, the slopes adjacent to the existing Hawaiian Telcom building site are also relatively intact native forest. With the current levels of protective management, these upper forests are expected to thrive well into the future.

3.5.2 Existing Conditions

3.5.2.1 Flora

Wind Farm

Botanical surveys were conducted at the wind farm site by Robert Hobdy in February and August 2010. Approximately 183 plant species were recorded in February and an additional 40 species during the survey in August. No Federally or State listed endangered, threatened, or candidate plant species, nor species considered rare throughout the Hawaiian Islands, were found at the wind farm site. No portion of the site has been designated as critical habitat for any listed plant species (Hobdy, 2010a; Hobdy, 2010b).

The existing vegetation is a mixture of aggressive weedy species that have proliferated since the abandonment of sugar cane agriculture. Guinea grass (*Urochloa maxima*) is the most abundant species within the site, forming deep growth on all the flat terrace areas and in many of the gulches. Other common species include: common ironwood (*Casuarina equisetifolia*), albizia (*Falcataria moluccana*), Formosan koa (*Acacia confusa*), koa haole (*Leucaena leucocephala*), Padang cassia (*Cinnamomum burmanni*), Java plum (*Syzygium cumini*), strawberry guava (*Psidium cattleianum*), cork bark passion flower (*Passiflora suberosa*) and swamp mahogany (*Eucalyptus robusta*). All of these species are non-native to the Hawaiian Islands (Hobdy, 2010a; Hobdy, 2010b).

Although the wind farm site is believed to have been forested with a variety of native trees, shrubs, ferns, and vines in Pre-Contact times, few native species persist in the area today. The lack of native species is attributed to years of agricultural activities and invasion by non-native plant and animal species. Significant remnants of native vegetation occur on the steep slopes of the gulches in the upper parts of the property. Thirty native plant species were identified within the wind farm site, of which thirteen are endemic (found only in Hawai`i). Seven species that were introduced by Polynesians also occur (Hobdy, 2010a; Hobdy, 2010b). Table 15 lists the native plant species recorded at the wind farm site.

TABLE 15
Native Plant Species Identified at the Kawailoa Wind Farm Site

Scientific Name	Common Name	Status
FERNS		
DENNSTAEDTIACEAE (Bracken Family)		
Pteridium aquilinum (L.) Kuhn var. *decompositum* (Gaud.) R.M. Tryon	*kilau*	En
DICKSONIACEAE (Dicksonia Family)		
Cibotium chamissoi Kaulf.	*hāpuʻu*	En
GLEICHENIACEAE (False Staghorn Fern Family)		
Dicranopteris linearis (Burm.f.) Underw.	*uluhe*	I
LINDSAEACEAE (Lindsaea Fern Family)		
Sphenomeris chinensis (L.) Maxon	*palaʻā*	I
NEPHROLEPIDACEAE (Sword Fern Family)		
Nephrolepis exaltata (L.) Schott	*niʻaniʻau*	I

TABLE 15
Native Plant Species Identified at the Kawailoa Wind Farm Site

Scientific Name	Common Name	Status
POLYPODIACEAE (Polypody Fern Family)		
Lepisorus thunbergianus (Kaulf.) Ching	*pākahakaha*	I
PSILOTACEAE (Whisk Fern Family)		
Psilotum nudum (L.) P. Beauv.	*moa*	I
MONOCOTS		
ASPARAGACEAE (Asparagus Family)		
Pleomele halapepe St. John	*halapepe*	En
CYPERACEAE (Sedge Family)		
Carex meyenii Nees	--	I
Carex wahuensis C.A. Meyen	--	En
Cyperus polystachyos Rottb.	--	I
PANDACEAE (Screwpine Family)		
Freycinetia arborea Gaud.	*ʻieʻie*	I
POACEAE (Grass Family)		
Chrysopogon aciculatus (Retz.) Trin.	*pilipili ʻula*	I
DICOTS		
ASTERACEAE (Sunflower Family)		
Bidens sandvicensis Less	*koʻokoʻolau*	En
EBENACEAE (Ebony Family)		
Diospyros sandwicensis (A.DC.) Fosb.	*lama*	En
ERICACEAE (Heath Family)		
Leptecophylla tameiameiae (Cham. & Schlect.) C.M. Weiller	*pūkiawe*	I
FABACEAE (Pea Family)		
Acacia koa A. Gray	*koa*	En
Vigna marina (J. Burm.) Merr.	*nanea*	I
GOODENIACEAE (Goodenia Family)		
Scaevola gaudichaudiana Cham.	*naupaka kuahiwi*	En
LAURACEAE (Laurel Family)		
Cassytha filiformis L.	*kaunaʻoa pehu*	I
MENISPERMACEAE (Moonseed Family)		
Cocculus orbiculatus (L.) DC.	*huehue*	I
MYOPORACEAE (Myoporum Family)		
Myoporum sandwicense A. Gray	*naio*	
MYRTACEAE (Myrtle Family)		
Metrosideros polymorpha Gaud. var. *polymorpha*	*ʻōhiʻa*	En
OLEACEAE (Olive Family)		
Nestegis sandwicensis (A. Gray) Degener, I. Degener & L.Johnson	*olopua*	En
ROSACEAE (Rose Family)		
Osteomeles anthyllidifolia (Sm.) Lindl.	*ʻūlei*	I
RUBIACEAE (Coffee Family)		

TABLE 15
Native Plant Species Identified at the Kawailoa Wind Farm Site

Scientific Name	Common Name	Status
Psychotria mariniana (Cham. & Schlectend) Fosb.	*kōpiko*	En
Psydrax odorata (G. Forst.) A.C. Smith & S.P.Darwin	*alahe'e*	I
SANTALACEAE (Sandalwood Family)		
Santalum freycinetianum Gaud. var. *freycinetianum*	*'iliahi*	En
SAPINDACEAE (Soapberry Family)		
Dodonaea viscosa Jacq.	*'a'ali'i*	I
STERCULIACEAE (Cacao Family)		
Waltheria indica L.	*'uhaloa*	I
THYMELAEACEAE ('Akia Family)		
Wikstroemia oahuensis (A. Gray) Rock.	*'akia*	En

LEGEND:
En = endemic (native only to Hawai`i); I = indigenous (native to Hawai`i and elsewhere).
Source: Hobdy (2010a,b)

Mt. Ka`ala Communication Sites

A botanical survey was conducted at the Mt. Ka`ala communication sites in August 2010. The survey covered an approximately 0.1-acre area at each of the two sites. The vegetation at both sites is mostly low and open from previous clearing work, and has been maintained in this condition for over 30 years. It is comprised almost exclusively of non-native species, including grasses, sedges and rushes. These areas, however, are fringed by steep expanses of nearly pure native forests. These fringes were surveyed out to a distance of approximately 30 feet to assess the species composition of the adjacent forest.

A total of 63 plant species were recorded during the survey, of which 30 were non-native weeds and ornamentals, and 33 were native species. The non-native plants did not extend into the dense fringing native forest. Species found to be common on the two sites include *uluhe* (*Dicranopteris linearis*), narrow-leaved carpetgrass (*Axonopus fissifous*), *'ohi'a* (*Metrosideros polymorpha varieties var. glaberrima* and *polymorpha*) and broad-leaved plantain (*Plantago* major). A total of 22 native species were observed that are endemic to the Hawaiian Islands; these are listed in Table 16. No Federally listed threatened or endangered plant species were encountered within either the cleared ridgetop areas or the fringing native forests, and none were encountered that are candidates for such status.

TABLE 16
Native Plant Species Identified at the Mt. Ka`ala Communication Sites

Common Name	Scientific Name
'akolea	*Athyrium microphyllum*
'ama'u	*Sadleria cyatheoides*
'ama'u	*Sadleria pallida*
hapu'u pulu	*Cibotium glaucum*
hapu'u 'i'i	*Cibotium menziesii*

TABLE 16
Native Plant Species Identified at the Mt. Ka`ala Communication Sites

Common Name	Scientific Name
uluhe lau nui	*Diplopterigium pinnatum*
pai	*Adenophorus hymenophylloides*
palai hinahina	*Hymenophyllum lanceolatum*
hoi kuahiwi	*Smilax melastomifolia*
olomea	*Perottetia sandwicensis*
'ohelo	*Vaccinium calycinum*
naupaka kuahiwi	*Scaevola mollis*
pu'ahanui	*Broussaisia arguta*
kapana	*Phyllostegia grandiflora*
kamakahala	*Labordia waiolani*
'ohi'a	*Metrosideros polymorpha* var. *glaberrima*
'ohi'a	*Metrosideros polymorpha* var. *polymorpha*
lehua 'ahihi	*Metrosideros tremuloides*
'ala'ala wai nui	*Peperomia macraeana*
pilo	*Coprosma longifolia*
manono	*Kadua affinis*
kukae moa	*Melicope clusiifolia*

3.5.2.2 Fauna

Wind Farm

Mammals

Six species of mammals were observed during a biological survey conducted by Robert Hobdy in February and August 2010: feral pig (*Sus scrofa*), mongoose (*Herpestes aruopunctatus*), domestic dog (*Canis lupus familiaris)*, rat (*Rattus* sp.), cat (*Felis catus*), and Hawaiian hoary bat (*Lasiurus cinereus semotus*). The Hawaiian hoary bat is listed as endangered and is protected under both Federal and State law; this species is further discussed in Section 3.5.2.3.

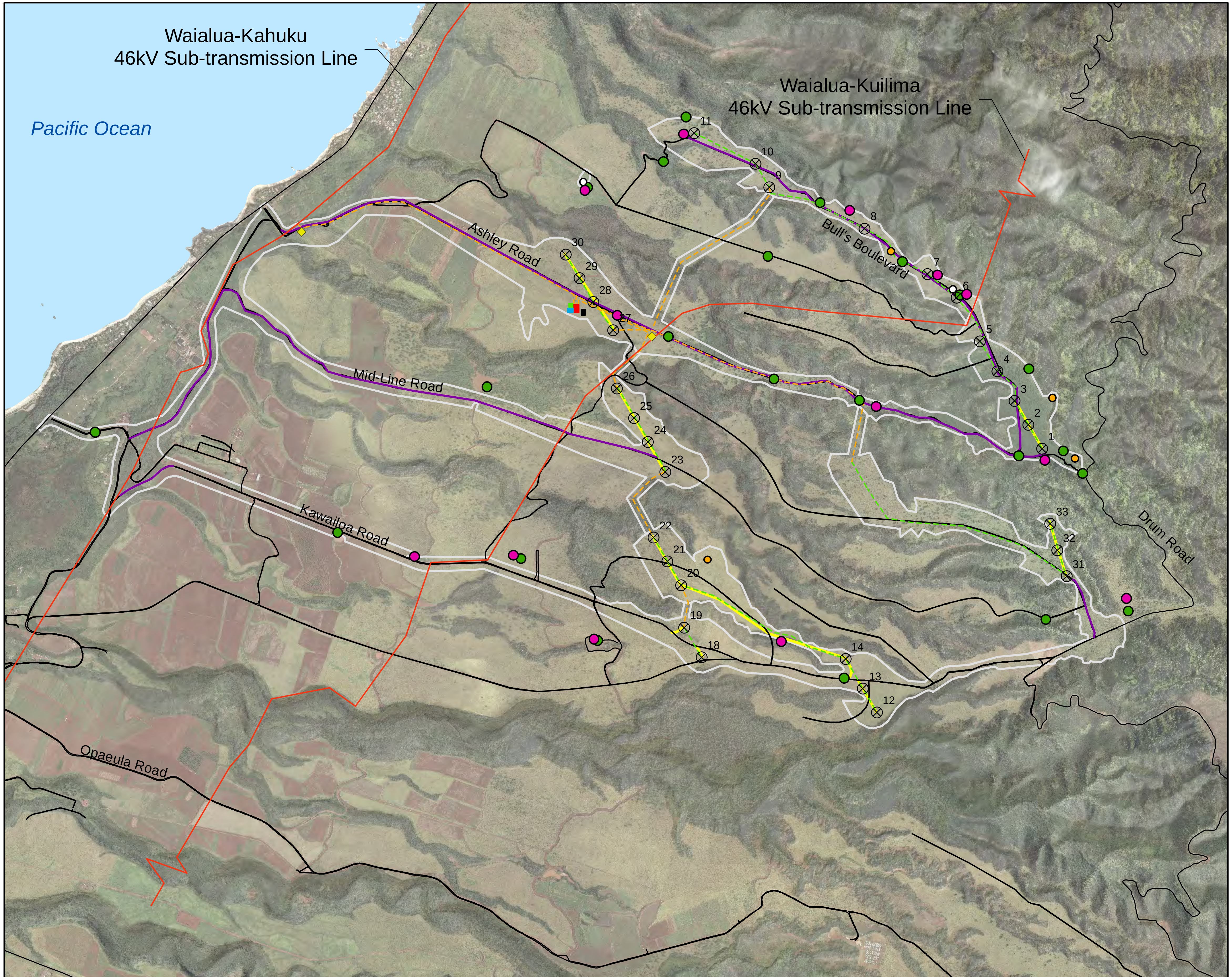
With the exception of the Hawaiian hoary bat, the mammalian species that were observed are non-native, feral species. Pigs and mongoose are common throughout the site, and many individuals and family groups were observed. Major trails were found in every gulch, and diggings and droppings associated with this species were widespread. Pig hunters frequent this area regularly with their dogs. Dense vegetation prevented good visibility of other ground-dwelling mammals, but a significant population of mice (*Mus domesticus*) would be expected, as they are known to frequent this type of habitat.

Avifauna

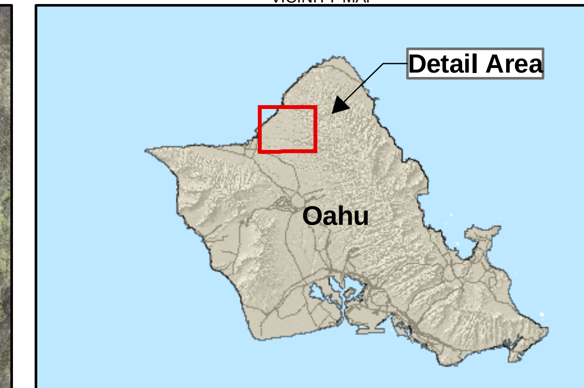
A variety of survey efforts have been conducted to identify avifauna species within the wind farm site. Specifically, nocturnal radar surveys were conducted in June and October 2009 to identify seabirds that may potentially transit the project site. Fall surveys were timed to coincide with fledging periods and the summer surveys to coincide with the incubation periods for Newell's shearwater (*Puffinus auricularis newelli*) and Hawaiian petrel (*Pterodroma sandwichensis*), both of which are Federally and State listed species. Criteria used to identify possible shearwaters/petrels consisted of radar targets moving at airspeeds greater than 30 mph, of the appropriate size, flying inland or seaward only (not parallel to shore), and exhibiting directional flight (Cooper et al. 2009). In addition, avian point count surveys were conducted from October 2009 to September 2010. A total of 29 point count surveys were conducted, with stations located in representative habitats within the wind farm site, close to potential turbine locations (Figure 17). Additional point counts were also taken at water bodies in the vicinity of the site, to document waterbird activity and use patterns of non-listed migratory bird species. To quantify bat activity within the project site, bat detection (Anabat) devices were deployed at various locations from October 2009 to present (Figure 17). A total of two to seven Anabat detectors have been stationed within the wind farm site, and have been moved among several locations to increase the total area sampled. Between October 2009 and December 2010, a total of 1643 detector nights were sampled. Incidental sightings of all native birds were also recorded while biologists were onsite. Data recorded included location, species, number of birds, the distance of the bird from observer, flight height and flight direction.

As a result of these survey efforts, a total of 27 bird species have been detected onsite. Of these, three are native species and one a winter migrant. The native species are the threatened Newell's shearwater (presumably detected during radar surveys), the black-crowned night heron (*Nycticorax nycticorax)* and the Hawaiian duck-mallard hybrid (*Anas* sp.). The winter migrant is the Pacific golden-plover (*Pluvialis fulva)*. An additional six species were observed at nearby ponds in the vicinity of the project area; native species included the endangered Hawaiian coot (*Fulica alai)*, the endangered Hawaiian moorhen (*Gallinula chloropus sandvicensis*) and the great frigate bird (*Fregata minor)*. The remaining species observed at the nearby ponds were introduced species.

Table 17 identifies all bird species detected during the point count and radar surveys, with an indication of where each species was detected. The table also specifies the Federal and State listing status of each species and whether it is protected under the Migratory Bird Treaty Act (MBTA). Federally and State listed species are discussed in further detail in Section 3.5.2.3.



VICINITY MAP



LEGEND

- Turbine
- Existing Meteorological Tower
- Proposed Meteorological Tower
- Anabat Detector
- Bird Point Count Station
- Substation
- Battery Energy Storage System (BESS)
- O&M Building
- Laydown Area
- Interconnection Facility
- Existing HECO 46kV Sub-transmission Line
- Overhead Collector Line
- Underground Collector Line
- Existing Roads
- Existing Roads to be Improved
- New Roads
- Maximum Project Envelope
- Ocean

Source:
Project Facilities - First Wind
Existing Hawaiian Electric Lines - First Wind
Basemap - Hawaii Statewide GIS Program (http://hawaii.gov/dbedt/gis)

N

0 0.25 0.5 1
Miles

Figure 17
Location of Bird Point Count Stations and Anabat Detectors
Kawailoa Wind Farm Project
Oahu, Hawaii

TABLE 17
Avian Species Identified Within and Adjacent to the Kawailoa Wind Farm Site

Common Name	Scientific Name	Status	MBTA	Onsite	Adjacent Ponds	Other
Newell's shearwater	*Puffinus auricularis newelli*	I, T	X	X[a]		
Great frigatebird	*Fregata minor*	I	X			X (Waimea Valley)
Cattle egret	*Bubulcus ibis*	NN	X	X	X	
Black-crowned night heron	*Nycticorax nycticorax*	I	X	X	X	
Mallard	*Anas platyrhynchos*	NN	X		X	
Hawaiian duck-mallard hybrids	*Anas* sp.	I	X	X[b]	X	
Muscovy	*Cairina moschata*	NN			X	
Domestic duck	*Anas platyrhynchos domestica*	NN			X	
Domestic geese	*Ana anser domesticus*	NN		X	X	
Gray francolin	*Francolinus pondicerianus*	NN		X		
Black francolin	*Francolinus francolinus*	NN		X		
Domestic chicken	*Gallus gallus*	NN		X	X	
Common peafowl	*Pavo cristatus*	NN		X		
Hawaiian coot	*Fulica alai*	En, E	X		X	
Hawaiian moorhen	*Gallinula chloropus sandvicensis*	En, E	X		X	
Pacific golden- plover	*Pluvialis fulva*	V	X	X	X	
Spotted dove	*Streptopelia chinensis*	NN		X	X	
Zebra dove	*Geopelia striata*	NN		X	X	
Barn owl	*Tyto alba*	NN	X	X	X	
Skylark	*Alauda arvensis*	NN				X (Opaeula Road)
Red-vented bulbul	*Pycnonotus cafer*	NN		X	X	
Red-whiskered bulbul	*Pycnonotus jocosus*	NN		X	X	
Japanese bush-warbler	*Cettia diphone*	NN		X	X	
White-rumped shama	*Copsychus malabaricus*	NN		X	X	
Red billed leothrix	*Leiothrix lutea*	NN		X		
Japanese white-eye	*Zosterops japonicus*	NN		X	X	
Common mynah	*Acridotheres tristis*	NN		X	X	
Red-crested cardinal	*Paroaria coronata*	NN		X	X	
Northern cardinal	*Cardinalis cardinalis*	NN	X	X	X	
House finch	*Carpodacus mexicanus*	NN	X	X	X	
Common waxbill	*Estrilda astrild*	NN		X	X	
Red avadavat	*Amandava amandava*	NN		X	X	
Nutmeg mannikin	*Lonchura punctulata*	NN		X		
Chestnut munia	*Lonchura malacca*	NN		X		
Total number of species				**27**	**23**	**2**

NOTES:
[a] Based on radar data, not confirmed by visual assessment
[b] Presumed, as discussed in the Kawailoa HCP.
LEGEND:
En= endemic; I = indigenous, V = visitor, NN = non-native permanent resident; E = Endangered, T = threatened

Invertebrates

In general, insects were not tallied within the wind farm site. However, the biological survey included a survey for a native sphingid moth, the Blackburn's sphinx moth (*Manduca blackburni*), which is a Federally and State listed endangered species (USFWS, 2000a). Blackburn's sphinx moth was known to occur on O`ahu in the past, although it has not been documented recently. Its primary native host plants are species of *'aiea* (*Nothocestrum spp.*), and alternative host plants are tobacco (*Nicotiana tabacum*) and tree tobacco (*Nicotiana glauca*). None of the host plant species, or Blackburns' sphinx moth or their larvae were observed (Hobdy, 2010a; Hobdy, 2010b).

In recent times, endangered molluscs have only been documented in native forests on O`ahu at elevations greater than 1,300 feet (400 meters) (USFWS, 1992). Because the wind farm site is lower in elevation and dominated by non-native vegetation, these species are not expected to occur. Thus, no mollusc survey was conducted within the wind farm site. However, the non-native rosy wolf snail (*Euglandina rosea*), has been incidentally encountered.

Mt. Ka`ala Communication Sites

Mammals

No mammals or evidence of mammals were observed on either of the two Mt. Ka`ala communication sites. This habitat type is often frequented by pigs, but no evidence of pig activity was observed. Mice, rats, feral cats, and mongoose would also be expected to occur.

Avifauna

Avian diversity and abundance appear to be rather sparse in the vicinity of the Mt. Ka`ala communication sites; however, because of restricted access, surveys of the sites were limited to a single day in August 2010. Only four species of non-native birds were observed or heard during the survey. These included Japanese bush warbler (*Cettia diphone*), red-vented bulbul (*Pycnonotus cafer*), Japanese white-eye (*Zosterops japonicas*), and house finch (*Carpodacus mexicanus*) (Table 18).

Based on historical information, native forest birds that may still frequent the area could include O`ahu *'amakihi* (*Hemignathus flavus*) and *'apapane* (*Himantione sanguinea*). Although more rare, O`ahu *'elepaio* (*Chasiempis ibidis*) and *'i'iwi* (*Vestiaria coccinea*) could also occur. A non-native bird that could occur is the red-billed leiothrix (*Leiothrix lutea*), a common resident in O`ahu wet forests. The open ridgetop area near the existing scaffold towers could also be suitable habitat for Newell's shearwaters. Radar studies were not conducted because the addition of antennae to the existing towers is not expected to increase the collision risk to shearwaters.

TABLE 18
Avian Species Identified at the Mt. Ka`ala Communication Sites

Common Name	Scientific Name	Status	Relative Abundance
Japanese bush-warbler	*Cettia diphone*	non-native	uncommon
Red-vented bulbul	*Pycnonotus cafer*	non-native	rare
Japanese white-eye	*Zosterops japonicus*	non-native	rare
House finch	*Carpodacus mexicanus*	non-native	rare

Invertebrates

In general, insects were not tallied at the Mt. Ka`ala communication sites, but specific inspections were made for endangered species of *Drosophila* fruit flies and candidate species of *Megalagrion* damsel flies; none were observed.

A mollusc survey was also conducted in August 2010. As listed in Table 19, one species of native snail was found at the existing Hawaiian Telcom building site. Seven native species were found at the site with the existing scaffold towers; six native species were also found enroute to this site, of which *Kaala subrutila*, an endemic mollusc, may be assessed for listing as a candidate species in the near future (C. King, DLNR Division of Forestry and Wildlife [DOFAW], personal communication).The majority of the native snail diversity was found on native plants along the edges of each site. Only two non-native mollusc species (*Oxychilus alliarius* and *Deroceras laeve*) were observed in total. *Oxychilus alliarius* is known to feed on other molluscs and represents a potential ecological threat to native molluscs at Mt. Ka`ala. The invasive slug *Deroceras laeve* competes with other molluscs and is also considered a threat to native ecosystems in Hawai`i.

TABLE 19
Invertebrate Species Identified at the Mt. Ka`ala Communication Sites

Location	Family	Species	Native?	Relative Abundance
Hawai`i Telcom Station	Zonitidae	*Oxychilus alliarius*	No	abundant
	Succineidae	*Succinea* spp.	Yes	highly abundant
Repeater Station	Succineidae	*Succinea* spp.	Yes	highly abundant
	Succineidae	*Catinella rotundata*	Yes	abundant
	Succineidae	*Catinella* sp.	Yes	common
	Agriolimacidae	*Deroceras laeve*	No	rare
	Achatinellidae	*Tornatellininae* spp.	Yes	common
	Achatinellidae	*Pacificellinae* spp.	Yes	common
	Achatinellidae	*Auriculellinae* spp.	Yes	common
	Achatinellidae	*Tornatellidinae* spp.	Yes	abundant
~50 m before Repeater Station (on trail)	Succineidae	*Succinea* spp.	Yes	highly abundant
	Succineidae	*Catinella rotundata*	Yes	abundant
	Achatinellidae	*Tornatellininae* spp.	Yes	abundant
	Achatinellidae	*Tornatellidinae* spp.	Yes	abundant
	Helicarionidae	*Philonesia* spp.	Yes	rare
	Helicarionidae	*Kaala subrutila*	Yes	rare

3.5.2.3 Threatened or Endangered Species

Wind Farm

No Federally or State listed endangered, threatened or candidate species are known to permanently reside within the Kawailoa wind farm site and no portion of the site has been designated as critical habitat for any listed species. However, several Federally or State listed species have been detected either within or adjacent to the site. The endangered Hawaiian hoary bat has been documented flying within the project area during the radar surveys and bat activity has been recorded on the acoustic bat detectors between April and December. It is possible that the tree-roosting Hawaiian hoary bat roosts on site during the months when bats are detected. These species are listed in Table 20 and are summarized below.

TABLE 20
Federally or State Listed Species Potentially Occurring Within the Kawailoa Wind Farm Site

Scientific Name	Common Name (Hawaiian Name)	Date Listed	Status
Birds			
Puffinus auricularis newelli	Newell's shearwater (*'a'o*)	10/28/1975	FT, ST
Anas wyvilliana	Hawaiian duck (*koloa maoli*)	3/11/1967	FE, SE
Himantopus mexicanus knudseni	Hawaiian stilt (*ae'o*)	10/13/1970	FE, SE
Fulica alai	Hawaiian coot (*'ala eke'oke'o*)	10/13/1970	FE, SE
Gallinula chloropus sandvicensis	Hawaiian moorhen (*'alae 'ula*)	3/11/1967	FE, SE
Asio flammeus sandwichensis	Hawaiian short-eared owl (*pueo*)	--	SE
Mammals			
Lasiurus cinereus semotus	Hawaiian hoary bat (*'ope'ape'a*)	10/13/1970	FE, SE

LEGEND:
FE = Federally endangered; FT = Federally threatened; SE = State endangered; ST = State threatened

Newell's Shearwater

Species Description. The Newell's shearwater is an endemic Hawaiian sub-species of the nominate species, Townsend's shearwater (*Puffinus a. auricularis*) of the eastern Pacific. The most recent estimate of population size was approximately 84,000 birds, with a possible range of 57,000 to 115,000 birds (Ainley et al., 1997). The largest breeding population occurs on Kaua`i (Telfer et al,. 1987; Day and Cooper, 1995, Ainley et al., 1995, 1997; Day et al., 2003a). Breeding also occurs on Hawai`i Island (Reynolds and Richotte, 1997; Reynolds et al., 1997; Day et al., 2003b) and almost certainly occurs on Moloka'i (Pratt, 1988; Day and Cooper, 2002). Recent radar studies suggest the species may also nest on O`ahu (Day and Cooper, 2008). On Maui, radar studies and visual and auditory surveys conducted over the past decade suggest that one or more small breeding colonies are present in the West Maui Mountains in the upper portions of Kahakuloa Valley (Spencer/First Wind, personal communication).

Declines in Newell's shearwater populations are attributed to loss of nesting habitat, predation by introduced mammals (mongoose, feral cats, rats and feral pigs) at nesting sites, and fallout of juvenile birds associated with disorientation from urban lighting (Ainley et al., 1997; Mitchell et al., 2005; Hays and Conant, 2007).

Newell's shearwaters typically nest on steep slopes vegetated by *uluhe* fern and scattered *'ōhi'a* trees. Currently, most Newell's shearwater colonies are found from 525 to 3,900 feet (160 to 1,200 meters) above mean sea level, often in isolated locations and/or on slopes greater than 65 degrees (Ainley et al., 1997). The birds nest in short burrows excavated into crumbly volcanic rock and ground, usually under dense vegetation and at the base of trees. A single egg is laid in the burrow and one adult bird incubates the egg while the second adult goes to sea to feed. Once the chick has hatched and is large enough to withstand the cool temperatures of the mountains, both parents go to sea and return irregularly to feed the chick. Newell's shearwaters arrive at and leave their burrows during darkness and birds are seldom seen near land during daylight hours. During the day, adults remain either in their burrows or at sea some distance from land.

The Newell's shearwater breeding season begins in April, when birds return to prospect for nest sites. A pre-laying exodus follows in late April and possibly May; egg laying begins in the first two weeks of June and likely continues through the early part of July. Pairs produce one egg, and the average incubation period is thought to be approximately 51 days (Telfer, 1986). The fledging period is approximately 90 days, and most fledging takes place in October and November, with a few birds still fledging into December.

The flight of the Newell's shearwater is characterized by rapid beats interspersed with glides, although beats tend to be fewer in high winds. The birds avoid flying with tailwinds because it decreases control. Over land, ground speed of the species has been measured to average 38 mph or 61 kph (Ainley et al., 1997). The wingbeat pattern of Newell's shearwater is somewhat similar to that of the Hawaiian petrel.

Species Occurrence. Nocturnal radar surveys were conducted within the Kawailoa wind farm site in June and October 2009. These surveys found an extremely low number of targets exhibiting flight speeds and flight patterns that fit the "shearwater-like" category. Visual identification of these birds was not possible; however, Cooper et al. (2009) suggests that the individuals were more likely to be Newell's shearwaters than Hawaiian petrels, because of both the timing of movements and the fact that available literature indicates that Newell's shearwaters (but not Hawaiian petrels) occur on O`ahu.

Assuming the detected birds were Newell's shearwaters, then their observed behavior suggests that at least a small number of these birds are breeding or prospecting in the Ko`olau Mountains. Because of the few detections obtained during the Day and Cooper study (2008) and lack of radar studies from adjacent lands, it is not known whether the Kawailoa wind farm site lies within the primary corridor used by these few birds as they move between their nesting areas and the ocean. For modeling purposes, it was assumed that approximately 75 percent of shearwaters would fly at or below turbine height, based on observations made on Kaua`i (Cooper et al., 2010).

Hawaiian Duck

Species Description. The Hawaiian duck is a non-migratory species endemic to the Hawaiian Islands, and the only endemic duck extant in the main Hawaiian Islands (Uyehara et al., 2008). Hawaiian ducks are closely related to mallards (Browne et al., 1993). Because of this close genetic relationship, the two will readily hybridize; allozyme data indicate there has been extensive hybridization between Hawaiian duck and feral mallards on O`ahu, with the near disappearance of Hawaiian duck alleles from the population on the island (Browne et al., 1993). Because of similarities between the species, it can be difficult to distinguish between pure Hawaiian ducks, feral hen mallards, and hybrids during field studies.

Hawaiian ducks occur in aquatic habitats up to an altitude of 10,000 feet (3,048 meters) in elevation (Uyehara et al., 2007). Specific habitat types include natural and man-made lowland wetlands, flooded grasslands, river valleys, mountain streams, montane pools, forest swamplands, aquaculture ponds, and agricultural areas (Engilis et al., 2002; Hawaii Audubon Society, 2005; USFWS, 2005). The species' historical range includes all the main Hawaiian Islands, except for the islands of Lāna'i and Kaho'olawe. Hawaiian ducks are strong flyers and usually fly at low altitudes. Intra-island movement has been recorded, where they may move between ephemeral wetlands or disperse to montane areas during the breeding season (Engilis et al., 2002). The current wild population of pure Hawaiian ducks is estimated to include approximately 2,200 birds, of which the majority reside on Kaua`i.

Hybridization with mallards is the largest threat to the Hawaiian duck. Reintroduction of pure Hawaiian ducks to O`ahu is being contemplated, although in order for pure Hawaiian ducks to continue to exist on O`ahu following reintroduction, the removal of all hybrids and the elimination of all sources of feral mallard ducks will need to occur (Engilis et al., 2002). At present it is uncertain when reintroduction would occur, but it is possible that reintroduction could occur during the 20-year life of the proposed project. In addition to hybridization, threats to Hawaiian ducks include predation by mongoose, feral cats, feral dogs, and possibly rats (Engilis et al., 2002). Black-crowned night herons, largemouth bass (*Micropterus salmoides*), and bullfrogs have been observed to take ducklings (Engilis et al., 2002). Avian diseases are another threat to Hawaiian ducks, with outbreaks of avian botulism (*Clostridium botulinum*) occurring annually throughout the state.

Species Occurrence. Ducks resembling Hawaiian ducks (but likely to be hybrids) have been observed flying over the north-northeastern section of the Kawailoa wind farm site. A total of 10 sightings have been recorded, of which five were during the point count surveys, four were incidental sightings and one was during the driving transects. Flock sizes ranged from one to 15 birds, with an average size of four birds. Similar to the black-crowned night heron, birds were observed in flight at ponds in the south-southwestern area of the project site or flying near the lower meteorological tower on Kawailoa Road. One incidental sighting was also reported along the northeastern access road located at the eastern end of Bull's Boulevard. No flocks were seen at the altitude of the proposed turbines (50 meter altitude or above).

Hawaiian Stilt

Species Description. The Hawaiian stilt is a non-migratory endemic subspecies of the black-necked stilt (*Himantopus mexicanus mexicanus*), which occurs in the western and southern portions of North America, southward through Central America and the West Indies, to southern South America and also the Hawaiian Archipelago (Robinson et al., 1999). The Hawaiian stilt and black-necked stilt are part of a superspecies complex of stilts found in various parts of the world (Pratt et al., 1987; Robinson et al., 1999).

The population size in Hawai`i has recently fluctuated between 1,200 to 1,500 individuals with a five-year average of 1,350 birds (USFWS, 2005). Adult and juvenile dispersal has been observed both intra- and inter-island within the State (Reed et al., 1998). The island of O`ahu supports the largest number of stilts in the state, with an estimated 35 to 50 percent of the population residing on the island. Some of the largest concentrations can be found at the

James Campbell National Wildlife Refuge (NWR), Kahuku aquaculture ponds, Pearl Harbor NWR, and Nuʻupia Ponds in Kāneʻohe (USFWS, 2005).

Hawaiian stilts favor open wetland habitats with minimal vegetative cover and water depths of less than 9.4 inches (24 centimeters), as well as tidal mudflats (Robinson et al., 1999). Stilts feed on small fish, crabs, polychaete worms, terrestrial and aquatic insects, and tadpoles (Robinson et al., 1999; Rauzon and Drigot, 2002). Hawaiian stilts tend to be opportunistic users of ephemeral wetlands to exploit the seasonal abundance of food (Berger, 1972; USFWS, 2005). Hawaiian stilts nest from mid-February through late August with variable peak nesting from year to year (Robinson et al., 1999). Nesting sites for stilts consist of simple scrapes on low relief islands within and/or adjacent to ponds. Clutch size averages four eggs (Hawaii Audubon Society, 2005; USFWS, 2005).

The most important causes of decline of the Hawaiian stilt and other Hawaiian waterbirds is the loss of wetland habitat and predation by introduced animals. Barn owls and the endemic Hawaiian short-eared owl are known predators of adult stilts and possibly their young (Robinson et al., 1999; USFWS, 2005). Known predators of eggs, nestlings, and/or young stilts include s mongoose, feral cat, rats, feral and domestic dogs, black crowned night-heron, cattle egret, common mynah, ruddy turnstone, laughing gull (*Larus atricilla*), American bullfrog (*Rana catesbeiana*), and large fish (Robinson et al., 1999; USFWS, 2005).

Species Occurrence. No Hawaiian stilts were observed flying over the site during the avian point count surveys or within the waterbodies that were surveyed. The irrigation ponds that occur in the vicinity of the wind farm site may potentially be attractive to Hawaiian stilt and used on an occasional basis. No other coastal wetlands are present within the airspace envelope of the turbine strings. Waimea River is a perennial stream, and is within the airspace envelope of the northern-most turbine string; however, stilt are not expected to be present in Waimea River as they require early successional marshlands for nesting and foraging (USFWS, 2005). However, because of the known dispersal capabilities of these birds (Reed et al. 1998), it is expected that individual stilts can fly over the Kawailoa wind farm site on a very irregular basis while moving between wetlands or islands.

Hawaiian Coot

Species Description. The Hawaiian coot is an endangered species endemic to the main Hawaiian Islands, except Kahoʻolawe. The Hawaiian coot is non-migratory and believed to have originated from migrant American coots (*Fulica americana*) that strayed from North America. The population has recently fluctuated between 2,000 and 4,000 birds, of which roughly 80 percent occur on O\`ahu, Maui, and Kaua\`i (Engilis and Pratt, 1993; USFWS, 2005). The O\`ahu population fluctuates between approximately 500 to 1,000 birds, depending on seasonal rainfall and variation in reproductive success. Hawaiian coots occur regularly in the James Campbell NWR (USFWS, 2002, 2005a). Inter-island dispersal has been noted and is presumably influenced by seasonal rainfall patterns and food abundance (USFWS, 2005).

Coots are usually found on the coastal plain of islands and prefer freshwater ponds or wetlands, brackish wetlands, and man-made impoundments. They prefer open water that is less than 11.8 inches (30 centimeters) deep for foraging. Preferred nesting habitat has open water with emergent aquatic vegetation or heavy stands of grass (Schwartz and Schwartz, 1949; Brisbin et al., 2002; USFWS, 2005). Nesting occurs mostly from March through September, with opportunistic nesting occurring year round, depending on rainfall.

Introduced feral cats, feral and domestic dogs, and mongoose are the main predators of adult and young Hawaiian coots (Brisbin et al., 2002; Winter, 2003). Other predators include black-crowned night heron, cattle egret and large fish. Coots are susceptible to avian botulism outbreaks in the Hawaiian Islands (Brisbin et al., 2002). In addition, wetland loss and degradation has also been noted as contributing to the decline of this species.

Species Occurrence. One observation of the Hawaiian coot was made along Kawailoa Road in September 2010; the individual was observed foraging in an adjacent pond and did not take flight. The individual was of the rare color morph, with a red frontal shield instead of white; only 1 to 3 percent of Hawaiian coots have the red frontal shield (Engilis and Pratt, 1993; Engilis, 1988). This individual was not identified when subsequent observations were made later in September. No suitable habitat for Hawaiian coot occurs on the Kawailoa wind farm site. The irrigation ponds that occur in the vicinity may potentially be attractive to Hawaiian coot and used on an occasional basis. No other coastal wetlands are present within the airspace envelope of the turbine strings. Waimea River is a perennial stream, and is within the airspace envelope of the northern-most most turbine string; however, coot are not expected to be present in Waimea River as they are primarily occupy coastal plains (USFWS, 2005). Regardless, Hawaiian coots are known to disperse between islands and coupled with the one-time observation of a foraging coot in the ponds adjacent to the site, there is potential for coots to occasionally fly over the lower elevations of the wind farm site if moving between foraging sites or islands.

Hawaiian Moorhen

Species Description. The Hawaiian moorhen is an endemic, non-migratory subspecies of the cosmopolitan common moorhen (*Gallinula chloropus*). It is believed that the subspecies originated through colonization of Hawai`i by stray North American migrants (USFWS, 2005). Originally occurring on all the main Hawaiian Islands (excluding Lāna‘i and Kaho‘olawe), the Hawaiian moorhen is currently limited to regular occurrence on the Islands of Kaua`i and O`ahu (Hawaii Audubon Society, 2005; USFWS, 2005). A population was reintroduced to Moloka‘i in 1983, but no individuals remain on the island today.

Hawaiian moorhen are very secretive; thus, population estimates and long-term population trends are difficult to approximate (Engilis and Pratt, 1993; Hawaii Audubon Society, 2005; USFWS, 2005). The population of Hawaiian moorhen appears to be stable, with an average annual total of 314 birds estimated between 1977 and 2002. Approximately half of this population occurs on O`ahu. Seasonal fluctuations in population have been recorded, although this is believed to be an artifact of sparser vegetation allowing greater visibility in fields in winter than in summer (USFWS, 2005). In 2006, a peak of over 90 moorhen was recorded at the Ki‘i Unit of the James Campbell NWR (USFWS, unpublished data).

In Hawai`i, moorhen largely depend on agricultural and aquaculture habitats. They prefer freshwater marshes, taro patches, reservoirs, wet pastures, lotus fields, and reedy margins of water courses. The habitats in which they occur are generally below 410 feet (125 meters) in elevation (Pratt et al., 1987; Engilis and Pratt, 1993; Hawaii Audubon Society, 2005; USFWS, 2005). According to the Second Draft Recovery Plan for Hawaiian Waterbirds (USFWS, 2005), the key components of moorhen habitat are 1) dense stands of emergent vegetation near open water, 2) slightly emergent vegetation mats, and 3) shallow, freshwater areas.

The key threats the Hawaiian moorhen are coastal wetland loss and degradation as a result of commercial, residential, and resort developments (Evans et al., 1994; USFWS, 2005). Feral cats, feral and domestic dogs, mongoose, and bullfrogs are known predators of Hawaiian moorhen. Black-crowned night herons and rats are also as possible predators (Byrd and Zeillemaker, 1981; Bannor and Kiviat, 2002; USFWS, 2005). The Hawaiian moorhen is also highly susceptible to disturbance by humans and introduced predators (Bannor and Kiviat, 2002).

Species Occurrence. No Hawaiian moorhens were detected during the avian point count surveys within the Kawailoa wind farm site. However, Hawaiian moorhen have been seen regularly at nearby water bodies. Hawaiian moorhen were observed in flight only once in December 2009 at the point count station located near Waimea Bay (Figure 17). A total of three individuals have been seen/heard and have responded to moorhen call playbacks on three occasions; these moorhen are likely resident at this location. A total of 10 moorhen are also known to be resident in the lotus ponds in Waimea Valley (Laurent Pool, Conservation Land Specialist, Waimea Valley, personal communication); three moorhen adults and two chicks were seen by SWCA biologists on a visit conducted in April 2010. Hawaiian moorhen were also seen at two locations at `Uko`a pond in November 2010. Hawaiian moorhen have not been seen and moorhen playbacks have not elicited any response at any of the other water bodies that were included in the point count surveys in the vicinity of the wind farm site. However, the irrigation ponds present in the vicinity of the wind farm site may potentially be attractive to Hawaiian moorhen and could be used on an occasional basis. It is very unlikely that Hawaiian moorhens regularly fly over the Kawailoa wind farm site; however, given their ability to fly and their occurrence at Waimea Valley, it is possible that individual Hawaiian moorhens would very occasionally fly over the project site, especially the lower elevation portion.

Hawaiian Short-Eared Owl

Species Description. The Hawaiian short-eared owl is an endemic subspecies of the nearly cosmopolitan short-eared owl (*Asio flammeus*). This is the only extant owl native to Hawai`i and is found on all the main islands from sea level to 8,000 feet (2,450 meters). The species was widespread at the end of the 19th century, but numbers are thought to be declining (Mostello, 1996; Mitchell et al., 2005). No surveys have been conducted to date to estimate the population size of Hawaiian short-eared owl.

This species occupies a variety of habitats, including wet and dry forests, but is most common in open habitats, such as grasslands, shrublands and montane parklands, including urban areas and those actively managed for conservation (Mitchell et al., 2005). Hawaiian short-eared owls nest on the ground; little is known about their breeding biology, but nests have been found throughout the year. Unlike most owls, Hawaiian short-eared owls are active during the day (Mostello, 1996; Mitchell et al., 2005), though nocturnal or crepuscular activity has also been documented (Mostello, 1996).

The species is threatened by loss and degradation of habitat, predation by introduced mammals, and disease. Hawaiian short-eared owls appear particularly sensitive to habitat loss and fragmentation, as ground-nesting birds are more susceptible to the increased predation pressure that is typical within fragmented habitats and near rural developments (Wiggins et al., 2006). These nesting habits make them increasingly vulnerable to predation by rats, cats and the small Indian mongoose (Mostello, 1996; Mitchell et al., 2005).

Species Occurrence. Hawaiian short-eared owls were not detected within the Kawailoa wind farm site or at the nearby water bodies. Because these owls are active during daytime and crepuscular periods, it seems probable that they would have been detected during the avian point counts if resident onsite. Regurgitated owl pellets of rodent hair and bones were observed on a trail on a grassy ridgetop in the upper part of the site (Hobdy, 2010a) and numerous pellets have been found during the monitoring of the meteorological towers (SWCA, personal observations). However, it is probable that these belong to the barn owl (*Tyto alba*), which is known to occur on site. Despite these observations, as suitable grassland habitat does occur at the project site, the Hawaiian short-eared owl may occasionally be present.

Hawaiian Hoary Bat

Species Description. The Hawaiian hoary bat is the only native land mammal present in the Hawaiian archipelago. It is a sub-species of the hoary bat (*Lasiurus cinereus*), which occurs across much of North and South America. Both males and females have a wingspan of approximately 1 foot (0.3 meter), although females are typically larger-bodied than males. Both sexes have a coat of brown and gray fur. Individual hairs are tipped or frosted with white (Mitchell et al., 2005).

The species has been recorded on Kaua`i, O`ahu, Moloka`i, Maui, and Hawai`i, but no historical population estimates or information exist for this subspecies. Population estimates for all islands in the state in the recent past have ranged from hundreds to a few thousand bats (Menard, 2001). Breeding has only been documented on the Islands of Hawai`i and Kaua`i (Baldwin, 1950; Kepler and Scott, 1990; Menard, 2001). It is not known whether bats observed on other islands breed locally or only visit these islands during non-breeding periods. It is suspected that breeding primarily occurs between April and August. Seasonal changes in the abundance of Hawaiian hoary bat at locations of different elevations indicate that altitudinal migrations occur on the island of Hawai`i. During the breeding period (April through August), Hawaiian hoary bat occurrences increase in the lowlands and decrease at high elevation habitats. In the winter, especially during the post-lactation period in October, bat occurrences increase in high elevation areas and in the central highlands, possibly receiving bats from the lowlands (Menard, 2001).

The Hawaiian hoary bat is believed to occur primarily below an elevation of 4,000 feet (1,220 meters). They roost in native and non-native vegetation from 3 to 29 feet (1 to 9 meters) above ground level. They have been observed roosting in *ʻōhiʻa*, *hala* (*Pandanus tectorius*), coconut palms (*Cocos nucifera*), *kukui* (*Aleurites moluccana*), *kiawe* (*Prosopis pallida*), avocado (*Persea americana*), mango (*Mangifera indica*), shower trees (*Cassia javanica*), *pūkiawe* (*Leptecophylla tameiameiae*), and fern clumps; they are also suspected to roost in eucalyptus (*Eucalyptus* spp.) and Sugi pine (*Cyrptomeria japonica*) stands. The species has been rarely observed using lava tubes, cracks in rocks, or man-made structures for roosting. Water courses and edges (for example, coastlines and forest/pasture boundaries) appear to be important foraging areas.

Species Occurrence. As previously described, Anabat detectors were deployed at various locations within the Kawailoa wind farm site in October 2009, and measurements are ongoing. A total of 1643 detector nights were sampled from October 2009 to December 2010. During this period, bat activity over the entire site occurred at 0.065 bat passes/detector night. An activity rate of 0.11 passes/detector night occurred during the peak activity months (from May through November, with greater than 0.01 passes/detector night for each month) and an activity rate of 0.0035 passes/detector night during off-peak months (December through April, with activity rates less than 0.01 passes/detector night for each month). Bat activity was recorded within a wide variety of landscape features, including clearings, along roads, along the edges of treelines, in gulches and at irrigation ponds. The overall detection rates at the Kawailoa wind farm site are approximately one-fifth the detection rates at Hakalau National Wildlife Refuge (0.66 passes/detector/night) (Bornaccorso, USGS unpublished report), but are 7-fold that at Kaheawa Wind Pastures and Kahuku Wind Power, both of which have an activity rate of approximately 0.01 bat passes/detector/night (SWCA, 2010b). One observed fatality has been recorded at the Kaheawa facility since the beginning of project operations in 2006.

The actual number of bats represented by the detections made by the Anabat detectors on the Kawailoa wind farm site is not known. Two Hawaiian hoary bats were visually observed onsite during the seabird radar survey in June 2009; none were observed in October 2009. Those observations translate to an estimated summer occurrence rate of 2 bats in 84 25-minute observation sessions (that is, 0.057 bats per hour). Both bats were flying at an altitude of ≤5 meters (Cooper et al., 2009). Given these results, it is presumed that a number of Hawaiian hoary bats forage over the Kawailoa wind farm site on a somewhat regular, though possibly seasonal, basis. These bats may also roost in the area.

Mt. Ka`ala Communication Facilities Site

Newell's Shearwater

No radar studies were conducted at the Mt. Ka`ala communication facility sites because the antennae would be mounted on existing towers and would not be expected to significantly increase the collision risk of any covered species if they should happen to transit the communication sites.

Waterbirds (Hawaiian Duck, Hawaiian Stilt, Hawaiian Coot and Hawaiian Moorhen)

There are no open water features near the Mt. Ka`ala communication sites, and no listed waterbird species have been historically documented at Mt. Ka`ala (DOFAW, 1990). In addition, none of the listed waterbird species have been observed at the sites (Hobdy, 2010c; Steve Mosher personal communication).

Hawaiian Short-Eared Owl

No Hawaiian short-eared owls were seen during the wildlife surveys at the Mt. Ka`ala communication sites. This species has not been historically documented at Mt. Ka`ala (DOFAW, 1990).

Hawaiian Hoary Bat

No surveys for Hawaiian hoary bats were conducted at the Mt. Ka`ala communication facility sites. However, given the native forest that surrounds the microwave facility sites, bats could be expected to forage in the area at least occasionally.

3.5.3 Potential Impacts and Mitigation Measures (Flora)

3.5.3.1 Proposed Action

Wind Farm

Flora

Direct impacts to flora would occur primarily as a result of clearing and ground disturbance during the construction phase; a total of approximately 306.4 acres would be disturbed. However, as described above, the wind farm facilities would generally be constructed in areas that have been extensively disturbed as part of previous agricultural operations, with existing vegetation largely comprised of weedy species. No Federally or State listed endangered, threatened, or candidate plant species, nor species considered rare throughout the Hawaiian Islands, have been identified within the wind farm site, and no portion of the site has been designated as critical habitat for any listed plant species (Hobdy, 2010a; Hobdy, 2010b). A few native species, notably *koa*, occur along the ridge tops and some trees may have to be removed as areas are cleared during construction. Removal of native trees would be kept to the minimum necessary to ensure safe conditions and satisfy construction requirements. To compensate for the loss of native trees because of construction, Kawailoa Wind Power has come to an agreement with the landowner (Kamehameha Schools) that at least an equal or greater number of native trees that are removed would be replanted in surrounding portions of the property. In addition to replacement of native trees, all temporarily disturbed areas would be revegetated immediately following construction using a hydroseed mixture of annual rye (*Lolium multiflorum*) or other suitable groundcover species to stabilize soil and prevent erosion.

Invasive plants, such as Java plum, strawberry guava, swamp mahogany, and albizia, are widespread within the wind farm site. Given the prevalence of these species, construction of the project is not expected to result in a significant increase in the number or distribution of invasive plant species within the site. Similarly, implementation of invasive species control measures would not be expected to result in a significant decrease in the number or distribution of invasive plant species that occur within the site. However, to minimize the potential for introducing new invasive species to the project site, the following measures would be implemented:

- All construction equipment, materials and vehicles arriving from outside of the island of O`ahu would be washed and/or visually inspected (as appropriate) for excessive debris, plant materials, and invasive or harmful non-native species before transportation to the project site; import of materials that are known or likely to contain seeds or propagules of invasive species would be prohibited.
- All cleaning and inspection activities would be properly documented.
- Offsite sources of revegetation materials (such as seed mixes, gravel, and mulches) would be certified as weed-free or inspected before transport to the project area.
- All areas that are hydroseeded would be monitored for six months after hydroseeding to identify invasive plants that establish from seeds inadvertently introduced as part of the seed mix; all invasive plants identified within the hydroseeded areas would be removed.

- At the end of the construction period, areas impacted by construction of the project would be surveyed to confirm that no problematic and/or invasive species had established. Appropriate remedial actions would be undertaken to facilitate containment or eradication of the target species as soon as reasonably possible.

As part of the operational phase of the project, search plots would be established around each turbine and meteorological tower to facilitate detection of downed wildlife. Each search plot would be approximately 370 feet in radius (75 percent of the total turbine height), including the previously disturbed work areas, but would exclude gulches and other unsearchable areas.[7] To improve the efficiency of the searches, the vegetation within the search plots would be mechanically cleared on a frequent basis. Similar to that approach taken during project construction, all native trees (such as *koa*) would be avoided to the extent possible; if native trees are removed, an equal or greater number of native trees would be replanted in surrounding areas of the property. No other aspects of project operations would be expected to affect botanical resources within the wind farm project site.

Mt. Ka`ala Communication Sites

Similar to the wind farm site, neither of the Mt. Ka`ala communication sites support any protected species. The communication equipment would be installed on existing structures at both of the sites, and no ground disturbance would occur. To minimize the potential for introduction of new invasive species, control measures would be implemented, as described above. As such, installation of the communication equipment would not be expected to significantly affect botanical resources on Mt. Ka`ala.

3.5.3.2 Alternative Communication Site Layout

Under this alternative, construction and operation of the equipment at the Mt. Ka`ala communication sites would involve installation of a new tower within those areas where vegetation has been previously cleared and maintained adjacent to each of the existing Hawaiian Telcom facilities. These areas do not support any protected plant species or habitats, and therefore, significant impacts to are not expected. However, the same measures planned for the wind farm would be implemented to reduce the likelihood of invasive species being introduced to the area.

3.5.3.3 No Action Alternative

Under the No Action alternative, the wind farm and associated communications facilities would not be constructed, and therefore, no impacts to plant species or their habitat would occur.

3.5.4 Potential Impacts and Mitigation Measures (Fauna)

3.5.4.1 Proposed Action

Wind Farm

Erickson et al. (2001) estimated that an average of 2.19 bird fatalities occur per wind turbine annually in the U.S. Given the number of turbines in operation at that time, this equated to

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7 Based on a radius of 370 feet for the search plot around each turbine, the total area of disturbance associated with the turbines would be approximately 296.2 acres. However, approximately 45.2 acres is considered to be unsearchable because of steep topography; therefore, the total area within the search plots is anticipated to be approximately 251.0 acres.

an annual mortality of approximately 33,000 birds (Erickson et al., 2001). Based on 12 wind projects in the U.S., the National Wind Coordinating Collaborative (NWCC) (2004) estimated an average annual avian fatality rate of 2.3 birds per turbine. Though avian fatality rates differ by region, projects in California presently account for the highest wind-related avian mortality in North America. Certain types of birds in certain settings seem to have a higher risk of collision with wind farm facilities than others. When abundant in open country, as in California, raptors (for example, hawks, eagles, falcons, and owls) have had comparatively high fatality rates, though passerines generally comprise the majority of fatalities at wind farms nationwide (Erickson et al., 2001; NWCC, 2004; Kingsley and Whittam, 2007). Although some impacts to avian species may occur as a result of habitat alteration and disturbance or operation of vehicles, most fatalities at wind farms are attributed to collisions with wind turbine rotors, meteorological towers, or guy wires (Kerlinger and Guarnaccia, 2005).

Overall, the number of avian fatalities at wind farm facilities are very low compared to the numbers of fatalities resulting from some other human-related causes. Known sources of anthropogenic bird losses outside of wind farm facilities include: lighted buildings, windows, communication towers, powerlines, smokestacks, vehicles, cat predation, pesticides, and hunting (Podolsky et al., 1998; Erickson et al., 2001; Martin and Padding, 2002; Woodlot Alternatives, Inc., 2003; Federal Register, 2004; Mineau, 2005). Mortality from these other sources is many orders of magnitude higher than that which occurs at wind farms.

Impacts to Non-Listed Species

As previously described, construction of the project would result in the disturbance of approximately 306.4 acres of area within the wind farm site, most of which has been previously disturbed and is overwhelmingly comprised of non-native species; of this area, a total of approximately 22.0 acres would be permanently displaced. Non-listed species that use this habitat could be either directly impacted by construction activities (for example, through collision with construction vehicles), or indirectly impacted by loss of habitat.

Non-listed bird species occurring in the project area are largely common and widespread on O`ahu and most are tolerant of some degree of development and human presence. The proposed project would reduce the amount of habitat available for these species, which could result in the displacement of some individuals and slight reduction in some local numbers. However, because these birds are generally common and widespread, the amount of affected habitat represents a very small part of the total range available to each species. Consequently, any impacts to non-listed bird species are not expected to be significant at the population level. Clearing for the project may be slightly beneficial to Pacific golden-plover because vegetation in the project area is generally too tall for use by this species; the cleared pads and road edges may provide increased foraging area for some members of this species (SWCA, 2010).

Similarly, construction of the project would reduce the amount of habitat available for introduced mammals that occur within the wind farm site. As with birds, loss of this habitat could result in displacement of some individual mammals and slight reduction in some local numbers. Impacts to non-native mammals could also include occasional collisions with project vehicles. However, introduced mammals are generally considered to be a threat to ecosystems as they often consume or trample native flora and fauna, accelerate erosion, alter soil properties, and promote the invasion of non-native plants (Stone et al., 1992; Courchamp et al., 2002; USFWS, 2008). As such, adverse impacts to introduced mammals could be considered a positive effect, although given the scale of the project, any actual change in local mammal numbers is likely to be so low as to be insignificant. Therefore, the proposed project would generally be expected to have a neutral effect on mammals.

Construction-related impacts to mollusc species could also occur, and similar to mammals, could include both direct impacts because of collisions with project vehicles and indirect impacts associated with habitat loss. However, the only mollusc species observed within the wind farm site are non-native and are generally widespread; consequently, any impacts to non-listed mollusc species are not expected to be significant at the population level.

Operation of the project could also directly impact non-listed wildlife through collisions with the wind turbine rotors, the meteorological towers, and the microwave towers. In general, the potential exists for individuals of any of the bird species that have been identified in the project area (Table 17) to collide with project components, although that potential is expected to be greater for birds that regularly fly well above ground (for example, bulbuls) than for those that usually remain low or concealed in vegetation (for example, white-rumped shama). While individual birds are expected to be killed on a very infrequent basis, collisions with the project components are not expected to cause significant impacts to any non-listed avian species at the population level.

Impacts to Listed Species

Construction and operation of the Kawailoa wind farm project would create the potential for Federally and State-listed bird and bat species to collide with project components, including the wind turbines, meteorological towers, and cranes used for construction of the turbines. In compliance with Section 10 of the ESA and HRS §195D-4(g), Kawailoa Wind has made a commitment to prepare an Habitat Conservation Plan (HCP) and apply for an Incidental Take Permit (ITP) and Incidental Take License (ITL) from the USFWS and DOFAW, respectively, for the Kawailoa wind farm project. An advanced draft of the HCP is currently undergoing review by DOFAW and USFWS, and is expected to be released for public comment in summer 2011. The purpose of the HCP is to ensure that a net conservation benefit is provided for any listed species covered under the plan; the resulting permits allow "take" of those species, provided that the "take" is incidental to otherwise lawful activities.[8] The HCP would cover the seven species described in Section 3.5.2.3: Newell's shearwater, Hawaiian duck, Hawaiian stilt, Hawaiian coot, Hawaiian moorhen, Hawaiian short-eared owl, and Hawaiian hoary bat (collectively referred to as the "covered species").

Because complete avoidance of risk to the covered species is impossible under the Proposed Action, several measures to avoid and minimize the risk to these and other wildlife species,

[8] "Take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect species listed as endangered or threatened, or to attempt to engage in any such conduct (50 CFR 17.3). "Harm" has been defined by USFWS to mean an act which actually kills or injures wildlife, and may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). "Harass" has been defined to mean an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering (50 CFR 17.3).

and to minimize impact on the human environment, have been incorporated into the project. These measures include, but are not necessarily limited to, the following:

- Monopole steel tubular turbine towers would be used rather than lattice towers. Tubular towers are considerably more visible than lattice towers and should reduce collision risk.
- Unguyed meteorological towers would be used for the project site instead of guyed permanent meteorological towers.
- Guy wires on temporary meteorological towers would be marked with high visibility bird diverters made of spiraled polyvinyl chloride (PVC) and twin 12-inch white poly vinyl marking tape to improve the visibility of the wires.
- The rotors selected for use would have a significantly slower rotational speed (range of 6 to 18.7 rpm, depending on the turbine chosen) compared to older designs (28.5 to 34 rpm); this increases the visibility of turbine blades during operation and decreases collision risk.
- All new electrical collector lines would be placed underground to the extent practicable to minimize the risk of collision with new wires; overhead collectior lines would be fitted with marker balls to increase visibility. All overhead collector lines would be spaced according to Avian Power Line Interaction Committee (APLIC) guidelines to prevent possible electrocution of native species. Species most at risk are those likely to perch on power poles or lines (APLIC, 2006); the only species identified to be at risk at the Kawailoa wind farm site is the Hawaiian short-eared owl. Using the barn owl as a surrogate species, the horizontal spacing would be more than 20 inches (51 centimeters) to accommodate the wrist-to-wrist distance of the owl. If a vertical arrangement is chosen, a vertical spacing of more than 15 inches (38 centimeters, head-to-foot length) would be used (APLIC, 2006). Any jumper wires would be insulated.
- Overhead collection lines would be parallel to treelines whenever possible.
- Drainage would be improved, as needed to eliminate the accumulation of standing water after periods of heavy rain to minimize potential of attracting waterbirds to the site.
- Where feasible, night-time construction activities would be minimized to avoid the use of lighting that could attract seabirds and possibly bats.
- A minimal amount of onsite lighting would be used at buildings and shielded fixtures would be used only on infrequent occasions when workers are at the site at night.
- Clearing of trees above 15 feet in height for construction would not be conducted between July 1 to August 15, which is the period when non-volent Hawaiian hoary bats juveniles may occur in the project area.
- Low wind speed curtailment would be implemented to reduce the risk of bat take: Recent studies on the mainland indicate that most bat fatalities occur at relatively low wind speeds, and consequently the risk of fatalities may be significantly reduced by curtailing operations on nights when winds are light and variable. Research suggests

this may best be accomplished by increasing the cut-in speed of wind turbines from their normal levels (usually 3.5 or 4 m/s, depending on the model) to 5 m/s. Two years of research conducted by Arnett et al. (2009, 2010) found that bat fatalities were reduced by an average of 82 percent (95% CI: 52 to 93 percent) in 2008 and by 72 percent (95% CI: 44 to 86 percent) in 2009 when cut-in speed was increased to 5 m/s. Therefore, based on best available science, low wind speed curtailment would be implemented at night by raising the cut-in speed of the project's wind turbines to 5 m/s. The times of the year when curtailment is implemented (that is, year-round or seasonal) would be established based on bat detection data on site, seasonal distributions of observed fatalities on site, and best available science, with concurrence from USFWS and DLNR. Based on data collected to date, the curtailment would initially occur during months of May to November, which is when bat activity has been consistently documented, for the duration of the night (from sunset to sunrise). Curtailment would also be extended if fatalities are found outside the initial proposed curtailment period with concurrence from USFWS and DLNR. Curtailment may also be reduced or shifted with the concurrence of DOFAW and USFWS if site-specific data demonstrate a lack of bat activity during certain periods, or if experimental trials are conducted that demonstrate that curtailment is not reducing collision risk at the project during the entire curtailment period.

- A speed limit of 15 mph would be observed while driving onsite, to minimize collision with covered species, in the event they are found to be injured or using habitat onsite.
- Vegetation clearing would be suspended within 300 feet (91 meters) of any area where distraction displays, vocalizations, or other indications of nesting by adult Hawaiian short-eared owls are seen or heard, and resumed when it is apparent that the young have fledged or other confirmation that nesting is no longer occurring.

No direct or indirect impacts to the covered species are expected to occur as a result of onsite habitat disturbance. The only listed species with potential to regularly use habitat within the project area is the Hawaiian hoary bat, which has shown seasonal activity rates on site and could roost in trees within the site. Likewise, the project area could also contain nesting habitat for Hawaiian short-eared owl, though the occurrence of regular breeding on site is considered highly unlikely because no sightings of the Hawaiian short-eared owl have been documented during the year-long avian surveys. As described above, vegetation clearing for the project would be performed during times of year when Hawaiian hoary bats are not expected to be breeding to avoid potential for harm to non-volent juvenile bats. As Hawaiian short-eared owls breed year round, it is not possible to time clearing activities to avoid nesting by this species. If distraction displays, vocalizations, or other indications of nesting by adult Hawaiian short-eared owls are seen or heard, vegetation clearing would be suspended within 300 feet (91 meters) and resumed when it is apparent that the young have fledged or other confirmation that nesting is no longer occurring.

The potential for each listed species to collide with the project components was assessed based on the results of the onsite surveys (as discussed in Section 3.5.2.2) and the proposed project layout. Fatality estimate models for birds were developed to incorporate rates of species occurrence, observed flight heights, encounter rates with turbines and meteorological towers, and the ability of birds to avoid project components. Ability of birds to avoid turbines was then varied in the models to create a range of probabilities of mortality for each species on an annual basis. Range of expected mortality coincides with the amount of direct take expected as a result of construction and operation of the Kawailoa wind farm project. Fatality estimates for bats were based on published data correlating bat activity rates with bat fatality.

In addition to direct take, mortality of listed species resulting from collisions with project components can also result in indirect take. For example, it is possible that adult birds killed through onsite collisions could have been tending to eggs, nestlings, or dependent fledglings, or adult bats could have been tending to dependent juveniles. The loss of these adults would then also lead to the loss of the eggs or dependent young. Loss of eggs or young would be considered indirect take attributable to the proposed project. The calculations used to estimate indirect take (as described in the draft HCP) are provided in Appendix A.

Pre-construction estimates of rates of take would not necessarily be accurate for all of the covered species. Post-construction monitoring would be used to estimate actual rates of take. The number of dead individuals of listed species found during monitoring would be used to reach an extrapolated level of total direct take that accounts for individuals that may not have been found because of limits to searcher efficiency and carcass removal by scavengers. Total direct take attributed to the project would be the sum of observed direct take (actual individuals found during post-construction monitoring) and unobserved direct take (individuals not found by searchers for various reasons, including vegetation cover and scavenging). A detailed protocol of how monitoring would take place at Kawailoa is provided in the Draft HCP.

Based on the total direct take and indirect take for each of the covered species, possible levels of take were identified as baseline, lower, or higher (SWCA, 2010b). For each species, the annual baseline level of take was estimated based on the expected average annual mortality identified through the modeling using the most reasonable expectations of avoidance for each species. This annual mortality was then multiplied over the project duration (20 years) to obtain the 20-year baseline take level. The lower rate for any species is the range of take that falls below approximately half the amount of take expected over any twenty-year period (rounded to whole numbers) based on the annual average rate of expected take as estimated through modeling. A higher rate of take would be that which exceeds the authorized baseline rate. In the HCP for this project, a higher take level may be up to twice the baseline requested take.

The requested rates of take at both the baseline and higher level for each species are listed in Table 21.

TABLE 21
Requested Take Levels for Covered Species

Covered Species	Level of Take	Requested Authorization	
		Annual Limit	20-Yr Limit
Newell's shearwater	Baseline	2 adults/ immatures and 1 chick/egg	6 adults/ immatures and 3 chicks/eggs
	Higher	3-4 adults/ immatures and 1-2 chicks/eggs	9-12 adults/ immatures and 4-5 chicks/eggs
Hawaiian duck	Baseline	2 adults/ immatures and 2 ducklings	4 adults/ immatures and 4 ducklings
	Higher	3-4 adults/ immatures and 3-4 ducklings	5-6 adults/ immatures and 5-6 ducklings
Hawaiian stilt	Baseline	2 adults/ immatures and 1 chick/egg	8 adults/ immatures and 4 chicks/eggs
	Higher	3-4 adults/ immatures and 2-3 fledglings	9-12 adults/ immatures and 5-6 fledglings
Hawaiian coot	Baseline	2 adults/ immatures and 1 chick/egg	8 adults/ immatures and 4 chicks/eggs
	Higher	3-4 adults/ immatures and 2-3 fledglings	9-12 adults/ immatures and 5-6 fledglings
Hawaiian moorhen	Baseline	2 adults/ immatures and 1 fledgling	8 adults/ immatures and 6 fledglings
	Higher	3-4 adults/ immatures and 2-3 fledglings	9-12 adults/ immatures and 6-8 fledglings
Hawaiian short-eared Owl	Baseline	2adults/ immatures and 2 owlets	4 adults/ immatures and 4 owlets
	Higher	3-4 adults/ immatures and 5-6 owlets	4-6 adults/ immatures and 4-6 owlets
Hawaiian hoary bat	Baseline	8 adults/ immatures and 6 juveniles	16 adults/ immatures and12 juveniles
	Higher	16 adults/ immatures and 12 juveniles	32 adults/ immatures and 24 juveniles

To compensate for these expected impacts of the project on the covered species, proposed mitigation measures were developed in collaboration with biologists from USFWS, DOFAW, First Wind, and SWCA, and members of the Endangered Species Recovery Committee (ESRC). The proposed mitigation is based on anticipated levels of incidental take as determined through onsite surveys, modeling, and the results of post-construction monitoring conducted at other wind projects in Hawai`i and elsewhere in the U.S.

According to USFWS policy (see 65 Federal Register 35242 [June 1, 2000]), adaptive management is defined as a formal, structured approach to dealing with uncertainty in natural resources management, using the experience of management and the results of research as an ongoing feedback loop for continuous improvement. In the case of the proposed Kawailoa wind farm project, there are uncertainty and assumptions associated with 1) the models used to estimate impacts to covered species and 2) the ability of take monitoring to detect the rare collision events involving the covered species. Therefore, based on the concept of adaptive management, mitigation would be adjusted to account for rates of take that are found to differ from baseline levels; mitigation for the higher and lower levels of take has been identified. Acknowledging that actual rates of take may not match those projected by the modeling, Kawailoa Wind proposes to increase mitigation efforts to the higher-level if the monitoring results demonstrate that incidental take is, or may be, occurring above baseline levels (but still within the higher level identified in the HCP). Similarly, Kawailoa Wind may also request to decrease mitigation efforts if rates of take are believed to be occurring below baseline levels. Any changes in the mitigation effort would be made only with the concurrence of USFWS and DLNR.

The goal of the habitat conservation program (minimization, mitigation, and monitoring) is to compensate for the incidental take of each species authorized at each tier (take scenario), plus provide a net conservation benefit, as measured in biological terms. Thus, for example, the overall expenditure at the baseline tier (excluding contingency funds) is not expected to exceed a total of $3.74 million. However, the budgeted amounts are estimates and are not necessarily fixed, and Kawailoa Wind would provide the required conservation measures in full, even if the actual costs are greater than anticipated. One way of accomplishing this is that past, current or future funds allocated to a specific species may be re-allocated where necessary to provide for the cost of implementing conservation measures for another species. Kawailoa Wind recognizes that the cost of implementing habitat conservation measures in any one year may exceed that year's total budget allocation, even if the overall expenditure for the conservation program stays within the total amount budgeted over the life of the project. As such, accomplishing these measures may require funds from future years to be expended, or likewise unspent funds from previous years to be carried forward for later use. For practical and commercial reasons, such reallocation of funds among years may require up to 18 months lead time in order to meet revenue and budgeting forecast requirements. Similarly, contingency funds earmarked for habitat conservation could be directed toward implementing adaptive management strategies. However, if reallocation between species or budget years and the contingency funds are not sufficient to provide the necessary conservation, Kawailoa Wind would nonetheless be responsible for ensuring that the necessary conservation is provided.

A summary of the proposed mitigation measures for each of the covered species is provided in Table 22. A detailed discussion of the potential impacts and mitigation measures for each of the covered species is provided below.

TABLE 22
Proposed Mitigation for Covered Species by Take Level

Species	Take Level		
	Lower	Baseline	Higher
Seabirds	Same as baseline	Participation in the KSHCP or colony-based management at suitable nesting sites on Kaua`i.	Increased funding to the KSHCP or increased colony-based management efforts at the same site(s) or additional mitigation measures at one or more seabird colonies on Kaua`i.
Waterbirds	Same as baseline	Predator control, fencing, and vegetation maintenance at `Uko`a Pond or other site for five years. Subsequent mitigation efforts to meet baseline requested take as required.	Additional mitigation efforts at `Uko`a Pond or at additional wetlands.
Hawaiian short-eared owl	Same as baseline	Upfront contribution of $12,500 for research and rehabilitation and up to a maximum of $25,000 as it becomes available.	Additional funding of $6,250 for research and rehabilitation and up to a maximum of $12,500 to implement management strategies.
Hawaiian hoary bat	Same as baseline	Up to a maximum of $500,000 for management of bat habitat.	Additional funding of up to a maximum of $500,000 for management of bat habitat.

Newell's Shearwater

Based on modeling, the total expected fatality for the turbines and met towers combined is calculated to be 0.46 shearwaters/year. However, this estimated fatality may still be inflated as, during the radar survey, it was evident that some of the targets observed on radar were likely not to be Newell's shearwater but other seabirds or shorebirds that have similar flight speeds and sizes, such as the Pacific golden-plover. Coupled with the uncertainty over whether the species still breeds on the Island of O`ahu, Kawailoa Wind Power proposes to assume that approximately only half the targets are Newell's shearwater and projects a mortality rate of 0.25 shearwaters/year for all turbines and meteorological towers on site.

The potential for shearwaters to collide with construction cranes during the construction phase of the project is considered negligible. The possibility for Newell's Shearwaters to collide with overhead collection lines that cross gulches within the project area is considered remote. Some potential exists for construction or maintenance vehicles to strike downed shearwaters (birds already injured by collision with turbines or towers) while traveling along the onsite access roads. None of these structures were identified as a likely source of take of Newell's shearwater in the mortality modeling performed for the species and, thus, the amount of take requested to be authorized through the ITP and ITL is based solely on mortality expected to occur as a result of construction and operation of the turbines and meteorological towers.[9]

The expected rates of take for Newell's shearwater, based on the information provided in the HCP (SWCA, 2011) is as follows:

Annual average	=	0.25 adults/immatures and 0.25 chicks (0.50 birds/year)
20-year project life	=	5 adults/immatures and 2 chicks

Based on these expected rates, the requested level of take was determined, as listed in Table 21.

To mitigate for these impacts, the Kawailoa Wind HCP is proposing to provide support to colony-based protection and productivity enhancement efforts. Baseline mitigation measures would most likely involve paying fees to the Kaua`i Seabird Habitat Conservation Plan (KSHCP), which is a joint effort between the USFWS and DOFAW. These fees would be used to implement, monitor, and adaptively manage mitigation projects designed to enhance populations of Newell's shearwater and other species such as the Hawaiian petrel, and band-rumped storm petrel at known breeding colonies on Kaua`i (USFWS and DOFAW, 2010). The details of the KSHCP are still being developed at the present time but mitigation measures include colony protection, colony restoration, a combination of colony protection and restoration, colony re-creation, and seabird translocation. Management activities that will be implemented to achieve the various goals of the mitigation measures include mammal eradication/control, invasive species eradication/control, planting native plants, and fencing. The mitigation provided by Kawailoa Wind Power would be in proportion to the authorized take and any loss of productivity that may occur in the interim. If the island-wide HCP does not come into fruition within three years from the start of project operations, then colony-based mitigation would be implemented, either by Kawailoa Wind Power or as part of a cooperative effort with another entity.

If take occurs at a higher level, and baseline mitigation measures are insufficient to compensate for the additional take, then additional mitigation would be provided through additional funding or in-kind services. Kawailoa Wind would increase the amount of funding provided to the KSHCP or at the seabird site chosen for colony-based management or other mitigation measures. The additional funding could also be used to implement mitigation measures at additional sites on Maui, Kaua`i, or elsewhere. Selection of additional sites, identification of the appropriate mitigation initiatives, and level of effort would be determined in consultation with DLNR and USFWS.

If higher rates of take persist for more than three consecutive years, Kawailoa Wind would conduct onsite investigations in an effort to determine the cause(s) of the unexpectedly higher levels of take, and to identify and implement measures, where practicable, to reduce take levels. Onsite investigations may include, but would not necessarily be limited to, additional surveys using radar, night-vision, thermal imaging, or newer state-of-the-art technologies, as appropriate, to document bird movements and behavior during periods when collisions are believed to be occurring, and particularly to determine whether certain

[9] In the unlikely event a seabird mortality is found and mortality can be attributed to the onsite construction cranes, communication facilities, overhead cables or utility poles, their loss will be mitigated at a level commensurate with any take recorded onsite.

turbines, seasonal or other site-specific conditions account for greater mortality. Investigations may also include experimental changes in project operations, and experimental measures to divert or otherwise repel birds from the area. Measures to reduce and minimize further take could include, but would not be limited to, implementing permanent changes in project operation, moving structures that cause a disproportionately high amount of take, and implementing methods to divert or repel birds from project facilities. Determining the appropriateness of any such measures would take into account costs and practicability.

Hawaiian Duck

Ducks are only expected to be at risk of collision with the turbines at Zone 1; thirteen turbines and two meteorological towers are anticipated in Zone 1. The estimated average rate of mortality at 99 percent avoidance is 0.18 ducks/year.

Ducks also have the potential to collide with microwave towers, overhead collection lines, relocation distribution lines and utility poles. However, as Hawaiian hybrid ducks are primarily diurnal, they are expected to easily avoid the microwave tower which would be highly visible during daylight hours. Observations of ducks conducted at wetlands at Kahuku in 2008 and 2009 demonstrated that Hawaiian duck hybrids easily negotiated the overhead powerlines strung across the wetland habitat (SWCA, 2010a). No ducks were observed to have any collisions or near-collisions with the overhead powerlines or utility poles (147 flocks observed, average of two birds per flock). Consequently, potential for hybrid Hawaiian ducks to collide with the microwave tower, overhead collection lines, relocated distribution lines and utility poles onsite is considered negligible.

Some very limited and temporary potential risk would also exist for ducks to collide with cranes during the construction phase of the project. However, the cranes would be highly visible, and so should be readily avoided. In addition, as discussed for Newell's shearwater, the cranes are only expected to be present onsite for a brief period. Consequently, potential for hybrid Hawaiian ducks to collide with construction cranes is considered negligible. Some potential also exists for construction or maintenance vehicles to strike downed ducks (ducks already injured by collision with turbines or towers) while traveling project roads.

Even though pure Hawaiian ducks are not expected to be present on O`ahu, given the dispersal capabilities of the species, it is possible for pure Hawaiian ducks to occasionally fly over from Kaua`i. It is conservatively assumed that one out of ten ducks seen have the potential to be pure Hawaiian ducks, though the proportion of pure Hawaiian ducks to Hawaiian duck-mallard hybrids is expected to be much less. Thus the expected fatality rate of pure Hawaiian ducks is projected to occur at one-tenth the rate of Hawaiian duck-mallard fatalities at 0.018 ducks/year. Reintroduction of pure Hawaiian ducks to O`ahu may also occur during the permit duration of the project. Given that the initial population is expected to be small and the permit duration is 20 years, the same rate of take is assumed in the event of a reintroduction.

The expected rates of take for the Hawaiian Duck, based on the information provided in the HCP (SWCA, 2011) are as follows:

Annual average = 0.018 adults/immatures and 0.022 ducklings (0.89 birds/year)

20-year project life = 1 adults/immatures and 1 duckling

Based on these expected rates, the requested level of take was determined, as listed in Table 21.

Mitigation for the baseline level of take of the four waterbirds at `Uko`a Pond will consist of a five year plan that will contribute to fencing and managing a smaller unit of wetland (40 acres) within `Uko`a pond. This 40-acre unit is currently overgrown by invasive species, particularly water hyacinth (*Eichhornia crassipes*) and bulrush (*Schoenoplectus varieties*), but is still connected to a small body of open water (Kamehameha Schools, unpublished data). There is a source of flowing water nearby from a previously capped well and the area is close to an access point where equipment and materials can be staged. The removal of the invasive vegetation is likely to increase the amount of open water available and should be attractive to waterbirds. The overall goals of the restoration and management efforts would be to attract waterbirds to the managed site and provide immediate protection from predators, thus encouraging breeding and increasing productivity. Partnerships between Kawailoa Wind Power, Kamehameha Schools, and a third party contractor will be developed for the management of the site. The details of the management plan are still being discussed with the third party contractor. The third party contractor will submit a work plan that will be approved by DOFAW before commencement of the work. Components of the plan that Kawailoa Wind proposes to fund include the following:

- A one-time contribution of $70,000 towards the construction of a fence around the 40-acre unit (Year 1)
- Up to $30,000 for costs associated with permitting for fence construction (Year 1)
- Up to $30,000 for 4 years of fence maintenance (Year 2 to 5)
- Up to $100,000 for 4 years of predator trapping by a qualified contractor or personnel approved by USFWS and DLNR (Year 2 to 5)
- $40,000 for 5 years for monitoring of the management effort (Year 1 to 5)
- $80,000 for 4 years of weed control (Year 2 to 5)

The total funding allocated to the management efforts amounts to $350,000. Following permit issuance for predator control, vegetation maintenance, and monitoring of waterbird populations and reproductive activity, the following will be conducted:

- Construction of a perimeter fence to keep out ungulates, cats, mongoose, dogs, and pigs (Year 1).
- Predator trapping and baiting will begin during the first breeding season after fence construction and vegetation removal and will be funded for 4 years (Year 2 through Year 5). Predator trapping will be conducted year-round using traps, leg holds, and/or snares. Traps would be placed along the perimeter of the fences. Leg holds and snares would be placed deeper within the fenced area, depending on visual observations of predators. Traps will be checked every 48 hours and snares and leg holds, every 24 hours, in accordance with USFWS guidelines. Bait stations will be deployed year-round following protocols set forth by the Department of Agriculture.

- Vegetation maintenance (Year 2 to Year 5) will be conducted to further remove and prevent invasive species from encroaching on waterbird nesting habitat and to enhance available nesting habitat where possible.
- Monitoring of reproductive activity and waterbird populations will quantify the effectiveness of the predator and vegetation control methods (Year 1 to Year 5). Monitoring of reproductive activity will be conducted weekly from December through September.

The predator control, vegetation maintenance and monitoring will be performed by a qualified contractor or personnel approved by DLNR and USFWS. After 5 years of management, the number of fledglings or adults accrued for the covered waterbird species will be reviewed, and if they are at least one more than required to compensate for the baseline requested take, the required mitigation will be considered fulfilled. This standard applies to the Hawaiian coot, Hawaiian stilt, and Hawaiian moorhen. Currently, as no pure Hawaiian ducks are believed to exist on O'ahu because of hybridization, mitigation for Hawaiian ducks may consist of removal of feral ducks, mallards, and Hawaiian duck hybrids at `Uko`a pond.

If a higher rate of take occurs for any of the waterbird species, the number of fledglings or adults accrued for that covered species would be examined to determine if the fledglings or adults accrued are enough to cover the number required to be commensurate with the requested take at the higher tier and achieve a net conservation benefit for the species. If this is determined to be so, then no additional mitigation would be provided. If it is determined that this is not the case, mitigation efforts would first be increased at `Uko`a Pond. Increased efforts could include intensifying the trapping effort or implementing additional vegetation management. If increased efforts at `Uko`a Pond are not sufficient to increase adult survival or produce enough fledglings required to be commensurate with the requested take at the higher tier, and achieve a net conservation benefit for the species at the measured take levels, Kawailoa Wind would provide funding for a similar set of waterbird management measures at one or more additional sites. Selection of additional sites and identification of appropriate levels of effort would be determined, in consultation with DOFAW and USFWS.

Lower rates of take can only be determined after 5 years of post-construction monitoring. Lower rates of take for waterbirds would only be identified if no take has been documented over the past 5 years. It is anticipated that, by the time lower rates of take are determined, mitigation at the baseline level would already have been achieved and no changes to mitigation measures are anticipated.

Predator trapping poses some risk of harassment because of capture, and could result in injury or mortality to the covered waterbird species. For example, moorhen are attracted to traps (DesRochers et al,. 2006) and moorhen on O`ahu have been documented entering live traps (DesRochers et al., 2006; Nadig/USFWS, personal communication). However, because of the minimal risk of injury or mortality expected, based on results from trapping at other sites such as Hamakua Marsh (Misaki, personal communication), no additional take is requested for any of the covered waterbird species. However, in the unlikely event a waterbird mortality or injury is caused by the mitigation measures, Kawailoa Wind would mitigate for that loss at a level commensurate with any take that occurs and measures would be implemented to prevent a repeat of the same occurrence as far as practicable.

Hawaiian Stilt

No Hawaiian stilts were observed flying over the project site during the avian surveys. Consequently, modeling would result in an estimated take rate of zero because known stilt passage rate is zero. Because Hawaiian stilts have historically occurred in the wetlands in the Kawailoa area, it is assumed that the project would create some risk of causing take of this species, however small. For the purposes of this HCP, the estimated rate of take of the Hawaiian stilt would be assumed to be the same as for Hawaiian duck hybrids, or an average of 0.18 stilts/year lost through interaction with turbines, met towers, onsite and offsite microwave facilities and overhead cables, utility poles and other associated structures, as well as mortality because of construction-related fatalities and vehicular strikes. The expected rates of take for the Hawaiian stilt, based on the information provided in the HCP (SWCA, 2011) are as follows:

Annual average	=	0.18 adults/immatures and 0.08 fledglings (0.26 birds/year)
20-year project life	=	4 adults/immatures and 2 fledglings

Based on these expected rates, the requested level of take was determined, as listed in Table 21.

Proposed mitigation measures for the Hawaiian stilt are as described for the Hawaiian duck, above.

Hawaiian Coot

A small number of fatalities of American coot have been reported at wind facilities in North America, although these involved projects where surface waters occurred within the project area. No coots were observed flying through the project area during the avian surveys but one Hawaiian coot was observed foraging in a pond adjacent to Kawailoa Road. The Hawaiian coot was absent in subsequent observations. Because the coot was not observed in flight, mortality modeling for this species would result in a projected rate of take of zero. As the Hawaiian coot presumably took flight to arrive and depart from the pond, Hawaiian coots may occasionally occur in or near the airspace envelope of the turbines. Therefore, it seems the potential for take of this species occurring from the proposed project, while very low, is not zero. Therefore, for the purposes of the HCP, it is assumed that the rate of take of Hawaiian coot would be the same as for hybrid Hawaiian ducks, or an average of 0.18 coots/year resulting from interactions with turbines, met towers, onsite and offsite microwave facilities, associated overhead cables, utility poles, and other associated structures, as well as mortality because of construction-related fatalities and vehicular strikes. The expected rates of take for the Hawaiian coot, based on the information provided in the HCP (SWCA, 2011) are as follows:

Annual average	=	0.18 adults/immatures and 0.08 fledglings (0.26 birds/year)
20-year project life	=	4 adults/immatures and 2 fledglings

Based on these expected rates, the requested level of take was determined, as listed in Table 21.

Proposed mitigation measures for the Hawaiian stilt are as described for the Hawaiian Duck, above.

Hawaiian Moorhen

Hawaiian moorhens were not detected at the Kawailoa wind farm site during the year-long avian point count survey, but are known to occur in the nearby waterbodies. However, Hawaiian moorhen are also thought to be at very low risk of collision with turbines because of their sedentary habits. However, for similar reasons discussed for Hawaiian stilt and Hawaiian coot, risk of collision by this species is not zero, and would be assumed to occur at the same rate assumed for those species, or on an average of 0.18 moorhens/year as a result of collision with turbines, met towers, onsite and offsite microwave facilities, associated overhead cables, utility poles and other associated structures, as well as mortality because of construction-related fatalities and vehicular strikes. The expected rates of take for the Hawaiian coot, based on the information provided in the HCP (SWCA, 2011) are as follows:

Annual average = 0.18 adults/immatures and 0.11 fledglings

20-year project life = 4 adults/immatures and 3 fledglings

Based on these expected rates, the requested level of take was determined, as listed in Table 21.

Proposed mitigation measures for the Hawaiian moorhen are as described for the Hawaiian duck, above.

Hawaiian Short-Eared Owl

Given that no Hawaiian short-eared owls have been observed on site, it is possible that no Hawaiian short-eared owl fatalities would be realized during the life of the Kawailoa Wind Power project. However, as suitable habitat for hunting does seem to be present, the risk of collision cannot therefore be considered zero. Given the onsite survey results and monitoring results from First Wind's Kaheawa wind farm project on Maui, it seems reasonable to assume that the chance of the proposed project causing a short-eared owl fatality in any given year is well less than 1.0. For the purposes of this HCP, it is assumed that the proposed project would on average result in the loss of 0.2 Hawaiian short-eared owl/year. This equates to one owl every five years. This mortality rate includes loss because of interaction with turbines, met towers, onsite and offsite microwave facilities and overhead cables, utility poles and other associated structures, as well as mortality because of construction-related fatalities and vehicular strikes.

The expected rates of take for the Hawaiian short-eared owl, based on the information provided in the HCP (SWCA, 2011) are as follows:

Annual average = 0.2 adults/immatures and 0.2 owlets (0.4 birds per year)

20-year project life = 4 adults/immatures and 4 owlets

Based on these expected rates, the requested level of take was determined, as listed in Table 21.

Mitigation for possible take of the Hawaiian short-eared owl would consist of two parts: funding research or rehabilitation of injured owls and subsequently implementing management actions on O`ahu as they are identified and as needed to bring mitigation ahead of take (that is, provide a net benefit). Before the commercial operation date, Kawailoa Wind Power will contribute a total of $12,500 to appropriate programs or facilities such as the Hawai`i Wildlife Center, to support owl research and rehabilitation. The Hawai`i Wildlife Center, located on the island of Hawai`i, is currently under construction and is still fundraising to complete the facility. Linda Elliot (founder, president and center director) identified the following needs for funding: 1) completion of the outdoor aviaries for raptors in the recovery yard (each outdoor aviary is estimated to cost $2,500 to build) and 2) facilities such as the intake/exam room, laboratory, holding room, or food preparation areas. Kawailoa Wind Power will fund the construction of outdoor aviaries and indoor facilities up to a total of $12,500. This facility, when completed, will have the capacity to rehabilitate native raptors from the entire Hawaiian Archipelago. The Hawaiian short-eared owl is one of two native raptors in the state, the other being the Hawaiian hawk, or *i'o* (*Buteo solitarius*).

The allocation of funds to research and/or rehabilitation will be determined by DOFAW and USFWS. If funding is allocated to research, funding may be used for (but not be limited to) the purchase of radio transmitters or receivers, or to provide support for personnel to conduct research such as a population census. However, these funds would be used for whatever management or research activity is deemed most appropriate at the time, with the concurrence of USFWS and DOFAW.

The rehabilitation efforts of injured owls are anticipated to offset any impact that the wind facility may have on the local population in the area. If research is funded, it is anticipated that the research conducted would result in an increased understanding of the habitat requirements and life history characteristics of Hawaiian short-eared owl populations, leading to the development practicable management strategies and possibly help with the recovery of the Hawaiian short-eared owl on O`ahu.

When practicable management actions that would aid in the recovery of Hawaiian short-eared owl populations are identified on O`ahu, Kawailoa Wind will provide additional funding of $12,500 up to a maximum of $25,000 to implement a chosen management measure as agreed upon by USFWS and DOFAW. The level of funding provided for management would be decided with the concurrence of DOFAW and USFWS and will be deemed appropriate to compensate for the baseline requested take (adjusted for take already mitigated for in the rehabilitation program) and also provide a net benefit to the species.

If monitoring indicates a higher level of take, Kawailoa Wind would provide additional funding of $6,250 for increased owl research and rehabilitation. Examples of possible research include studies of where Hawaiian short-eared owls are likely to breed, quantification of productivity, or developing and testing the effectiveness of management techniques. However, should research indicate that other areas of study are more important or pressing in aiding the recovery of the species, in concurrence with USFWS and DLNR, these funds would be used for whatever management or research activity is deemed most appropriate at the time.

This funding would be followed by an additional $ 6,500 up to a maximum of $ 12,500 for implementing chosen management actions as they become available, with the concurrence of USFWS and DLNR. The level of funding provided for management will be decided upon with concurrence of DLNR and USFWS and will be deemed appropriate to compensate for the requested take at a higher tier and also provide a net benefit to the species.

Hawaiian Hoary Bat

Hawaiian hoary bats have been known to use both native and non-native habitats for feeding and roosting (Mitchell et al., 2005). The vegetated areas within the maximum project envelope for the wind farm site consist mostly of agricultural land, alien grassland and forest. The forest habitat is fairly homogenous and comprised of non-native species, including stands of albizia, ironwood and eucalyptus trees; these trees may provide roosting habitat for bats. Bat activity has been detected in essentially all habitats, including in clearings, along roads, along the edges of treelines, in gulches, and at irrigation ponds; monitoring to date indicates that bats use all of these features for travelling and foraging.

Construction of the project will result in the loss of about 5.6 acres of land to permanent structures such as turbines, meteorological towers, buildings, and riser poles (Table 2). An additional 16.4 acres of land is expected to be altered by road widening or creation of access roads to turbine pads (Table 2). These changes are not expected to adversely affect the Hawaiian hoary bat, as they are likely to continue to use the clearings and edges of the new or widened roads for traveling and foraging much as they do now. A total of approximately 251.0 acres of land will be cleared to establish search plots for the monitoring of downed wildlife around each turbine. These search plots will be maintained as short stature shrubs and grasses to maximize the probability of finding downed wildlife and will result in the conversion of approximately 44 acres of agricultural land, 62 acres of shrubland, 124 acres of alien forest, and 21 acres of grassland to mowed or otherwise maintained clearings. Although patterns of use may change, modifications to the habitat mosaic are not expected to adversely affect the Hawaiian hoary bat provided that clearing occurs outside the pup-rearing season when non-volent young may be present. Bat activity has been detected in similar types of clearings around the current temporary meteorological towers. Although bats may use the alien forest trees on the site for roosting, the loss of 124 acres of alien forest constitutes only 0.9% of the total lowland forest (alien and native) available in the project area and vicinity.[10] Clearing this small percentage of available forest is not expected to measurably decrease the amount of forest available to the local population of bats for roosting. In addition, as the total population of bats on Oahu is believed to be small (USFWS, 1998), and trees are plentiful, roost trees are probably not a limiting factor for the species on O`ahu. The alien forest habitat in the vicinity of the wind farm site is fairly homogenous, and does not vary significantly in composition or structure between adjacent patches (L. Ong/SWCA, personal observations). For these reasons, it is expected that any bats displaced by the clearing would readily find alternate roost sites in surrounding undisturbed forest.

The potential for bats to collide with met towers onsite and offsite microwave facilities and overhead cables, utility poles, other associated structures, or cranes is considered to be negligible because they would be immobile and should be readily detectable by the bats through echo-location. While the guy wires on the temporary meteorological towers may

[10] The area analyzed includes vegetation bounded by Waimea Valley to the north, Kawailoa Gluch to the south, the coastline to the west, and lowland forest that extends to an elevation of 1600 feet, to the east.

pose a somewhat greater threat to bats, bats present at KWP on Maui have not been found to have collided with the guyed met towers after three years of operation nor with any cranes during the construction phase of that project. Similarly, no downed bats have been found during the weekly searches of the four guyed temporary meteorological tower within the Kawailoa wind farm site. Weekly searches began in October 2009 and are ongoing. These search plots have been regularly mowed since the plots were established. In addition, of 64 wind turbines studied at Mountaineer Wind Energy Center in the Appalachian plateau in West Virginia, bat fatalities were recorded at operating turbines, but not at a turbine that remained non-operational during the study period (Kerns et al., 2005). This supports the expectation that presence of the stationary structures such as met towers and cranes should not result in bat fatalities.

The estimated average rate of take for the proposed project is 0.0656 bats/turbine/year. This equates to a total average take of 2.0 bats/year for 30 turbines on the site. However, as previously described, in an effort to minimize this risk, low wind speed curtailment will be implemented from the start of project operations for peak months of May through November. The expected fatality at the Kawailoa wind farm site with low wind speed curtailment assumes a conservative 70 percent reduction in fatalities. During the peak months, the expected fatality per turbine is 0.0196 bats/turbine/year and 0.0015 during the off-peak months, resulting in a total expected direct take of 0.0211 bats/turbine/year. This results in an overall take of 0.63 bats/year for the entire project and approximately 13 bats for the life of the project.

The expected rates of take for the Hawaiian hoary bat, based on the information provided in the HCP (SWCA, 2011) are as follows:

Annual average	=	0.6 adults/immatures and 1.1 juveniles (1.7 bats per year)
20-year project life	=	13 adults/immatures and 10 juveniles

Based on these expected rates, the requested level of take was determined, as listed in Table 21.

Because of the lack of life history information on the Hawaiian hoary bat, development and implementation of a survey and monitoring program remains a high priority and a key recovery objective for the Hawaiian hoary bat (Gorresen et al, 2008; USFWS, 1998). As such, baseline mitigation measures for the Proposed Action have been developed through discussions with Kawailoa Wind, USFWS, DLNR, and USGS bat experts and include the following:

- Onsite surveys to add to the knowledge base of the species' status on O`ahu
- Onsite research into bat interactions with the wind facility
- Implementation of bat habitat improvement measures to benefit bats as determined in consultation with DLNR, USFWS and ESRC

A critical component identified as essential to Hawaiian hoary bat recovery is the need to develop a standardized survey protocol for the Hawaiian hoary bat monitoring program to enable direct comparison of results collected by different parties. Kawailoa Wind will also join the Hawaiʻi Bat Research Cooperative (HBRC) and as a contribution to the on-going research efforts in the state, will conduct its own surveys and monitoring at the Kawailoa wind farm site and the vicinity. Survey protocols will be developed before start of project operations, in consultation with HBRC, with approval by USFWS and DLNR. Up to 12 anabat detectors will be deployed at Kawailoa Wind and the vicinity.

In order to document bat occurrence, habitat use, and habitat preferences on site, as well as identify any seasonal and temporal changes in Hawaiian hoary bat abundance, Kawailoa Wind would continue to survey for and monitor Hawaiian hoary bats within and in the vicinity of the Kawailoa Wind Power site. These onsite surveys are also expected to advance avoidance and minimization strategies that wind facilities in Hawai`i and elsewhere can employ in the future to reduce bat fatalities. Surveys would be conducted during years when systematic fatality monitoring is conducted (that is, during the first 2 to 3 years and at 5-year intervals thereafter, or as otherwise determined under the Adaptive Management provisions); the purpose of these surveys would be to do the following:

- Correlate observed activity levels with any take that is observed; thermal imaging or night vision technology, or other additional techniques and technologies may be used to assist acoustic monitoring as trends are detected
- Determine seasonal and nightly peak bat activity periods onsite
- Determine if bats are being attracted to the wind facility by comparing post-construction data with pre-construction activity levels

Incidental bat observations will also be recorded under the Wildlife Education and Observation Program (WEOP).

Kawailoa Wind will contribute $100,000 up to a maximum of $500,000 to fund an appropriate program to implement management measures that will benefit bats. Measures that may be considered include preserving or enhancing foraging and/or roosting habitat capable of supporting a commensurate number of bats to achieve the mitigation requirement. The baseline requested take of 16 adult bats and 12 juveniles equates to approximately 20 adults (with an estimated 30 percent survival rate of juveniles to adulthood). DLNR, USFWS, ESRC and First Wind will consult to determine the most appropriate measures for implementation. As recommended by DLNR, USFWS, and ESRC, the measures, if implemented as stipulated, will be sufficient to mitigate for the baseline requested take and provide a net benefit to the species.

Native habitat plant restoration at degraded forest on Maui was identified as one option for enhancing bat habitat. Kahikinui Forest Reserve has been proposed by DOFAW as a mitigation bank for restoring and providing additional foraging and roosting habitat for 250 bats. Kahikinui Forest Reserve located on the leeward flank of Haleakala encompasses approximately 8,000 ac of tropical dryland forest, with elevation ranging from 4,400 feet (1,341 meters) to 9200 feet (2,804 meters). The *koa-ohia* montane mesic forest ranges from 3,500 to 6,500 feet (1,067 to 1,981 meters) and the understory is heavily degraded by ungulates. The *ohia* and *mamane* (*Sophora chrysophylla*) subalpine dry forest is also severely damaged by ungulates and ranges from 6,500 to 8,000 feet (1,981 to 2,438 meters). Above that from 8,000 to 9,200 feet (2,438 to 2,804 meters) is the pūkiawe/ohelo (*Leptecophylla tameiameiae* / *Vaccinium calycinum*) dry alpine shrubland that is still relatively intact. Fencing of the Kahikinui Forest Reserve to exclude ungulates with enable the koa-ohia montane mesic forest to regenerate naturally and has been estimated by DOFAW to potentially provide additional habitat for up to 250 bats. Kawailoa Wind would contribute to funding the fencing and management of the Forest Reserve (including the monitoring of bat activity on site) commensurate with the baseline requested take. The fencing, ungulate removal and habitat restoration of Kahikinui is expected to take 6 years at an estimated cost of $3,060 per bat per year (or $61,200 for 20 bats per year) for a total of $367,200 for 20 bats after 6 years. The subsequent cost of yearly maintenance of the habitat is estimated at $450 per year for one bat ($9,000 per year for 20 bats) for a total of $126,000 for 20 bats over the remaining 14 years of the expected operations of the Kawailoa wind farm project. The total cost for 20 bats is $493,200 over the life of the project (20 years).

It is anticipated that the measure outlined above or any others that are developed in the future would be conducted in partnership with other conservation groups or entities and that these activities would complement other restoration, reforestation or conservations goals occurring in that area at the time. Other sites may be chosen if they are determined to be more appropriate for the implementation of the mitigation measures, or if the originally identified mitigation measure does not come to fruition within three years from the start of project operations. The allocation of the funds for any mitigation measure would be determined by Kawailoa Wind in consultation with USFWS and DLNR 60 days from the start of construction. Funds would be directed toward whatever management or research activity is deemed most appropriate at the time.

If monitoring demonstrates that levels of take exceed the baseline levels, Kawailoa Wind would monitor fatalities in an effort to determine whether measures in addition to the low wind speed curtailment can be implemented that would reduce or minimize take. If causes cannot be readily identified, Kawailoa Wind would conduct supplemental investigations that may include but not be limited to the following:

- Additional analysis of fatality and operational data
- Deployment of acoustic bat detectors to identify areas of higher bat activity during periods when collisions are believed to be occurring
- Use of thermal imaging or night vision equipment to document bat behavior
- Determination whether certain turbines are causing most of the fatalities or if fatality rates are related to specific conditions (for example, wind speed, other weather conditions, season)

Other measures to reduce bat fatalities would be implemented as identified and feasible and may include changes in project operations such as modifying structures and lighting, and implementing measures to repel or divert bats from areas of high risk without causing harm if practicable. These data may also be used to refine low-wind speed curtailment options, such as determining the times of year when curtailment is mandatory, or if curtailment can be confined to a subset of “problem” turbines. These additional measures would be implemented by Kawailoa Wind with the concurrence of USFWS and DLNR.

An additional negotiated amount (currently estimated at $100,000, but up to a maximum of $500,000) would also be provided by Kawailoa Wind to implement appropriate Hawaiian hoary bat management measures when identified. This budget range has been determined based on an expenditure of up to 50 percent above the maximum baseline budget. This funding would be used to conduct mitigation measures that would be deemed to be appropriate to compensate for the requested take at the higher tier. The most appropriate mitigation measure to be implemented would be determined in consultation with DLNR and USFWS.

Mt. Ka`ala Communication Sites

Because the proposed antennas are static features attached to existing Hawaiian Telcom structures, no habitat loss or related impacts to faunal resources are anticipated. The existing structures are relatively low, with a small profile, and the proposed equipment is similar in size and type to equipment that currently exists onsite; therefore, installation of the equipment is not expected to create a significant collision hazard to any non-listed or covered species, if they should happen to transit the tower location.

3.5.4.2 Alternative Communications Site Layout

Under this alternative, a new tower would be installed in the areas adjacent to the existing Hawaiian Telcom structures, and communications equipment would be mounted on each tower. Approximately 144 square feet of vegetation would be cleared at each site, resulting in a small loss of habitat for avian, mammalian, and mollusc species. However, the disturbed area would constitute a only a sliver of the range of the species identified within this site and, as such, would not be expected to significantly affect any of the faunal resources at the population level. To minimize direct impacts of clearing on native mollusc species, the vegetation would be hand cleared and cut plants would be placed near adjacent vegetation of similar species to enable the snails to move on to new plants. Leaf litter would be collected before the area is graded and distributed to the surrounding area. No direct impacts to avian or mammalian species would be expected to occur.

The construction of the towers is not expected to increase the requested take for any of the covered species. Studies have shown that only 1 percent of Newell's shearwaters (n = 688 birds; B. Cooper/ABR, personal communication) fly below 60 feet and of these individuals, the estimated collision avoidance rate is 97 percent (Day et al., in prep). Given that the seabird traffic rate on O`ahu is extremely low, and that the towers are less than 60 feet tall, the likelihood of a seabird flying at such low altitudes and colliding with the microwave towers is considered to be remote.

There are no open water features near the proposed location of the microwave towers, and waterbirds have not been historically documented at Mt. Ka'ala (DOFAW, 1990). In addition, none of the listed waterbird species have been observed at the site (Hobdy 2010c; Steve Mosher, personal communication). Therefore, the erection of additional microwave towers is not expected to increase the risk of waterbird fatality for the project.

Potential for short-eared owls to collide with the microwave towers is also considered negligible because these structures would be immobile and stationed in cleared sites. The towers should be readily visible to, and avoidable by, owls. Likewise, the potential for bats to collide with the microwave towers is considered to be negligible because they would be immobile and should be readily detectable by the bats through echolocation.

3.5.4.3 No Action Alternative

No change in existing conditions relative to fauna would occur if the facility is not constructed and operated.

3.6 Historic, Archaeological, and Cultural Resources

3.6.1 Existing Conditions

3.6.1.1 Wind Farm

Whereas at least the deeply dissected and flat-bottomed Waimea River valley to the north and the Anahulu River valley to the south contain intact remnants of prehistoric and historic period Hawaiian occupation and use, the archaeological integrity of the interceding tablelands and the coastal plain behind Waialua Bay (including the project area) have for the most part been compromised by historic period ranching, cultivation, silviculture, military activities, and modern habitation.

To provide a comprehensive understanding of the historic context of the project area, archival and historical data are summarized below, followed by a description of previous and current archaeological studies. Additional detail is provided in the *Draft Archaeological Inventory Survey of the First Wind Kawailoa Wind Power Project Area*, contained in Appendix B.

Pre-Contact and Historical Context

The proposed wind farm site is located within the Kawailoa *ahupuaʻa*.[11] The Kawailoa *ahupuaʻa*, and many of the places named within it, have traditional legends and historical accounts associated with them. In particular, the Waimea River valley to the north and the ʻUkoʻa pond *makai* of the project area are associated with legends, most of which relate to this area's long-standing association with very old lines of prominent priests on O\`ahu. Historical accounts reference the *heiau* at Waimea, one being Pu\`u O Mahuka, on a high bluff north of where the river enters the ocean, and the other being Kupopolo, near the beach south of the river mouth (Takemoto, 1974).

Bingham (McAllister, 1933) recorded a tradition that claims that Pu\`u O Mahuka was the birthplace of prominent *aliʻi*. It is said that the much smaller Kupopolo *heiau*, like Pu\`u O Mahuka, was used for human sacrifices, among other activities. In addition, considering that numerous stories centered on fishing in the adjacent ocean, many mentioning the fishing deity Kaneaukai, it is conceivable that at least some sacrifices at Kupopolo *heiau* related to fishing deities.

Before the arrival of Europeans to the area, the valley was known for its taro, sweet potatoes, ʻ*awa*, and breadfruit. Following his visit to the Waimea River Valley, McAllister (1933) reported the remains of agricultural terraces on both sides of the river for up to a distance of two miles inland from the bay. Irrigation ditches and numerous housing enclosures support historic observations that the valley around Waimea Bay was once heavily populated.

[11] An *ahupua\`a* is a traditional unit of land division, usually extending from the mountain to the sea. Dega (1996) suggests that before the *Māhele* of 1848 (an event marked by complex land transactions that often resulted in changed names and configurations), the area comprised by Kawailoa was traditionally identified as six *ahupuaʻa*, from north to south: Kapaeloa, Punanue, Kuikuiloloa, Lauhulu, Kawailoa, and Paʻalaʻa. Sahlins (1992) refers to the other five land units as *ʻili*. This report will refer to the single post-Māhele Kawailoa *ahupuaʻa*.

According to the records of Thrum (1906) and McAllister (1933), the broader and flatter landscape around Waialua Bay was marked by ponds, irrigated pond fields, irrigation ditches, various *heiau*, and *akua* stones (Kirch, 1992). Indigenous Hawaiian accounts mention a lizard-like female deity, known as Laniwahine, that used to live in the ʻUkoʻa pond. The pond was her "long house," connected to the ocean via a narrow tunnel.

Farther south, on Kaiaka Bay, a prominent legendary *heiau*, known as Kapukapuakea, was reputedly the place where high priests inaugurated Maʻilikūkahi as paramount chief over the area. If Waimea Bay is primarily remembered for its line of indigenous priests, Waialua Bay is known for its line of indigenous chiefs. Traditional orally transmitted accounts from the Waialua area claim that the Kapukapuakea *heiau* was constructed by *menehune*, the little people of legend (Sahlins, 1992).

Historical and Archaeological Accounts

Soon after going ashore at Waimea Bay in 1779, Captain Clerke walked up the Waimea River valley, which he described as "well cultivated and full of villages" (Kuykendall, 1938). Generally speaking, the coastal lands southwest of the project area and southeast of Waimea Bay were occupied by houses, occasional fishponds, and small cultivation plots containing taro and sweet potato (Pfeffer and Hammatt, 1992). *Mauka* of the coastal plain, irrigated taro fields were created in the bottoms of river valleys, such as those within the Anahulu River valley. Higher up the valley slopes were hillside, or *kula*, cultivation of crops and trees. Isolated pockets of planted areas occurred even higher up in the narrower confines of the valleys and their numerous tributaries. Families owned plots in these different zones so that they could use the diverse resources. At the very high end of the river valleys Hawaiians collected a variety of wild plants and hunted birds.

It is only after the armed forces of Kamehameha I permanently occupied O`ahu in 1804 that the interior of the Anahulu River valley became used and modified more intensively, which included the construction of irrigation canals and terraced fields for as much as three miles up the valley. A variety of stone features have been identified on the colluvial and talus slopes of the Anahulu valley uplands. Among these are stone piles, stone walls, stone-lined planting circles, small stone-walled garden plots, and terraces cleared of talus; these features were probably related to the growing of sweet potato, paper mulberry, yam, and banana (Kirch, 1992).

Handy and Handy (1972) maintain that the dry gulches between Anahulu and Waimea Rivers (those within the project area) probably never watered taro. It is likely that cultivators within the Anahulu valley used the rich tablelands on both sides for shifting cultivation even before the settlement of Europeans in the area. In *Māhele* land claims, for example, some of the upper valley claimants refer to swidden-like garden plots in the flat portions of mountains, which could refer to the surrounding tablelands (Kirch, 1992). Moreover, maps of land claims in upper portion of the valley, known as Kawailoa-uka, show winding trails connecting valley bottom residences and terraced fields with tableland top ridge spurs (Kirch, 1992).

As part of the *Māhele* of 1848,[12] Kawailoa *ahupuaʻa* was awarded to Victoria Kamamalu, thus ownership eventually fell to the Bishop Estate (now Kamehameha Schools). According to the Waihona ʻAina database there were 95 *kuleana* claims made for Kawailoa *ahupuaʻa*. Most of these were for land *makai* of the project area and in Anahulu Valley. However, Cane Haul Road, which follows a former railway alignment, traverses four small *kuleana* parcels (LCA # 2727, TMK:1-6-2-02:002; LCA # 10364:2, TMK:1-6-1-05:020; LCA # 8419:1, TMK:1-6-1-05:021; LCA # 7417:1, TMK:1-6-1-05:022).

Between 1850 and 1900, substantial portions of the project area were planted in sugarcane (Pfeffer and Hammatt, 1992). Early in the plantation history sugarcane did not extend higher than the 200 feet contour above sea level. Above this elevation, pineapples were grown. However, some time after that date, with increased technology sugarcane supplanted pineapples in the upper fields. In 1936, irrigation reservoirs, wells, and canals were introduced, an infrastructural development that drastically increased production output. The sugar and pineapple companies modified and used most of the land within the project area, clearing original vegetation, leveling original landforms, digging ditches, constructing reservoir walls, and building roads and railroads. These alterations virtually obliterated material traces left by both traditional Hawaiian and early historical agricultural modification of the tablelands. Substantial amounts of foreign laborers (mostly Chinese, Filipino, and Japanese) were imported to work the fields, with labor camps dotting the landscape (Pfeffer and Hammatt, 1992). As far as can be ascertained, the Kawailoa plantation field camp partly overlapped the Kawailoa Road corridor.

By 1920, the O`ahu Railway and Land Company, originally started in 1886, has built tracks that skirted the island's shoreline (Dorrance and Morgan, 2000); a rail line zigzags across the lower portion of the project area. As early as World War I, the U.S. Army considered using the railway system in the event of an enemy attack on the northern side of the island; over the course of time, several military operations were undertaken in the vicinity of the project area. In 1942, the U.S. Army-built Battery Carroll Riggs on a plantation workers camp in an area currently known as Opaeula Ranch, southwest of the project area. South of Battery Riggs, Brodie Camp No. 4 had a cable hut and a 100-pair cable installed (Bennett, 2002), as part of a circum-island command and fire control communication system. Northeast of the project area, the Waimea Battery Battle Position serves as the southernmost perimeter of the Waimea Battery, with gun emplacements constructed on a bluff above Kaiwikoele Stream. In addition, Drum Road, which runs from Helemano to the Army's Kahuku training range, was constructed by the U.S. Army in the 1930s to handle increases in military vehicle traffic and to provide an alternative route to the north of the island in the event of potential damage to Kamehameha Highway.

The last sugarcane fields in this area date to 1996 (Dorrance and Morgan, 2000; Rick Rogers, personal communication). This final episode of sugar planting was marked by heavy machinery creating a virtually continuous wall of push piles along the edges of the fields, and in so doing obliterated much of the older irrigation ditches on the tablelands.

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[12] The Organic Acts of 1845 and 1846 initiated the *Māhele* – the division of Hawaiian lands – which introduced private property into Hawaiian society. During the *Māhele*, land interests of the King (Kamehameha III), the high-ranking chiefs, and the low-ranking chiefs, the *konohiki*, were defined. All lands were placed in one of three categories: Crown lands (for the occupant of the throne), Government lands, and *konohiki* lands. All three types of land were subject to the rights of the native tenants therein, who could make claims for property they occupied and/or farmed. The native tenant awarded lots are referred to as *kuleana* parcels.

Archaeological Investigation

No archaeological work has been previously conducted within the project area; however, the results of previous archaeological research in the vicinity of the project area provide an indication of the types of sites one would expect to encounter given the physical setting. A detailed account of previous archaeological studies in surrounding areas is provided in the *Archaeological Inventory Survey of the First Wind Kawailoa Wind Power Project Area* (Rechtman, 2011), contained in Appendix B.

To identify archaeological and historical resources within the project area, a detailed archaeological investigation is being conducted by Rechtman Consulting, LLC. The first phase of fieldwork for the current project was conducted between April 12, 2010, and May 14, 2010; portions of the project area addressed during the first phase of fieldwork include the western tableland array, Kawailoa Road, the southern end of Cane Haul Road, and Ashley Road (Figure 18).

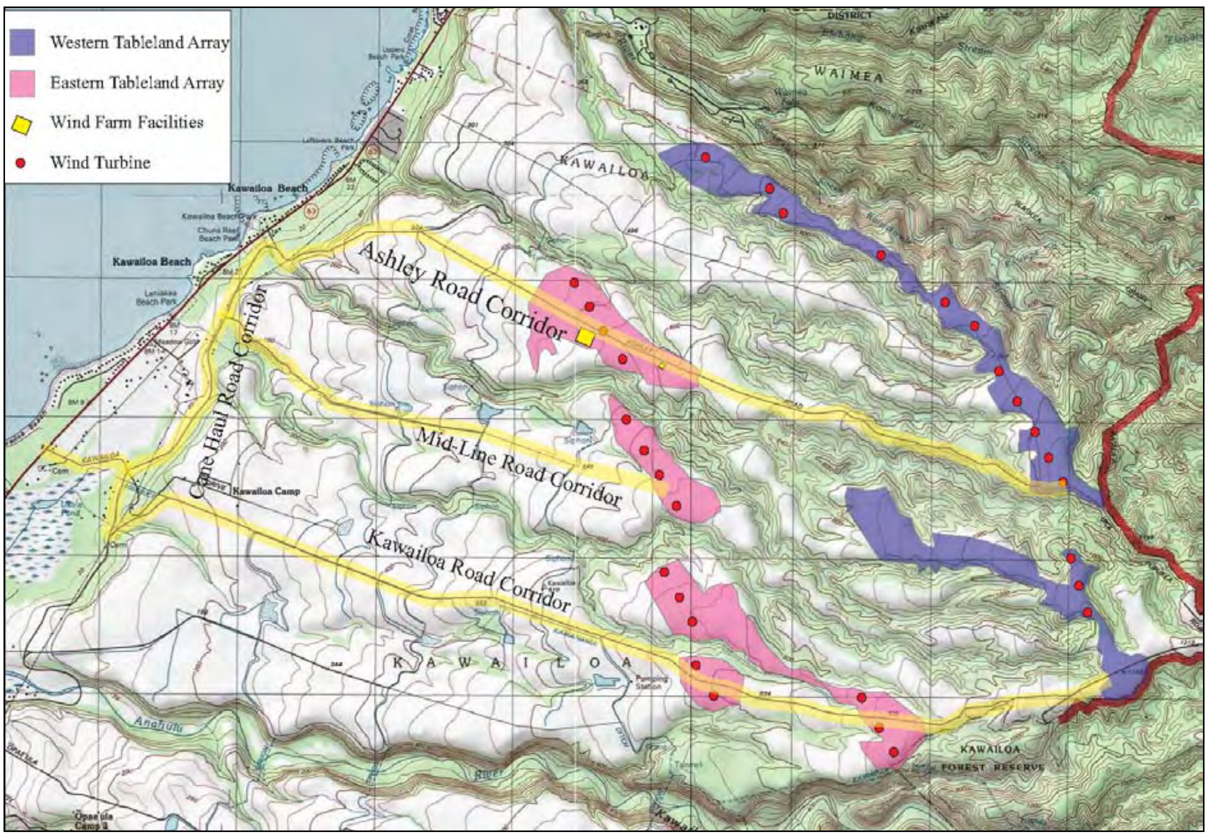


FIGURE 18
Portions of the Project Area Referenced in Archaeological Surveys

A second phase of fieldwork is ongoing; areas being addressed as part of this effort are focused on the eastern tableland array, Mid-Line Road, and the remainder of Cane Haul Road. In addition to the archaeological fieldwork, archival cartographic material concerning plantation infrastructure was obtained and correlated with the field findings. Also, whenever possible, individuals knowledgeable about the area and past land use practices were consulted.

As a result of the work conducted to date, eleven archaeological sites have been identified within the project area (Table 23). All of these sites date from the historic period and were likely associated with either former military operations or former plantation activities. Given the extensive disturbance of the project area by the sugarcane industry, it is likely that any earlier archaeological features were significantly impacted if not completely destroyed.

TABLE 23
Archaeological Sites Recorded Within the Project Area To Date

Site #	Description	Function	Association	Location[a]
T-3	Concrete pillar	Military communication	WWII	WTA
T-4	Concrete pillar	Military communication	WWII	WTA
T-5	Concrete marker	Agricultural field marker	Plantation	WTA
T-6	Metal pole/concrete footing	Military communication	WWII	WTA
T-7	Ditch complex	Agricultural irrigation system	Plantation	KRC
T-8	Metal pipe	Water system	Plantation	CHRC
T-9	Stone and concrete culvert	Drainage control	Plantation	CHRC
T-22	Stone and concrete culvert	Drainage control	Plantation	CHRC
T-30	Stone and concrete culvert	Drainage control	Plantation	CHRC
T-33	Loading platform	Agricultural transportation	Plantation	ARC
T-34	Ditch complex	Agricultural irrigation system	Plantation	ARC

NOTES:
[a] WTA-Western Tableland Array; KRC-Kawailoa Road Corridor; CHRC-Cane haul Road Corridor; ARC-Ashley Road Corridor.

Of the eleven Historic Period sites found within the project area, three are associated with the irrigation of sugarcane. Sites T-7 (Kawailoa Ditch Complex), and T-34 (Ashley Road Ditch Complex) are ditch and pond complexes, and Site T-8 is a water pipe system that connected the Kawailoa ditch complex (Site T-7) with Pump House 4 (an existing facility situated on private land *makai* of the project area). A fourth site (Site T-5) is a possible concrete field marker identifying the location of one of the *mauka*-most agricultural plots within the project area.

A 1929 Hale`iwa Quadrangle map shows an extensive network of irrigation features along Kawailoa Road. Historical documents (such as Dorrance and Morgan, 2000) suggest that by 1936, irrigated fields covered vast portions of the project area, which included ditches, pipes, tunnels, a few pump houses, several reservoirs/ponds, roads, and railway lines. Dates incised into the cement capping of ditch and sluice gate walls suggest that the Kawailoa complex was in place by at least 1913, and dates incised in other concrete features recorded at the site suggest that by 1926 and 1927, the main channels were well established. A spurt of activity occurred in 1937, and ongoing maintenance to the ditch was occurring during the war years, as attested by a few early 1940s dates. Judging from the incised dates, a second spurt of activity occurred between 1950 and 1953 at Site T-7, and further maintenance and update activities occurred between 1981 and 1987. Even though sugarcane cultivation was terminated at the end of 1996, the ditch complex continued to be used and maintained along certain sections, as attested by the 2009 date incised on a concrete repair at the bottom of the main ditch. Features associated with the transport of sugarcane within the project area include the loading dock platform immediately north of Ashley Road (Site T-33), and the three stone-walled road culverts (Sites T-9 and T-22 on Cane Haul Road, and Site T-30 on Hakina Bypass Road).

Sites seemingly associated with World War II military activities include three separate concrete pillar foundations (Sites T-3, T-4, and T-6) along the northern *mauka*-most ridge within the project area. These three related sites are most probably remnants of a military cable-communication and signaling network. These, along with Site T-5, are the only sites that were found in the vicinity of any of the proposed wind turbines tower locations.

Traditional Cultural Uses and Practices

In accordance with the provisions of HRS Chapter 343, Act 50, approved by the Governor on April 26, 2000, and the Office of Environmental Quality Control (OEQC) "Guidelines for Assessing Cultural Impact," a Cultural Impact Assessment (CIA) is currently being conducted by Cultural Surveys Hawai`i. The OEQC Guidelines identify several possible types of cultural practices and beliefs that are subject to assessment. These include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs. The guidelines also identify the types of potential cultural resources, associated with cultural practices and beliefs that are subject to assessment. These are essentially natural features of the landscape and historic sites, including traditional cultural properties.[13] "Traditional" as it is used, implies a time depth of at least 50 years, and a generalized mode of transmission of information from one generation to the next, either orally or by act. "Cultural" refers to the beliefs, practices, lifeways, and social institutions of a given community. The use of the term "Property" defines this category of resource as an identifiable place. Traditional cultural properties are not intangible, they must have some kind of boundary. With one important exception, they are subject to the same kind of evaluation as any other historic resource; the exception stems from the fact that, by definition, the significance of traditional cultural properties is determined by the community that values them.

The process used to conduct a CIA typically includes first generating the cultural and historical background, based on a synthesis of relevant archaeological, ethnographic and historic information. Sources of data include archaeological reports, ethnographies, historic documents, collected *mo'olelo* (oral traditions), Land Commission Awards of the Māhele, previously recorded life histories/interviews, and historic maps, aerial images, and photographs. Much of this information has been compiled for this project, as summarized in the earlier part of this section.

The second component of the CIA involves a series community consultation and interviews. To date, a list of approximately 30 Hawaiian organizations and individuals has been compiled. This list of organizations and individuals reflects the extensive community outreach and consultation conducted by Kamehameha Schools for their North Shore master

[13] The origin of the concept of traditional cultural property is found in National Register Bulletin 38, published by the U.S. Department of the Interior, National Park Service.

planning effort. Cultural Surveys Hawai`i is in the process of contacting these organizations and individuals to identify those who would be interested in participating in a formal interviews and/or site visit. It is anticipated that a minimum of 6 to 8 interviews will be conducted; each interview will be summarized and provided to the interviewee for their review and approval. Along with the cultural and historic background information, the results of the interviews will then be consolidated into a CIA Report; this report will be incorporated as part of the Final EIS.

3.6.1.2 Mt. Ka`ala Communication Sites

From a traditional Hawaiian perspective, Mt. Ka`ala is revered and honor as a sacred place. As McGrath et al. (1973) relate, "this peak stand 4,040 feet high, the tallest on O`ahu. Ancient Kahunas spoke of Mt. Ka`ala as being clothed in the golden cloak of Kāne, the first deity of the Hawaiian pantheon. Ka`ala was the guardian of the road to the west, the path of the sun, the resting place on that great road to death where spirits of the dead return to their homeland."

A review of the records on file at the Hawai`i Department of Land and Natural Resources State Historic Preservation Division (DLNR-SHPD) suggests that no archaeological studies have been conducted at the upper elevations on Mt. Ka`ala, and that no sites are known to exist in the vicinity of the proposed communication sites. However, there was one Section 106 consultation/determination made for the existing Hawaiian Telcom facility located along Mt. Ka`ala access road, which is one of the two sites that is the subject of the current study. In May 2005, the Hawai`i State Historic Preservation Office (SHPO) (DLNR-SHPD Doc. No. 1005RS47) concurred with an applicant determination that the proposed co-location of cellular communication antennae and a 100-square-foot ground sublease would not affect historic properties. A field inspection of both of the existing facility locations was conducted by Rechtman Consulting, LLC on July 16, 2010. There were no archaeological resources observed at either site. The Mt. Ka`ala communication sites are also being addressed as part of the CIA.

3.6.2 Potential Impacts and Mitigation Measures

3.6.2.1 Proposed Action

Wind Farm

The sites recorded to date were assessed for their significance based on criteria established and promoted by the DLNR-SHPD and contained in HAR §13-284-6. This significance evaluation should be considered as preliminary until DLNR-SHPD provides concurrence. For a resource to be considered significant it must possess integrity of location, design, setting, materials, workmanship, feeling, and association and meet one or more of the following criteria:

- A Be associated with events that have made an important contribution to the broad patterns of our history;
- B Be associated with the lives of persons important in our past;
- C Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;

D Have yielded, or is likely to yield, information important for research on prehistory or history;

E Have an important traditional cultural value to the native Hawaiian people or to another ethnic group of the state because of associations with traditional cultural practices once carried out, or still carried out, at the property or because of associations with traditional beliefs, events or oral accounts—these associations being important to the group's history and cultural identity.

The preliminary evaluation of significance of the recorded sites is discussed below and presented in Table 24.

TABLE 24
Preliminary Evaluation of Significance and Recommendations for Treatment

Site #	Description	Historic Association	Significance	Treatment
T-3	Concrete pillar	WWII	A, D	No further work
T-4	Concrete pillar	WWII	A, D	No further work
T-5	Concrete marker	Plantation	D	No further work
T-6	Metal pole/concrete footing	WWII	A, D	No further work
T-7	Ditch complex	Plantation	D	No further work
T-8	Water pipe	Plantation	D	No further work
T-9	Road culvert	Plantation	D	No further work
T-22	Road culvert	Plantation	D	No further work
T-30	Road culvert	Plantation	D	No further work
T-34	Ditch complex	Plantation	D	No further work
T-33	Loading platform and bay	Plantation	D	No further work

Sites T-3, T-4, and T-6 are likely interrelated elements of a WWII military cable-communication and signaling network that was established as a warning system in the event of a foreign invasion. Although the integrity of the overall system no longer exists, the locational and contextual integrity of these elements are intact, and as such these sites are considered significant under Criteria A and D.

Sites T-5, T-7, T-8, T-9, T-22, T-30, T-33 and T-34, although either non-functional (T-5, T-8, T-33, and T-34) partly functional (T-7) or fully functional (T-9, T-22, T-30), do retain sufficient integrity to be considered significant under Criterion D for the historical information they have yielded relative to the development of the plantation industry on the north shore of O`ahu.

To the extent possible, impacts to these features would be avoided as part of construction and operation of the project. However, in the event that impacts are unavoidable, it is expected that a reasonable and adequate amount of information has been collected about all of these potentially significant historic properties as part of the archaeological assessment to warrant a no further work requirement, and thus a no historic properties affected determination for these sites.

It is anticipated that additional archaeological resources identified during the remainder of the investigation, if any, would be similar in type and significance to those listed in Table 24. The final results of the investigation and the preliminary evaluation of significance will be provided through consultation to SHPD and will be presented in the Final EIS.

Mount Ka`ala Communication Sites

Given the negative findings of the field investigation coupled with the fact that the proposed communication equipment would be installed on existing structures, no archaeological resources are expected to be affected at the Mt. Ka`ala communication sites.

3.6.2.2 Alternative Communication Site Layout

Under this alternative, new communication towers would be installed adjacent to the existing Hawaiian Telcom facilities, resulting in a small amount of ground disturbance at each site. However, no archaeological resources were identified within these sites, and as such, no archaeological impacts are expected.

3.6.2.3 No Action Alternative

Under the No Action alternative, none of the project components would be constructed and therefore, impacts to cultural resources within the project site would not occur.

3.7 Visual Resources

Visual resources refer to the natural and constructed features that give a particular environment its aesthetic qualities. In undeveloped areas, landforms, water bodies, and vegetation are the primary components that characterize the landscape. These components are characterized in terms of form, color, texture, and scale. They also may be described in terms of the extent to which they are visible to surrounding viewers (that is, foreground versus background). In developed areas, the natural landscape often provides a background for constructed features, which are often characterized in terms of the size, form, materials, and function of buildings, structures, roadways, and associated infrastructure. The combination of these characteristics defines the overall landscape, thus determining the visual quality of an area. Attributes used to describe visual quality include significant views or vistas, landscape character, perceived aesthetic value, and uniqueness. Visual quality is also described in terms of sensitive receptors, which include areas with high scenic quality (designated scenic corridors or locations), areas where high concentrations of people may be present (recreation areas), and important historic or archaeological locations. Visual impacts are generally defined in terms of a project’s physical characteristics and potential visibility, as well as the extent to which the project’s presence would change the perceived visual character and quality of the environment in which it would be located.

3.7.1 Existing Conditions

The project is located on the north shore of O`ahu, a relatively rural area known for its scenic shoreline, expansive agricultural lands, and natural character. In general, the region has a high aesthetic quality, which is generally attributed to the sweeping landscape views of the ocean and open lands, with the backdrop of the Ko`olau and Waianae mountain ranges. There are frequent opportunities for views of both the coastline and the mountains from Kamehameha Highway, the main roadway which runs the length of the coastline. Two small towns, Hale`iwa and Waialua, and several residential communities, including Pūpūkea, are also located in the project vicinity. This section of the coastline also includes many well-known beaches, including Waimea Bay, Chun's Reef, Laniakea, Pua`ena Point, and Hale`iwa Beach Park.

The North Shore Sustainable Communities Plan (City and County of Honolulu, 2000) addresses the scenic quality of this region and identifies protection of scenic views as a general policy. Within the context of this policy, one of the planning principles identified in the plan is the preservation of views of the mountains, coastline, and Pacific Ocean from public places, including major roadways. The plan establishes specific guidelines including the need to evaluate the impact of land use proposals on the visual quality of the landscape, but recognizes that the protection of roadway views should be balanced with the operating requirements of diversified agriculture. Scenic views listed in the North Shore Sustainable Communities Plan that include portions of the project area include (1) views of the Ko`olau Mountains from Kamehameha Highway at the entrance to the North Shore and (2) *mauka* views from Kamehameha Highway between Hale`iwa and Waimea Bay.

3.7.1.1 Wind Farm

The visual character of the wind farm site is defined by the broad agricultural fields with the lush, rugged Ko'olau Mountains as a backdrop, as indicated in Figure 4. The site is comprised of a series of broad upland plateaus interspersed with steep gulches. The uplands support either actively maintained agricultural crops or overgrown, weedy vegetation. The gulches are densely vegetated with a well-developed canopy, which blocks portions of the *mauka* views from Kamehameha Highway. In addition, a steep bluff occurs along the lower edge of the Kawailoa property, just *mauka* of Kamehameha Highway, further limiting the views of the wind farm site from the highway. The site is visible at a distance from areas to the north (including Pūpūkea) and to the south (including Hale`iwa, Waialua, and Mokuleia), as well as from the ocean.

The proposed project site would be located at an elevation ranging between approximately 100 and 1,300 feet above mean sea level (msl). The turbines would be located a minimum of approximately 0.7 mile from Kamehameha Highway, 0.85 mile from Pūpūkea, and 3.8 miles from Hale`iwa Town.

3.7.1.2 Mt. Ka`ala Communication Facility Sites

The proposed communications sites can be characterized as rocky mountain ridges, surrounded by steep mountainous slopes. As described in Section 2.1.3.2 and shown on Figure 9, these sites each include existing Hawaiian Telcom structures that have been in place for several decades. The ridges are part of the Mokuleia Forest Reserve, and are heavily vegetated with a well developed canopy and dense undergrowth. The microwave tower site is generally visible from the Mt. Ka`ala access road. The repeater site is along the DuPont Trail, but is not visible from the access road.

3.7.2 Potential Impacts and Mitigation Measures

3.7.2.1 Proposed Action

Wind Farm

To assess the potential impacts of the wind farm project, two separate analyses were conducted. First, a zone of visual influence (ZVI) analysis was conducted to identify locations on the island from which the turbines would be visible, and to assess the extent to which they might be potentially visible. Second, visual simulation were produced which illustrate the appearance of the wind farm site from key observation points (KOPs), both with and without the project. Following is a discussion of these two analyses and the results of each.

ZVI Analysis

A ZVI analysis was completed for the wind farm project in January 2011 to evaluate potential aesthetic effects of the Proposed Action. The analysis was conducted based on digital elevation model (DEM) information from the State of Hawai`i, specifications of the Siemens SWT-2.3-101 wind turbine model and the 30-turbine layout. The key dimensions of the Siemens turbines are described in Section 2.1.3.2 and listed in Table 3.

Project features were plotted on topographic maps using ArcInfo GIS and overlaid with the locations of communities, roads, preservation areas, historic landmarks, and recreation areas (that is, parks, hiking trails, and beaches). A viewshed analysis was subsequently conducted to determine the areas from which project features could be visible. The analysis extended 20 miles from the project site in every direction, which represents a conservative approach to capture all sensitive viewpoints from which the project would be visible. Although this analysis considers the extent to which topography would block views of the turbines, it does not take into account the extent to which buildings and vegetation would also block views. Analysis of these sites relative to the project area allowed a preliminary assessment of visual impacts associated with the project.

The following three types of potential visibilities were assessed:

- Areas where turbines would not be visible because the line-of-sight is blocked by terrain.
- Areas in which turbines have the potential to be visible
- Areas in which turbines are potentially visible but have the potential to be screened by forest cover

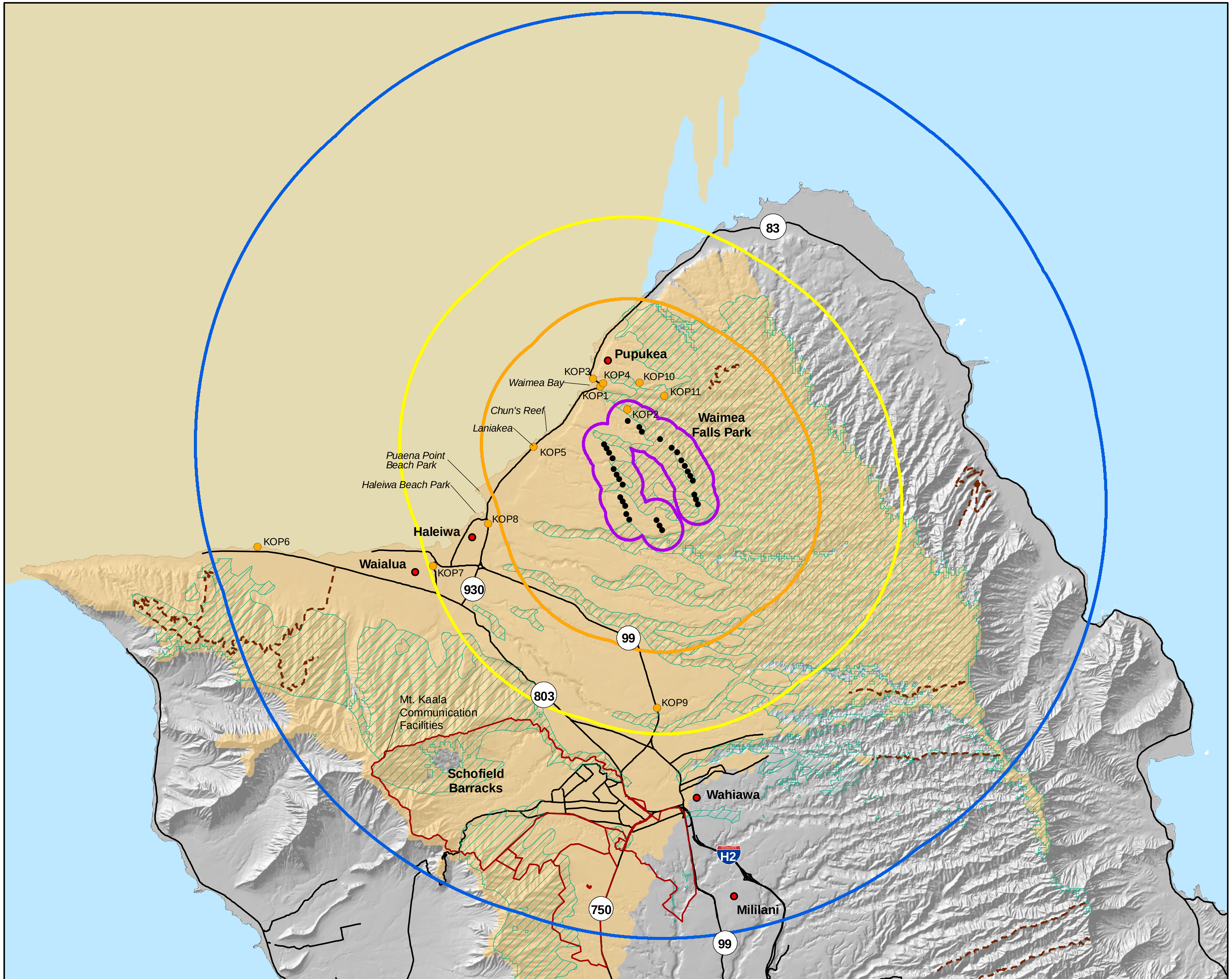
Distance is a factor that can be taken into account in evaluating the visibility and potential visual effects of wind farm projects, or other features in the landscape. With increasing distance, the apparent size, relative visibility, and potential visual effects of features generally decreases. To capture the effects of distance, the ZVI analysis was supplemented to indicate the locations of distance zones, based on the landscape impact assessment systems developed by the U.S. Bureau of Land Management (BLM) and the U.S Forest Service (USFS). For this analysis, the distance zones that have been applied are generally similar to those developed by the BLM and USFS, but have been adapted to slightly take into account the large scale of the proposed wind turbines. These distance zones are detailed as follows:

- The Near Foreground zone, is defined as the area within four times the maximum tip height of the turbines (in this case, 1,900 feet or 0.36 mile). This zone identifies the area within which the turbines have the most potential to be perceived as looming over the viewer and dominating the view.
- The remainder of the Foreground zone, which can also be thought of as the far foreground zone, extends out to 0.5 mile from the turbines and is the area within which the turbines would no longer be perceived as looming over the viewer, but where the details of the turbines and other project features would still be readily visible and where the turbines would still have the potential to be visually dominant.
- The Near Middleground zone, within 0.5 to 3.0 miles turbines, is the area in which degree of detectable detail begins to decrease, and the turbines begin to fit into the larger landscape and become less visually dominant.
- The Far Middleground zone, between 3.0 to 5.0 miles from the turbines, is the area where the structure details become even less visible. Because of the effects of the atmosphere, colors will become bluer and softer than those seen in the foreground, and the turbines appear to be further integrated into their overall landscape settings and increasingly less visually dominant.
- The Near Background Zone is the area between 5.0 and 10.0 miles from the closest turbine. In this area, details fade even more, colors become even less intense and more blued, and the apparent size of the turbines decreases even more. In this zone, although the turbines may be visible, they are less distinct, tend to be integrated into the overall view, and are unlikely to dominate the view.
- The Far Background zone is the area that lies 10 miles and more from the turbines. In this zone, the turbines appear as very small elements in the overall landscape, haze effects often make them difficult to see, and their potential for detectable effects of any consequence on views is very low.

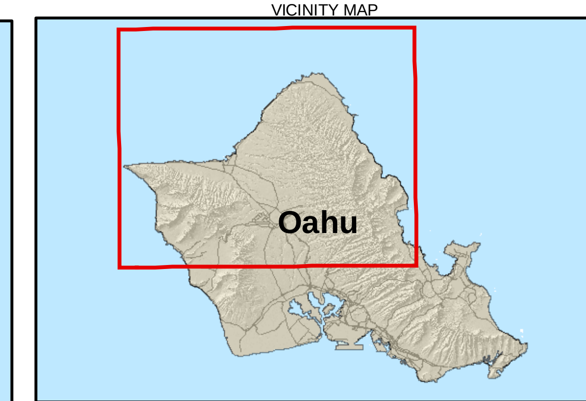
The results of the ZVI analysis are depicted in Figure 19, indicating the areas from which the turbines are potentially visible. The general landscape setting surrounding the wind farm site is shown in Figure 20.

Visual Simulations

Visual simulations were prepared for each KOP using computer modeling techniques to depict the view as it would appear with the project constructed. A combination of computer-aided drafting, geographic information system (GIS), and rendering programs were used to produce the images of the project facilities that are superimposed on photographs. To produce the simulations, a digital site model was created using topographic and site data. Next, three-dimensional (3-D) models of project features were prepared using project plans, and these were superimposed on the digital site model. For each KOP, the viewer location was digitized from topographic maps, using 1.5 meters (5 feet) as the assumed eye level. Computer wire frame perspective plots were overlaid on the photographs of the KOPs from the simulation viewpoints to verify scale and viewpoint location. Digital visual simulation images were produced based on renderings of the 3-D model combined with the high-resolution digital base photographs.



VICINITY MAP



LEGEND

- Proposed Turbine Location
- KOP Location
- Road

Potential Visibility Based Upon Viewshed Analysis to 99.5 m Hub and 150 m Tip Height

- Not visible, line of sight blocked by terrain
- Areas in which turbines have the potential to be visible
- Turbines potentially visible but with year-round screening from forest cover
- Schofield Barracks Army Base Installation Boundary
- Na Ala Hele Trail

Distance Zones

- Foreground Zone 0 - 0.5 miles from turbines
- Near Middleground Zone 0.5 - 3.0 miles from turbines
- Far Middleground Zone 3.0 - 5.0 miles from turbines
- Near Background Zone 5.0 - 10.0 miles from turbines

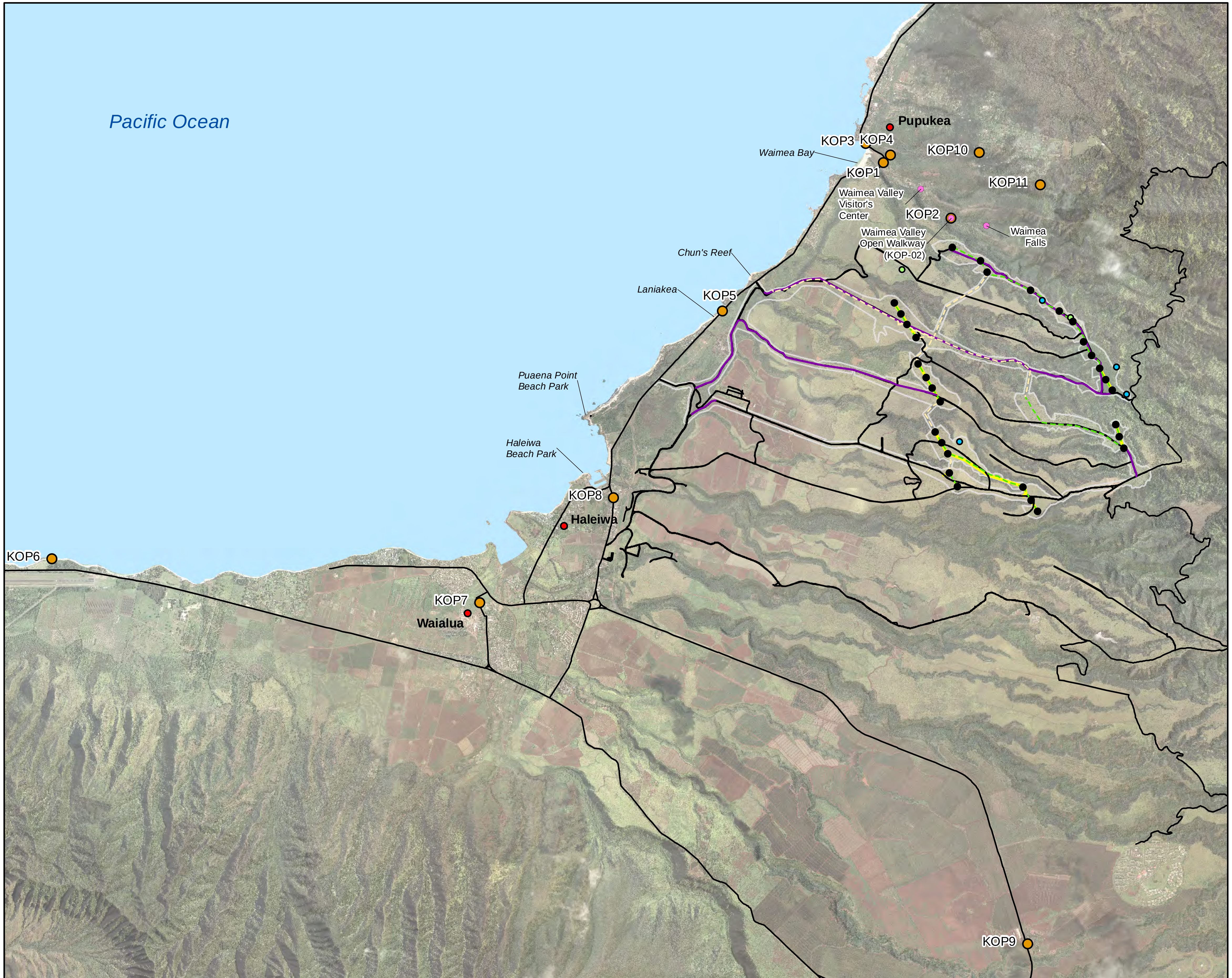
N

0 0.75 1.5 3
Miles

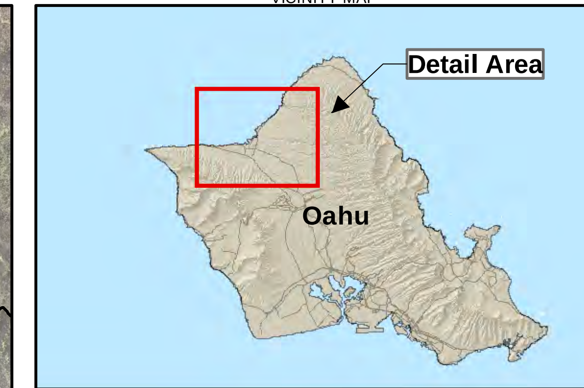
Figure 19
Zone of Visual Influence (ZVI) for the Kawailoa Wind Farm Site
Kawailoa First Wind Farm Project
Oahu, Hawaii

CH2MHILL

HNL \\NALA\PROJ\FIRSTWINDLLC\398315KAWAILOA\GIS\MAPFILES\EIS\FIG19_ZVI_VIEWSHED.MXD LSHARIQ 12/23/2010 11:52:22



VICINITY MAP



LEGEND

- Line of Sight Locations
- KOP Points
- Turbine
- Existing Meteorological Tower
- Proposed Meteorological Tower
- Overhead Collector Line
- Underground Collector Line
- Improved Roads
- Existing Roads
- New Roads
- Maximum Project Envelope
- Ocean

Source:
Project Facilities - First Wind
Existing Hawaiian Electric Lines - First Wind

N

0 0.25 0.5 1 1.5 2
Miles

Figure 20
Landscape Setting of Proposed Wind Farm Site
Kawailoa Wind Farm Project
Oahu, Hawaii

The only project component shown in the simulations are the wind turbines, as they are much taller and bulkier than the other structures (that is, overhead cable, utility poles, and buildings), and thus would be the most visually prominent component of the project. In many cases, the turbines would be screened by vegetation, houses, existing infrastructure, or other physical features of the landscape; this is accounted for as part of the rendering process.

In general, KOPs that are expected to be of concern to local residents, businesses and visitors were selected for the visual simulations. The results of the visual simulations are shown in Figures 21 through 31; the KOPs include the following:

- Entrance to Waimea Valley Park (Figure 21)
- Within Waimea Valley Park (Figure 22)
- Kamehameha Highway above Waimea Bay (Figure 23)
- Pu'u O Mahuka Heiau (Figure 24)
- Kamehameha Highway near Turtle Beach (Figure 25)
- Mokuleia Beach Park (Figure 26)
- Waialua District Park (Figure 27)
- Matsumoto's Shave Ice Shop (Figure 28)
- Dole Plantation Visitor's Center in Wahiawā (Figure 29)
- Pūpūkea Residence on Holike Road (Figure 30)
- Pūpūkea Private Property on Maulukua Road (Figure 31)

Each of these figures present the existing view and the simulated view from the above referenced KOPs. In general, an assessment of the simulations indicates that the degree of turbine visibility is dependent on the distance of the viewer (for example, foreground zone, near middleground zone, or similar) and extent of obstruction by existing vegetation, topography and structures. Each of the KOP simulations is briefly described below according to distance zone.

No locations within the Near Foreground zone (within 1,900 feet or 0.36 mile of the turbines) were selected as KOPs because these areas are not readily accessible to the public. Only personnel operating or maintaining the wind turbines and other land users having agreements with Kamehameha Schools would be able to access this zone.

The only KOP simulated within the remaining Foreground zone of the ZVI (greater than 0.36 mile but no more than 0.5 mile) was the Waimea Valley KOP (KOP-02). Initial efforts to simulate views from Waimea Valley indicate that, while several of the turbines may be visible, the views are heavily influenced by the existing topography and vegetation. For example, the simulated view of KOP-02, as shown on Figure 22, shows that the turbines are potentially obstructed by the existing vegetation, but this may not necessarily be the case for all potential viewing locations throughout Waimea Valley. Acknowledging that this KOP does not show an unobstructed viewpoint, the simulation has been included in this Draft EIS to provide initial results. Additional simulations will be developed for the Final EIS to capture additional viewpoints.

Given the difficulty of identifying a KOP that captures the full extent of the turbines unobstructed by existing vegetation cover, a line-of-sight analysis was conducted from three viewing locations within Waimea Valley to determine the potential line-of-sight for turbines without potential obstructions from vegetation cover. The additional analysis incorporated a terrain model of the area; distance, elevation, and height of the turbines in relation to the three viewing locations within Waimea Valley; and the view plane of a viewer. The three viewing locations are the Waimea Valley Visitor's Center (LOS-01), the location of KOP 02 (LOS-02), and further into Waimea Valley at Waimea Falls (LOS-03); these are shown on Figure 20. A profile view of the topography between the selected viewing location and nearest turbines were generated and integrated the view plane of the viewer, as shown in the diagrams on Figures 32 through 34. The topographic profiles are presented as green contours on the diagram. Potential views of the turbine tips are indicated by a red diagonal dashed line from the viewer's vantage point to the turbine location; the potential views of the lowermost portion from the viewer's vantage point to the turbine location is indicated by a blue diagonal dashed line. Diagrams where no blue dashed lines are shown and where the red dashed line intersects the green topographic profile indicate that the turbine is potentially not visible at all due to existing topographical features.

From the Waimea Valley Visitor's Center (LOS-01), the line-of-sight analysis indicated that the majority of the tower and blades of Turbine 10 will be potentially visible. The upper portion of Turbine 11's tower and the turbine blades may be visible, while views for Turbines 7 and 8 may be obstructed by existing topographical features. From KOP-02 (LOS 02), the line-of-sight analysis indicated that the majority of the tower and blades of Turbine 8 will be potentially visible, while only the upper portion of the turbine towers and turbine blades for Turbines, 7, 10, and 11 may be visible. The views of turbines are potentially obstructed from the Waimea Falls location (LOS-03) by the topographical feature known as South Ridge. South Ridge immediately borders Waimea Falls to the south, and ranges in heights from 95 to 180 feet elevation. Based on this information, additional simulations will be developed for the Final EIS to capture additional viewpoints where topographical features and vegetation do not obstruct views to the turbines.

KOPs located in the Near Middleground zone include the entrance to Waimea Valley (KOP 01; Figure 21), Kamehameha Highway above Waimea Bay (KOP-03; Figure 23), Pu`u O Mahuka Heiau (KOP-04; Figure 24), the Pupukea residence on Holike Street (KOP-10; Figure 30), the Pupukea private property on Maulukua Road (KOP-11; Figure 31), and Kamehameha Highway at Turtle Beach (KOP-05; Figure 25). As indicated on the figures, existing vegetation and topographical features may potentially obstruct views of the turbines from these KOPs.

KOPs located in the Far Middleground zone include Kamehameha Highway at Matsumoto's Shave Ice Shop (KOP-08; Figure 28) and Waialua District Park (KOP-07; Figure 27). As indicated on the figures, the views are potentially obstructed by existing vegetation and structures such as buildings, utility poles, and lines.

KOPs located in the Near Background zone include Mokuleia Beach Park (KOP-06; Figure 26), and the Dole Plantation Visitors Center (KOP-09; Figure 29). While turbines are potentially visible from the Mokuleia Beach Park and Waialua District Park, turbines are potentially obstructed by vegetation, existing structures, and topographical features from the Dole Plantation Visitor's Center.

A. KOP-01. Existing view toward the project site from the Waimea Valley Entrance.

B. KOP-01. Simulated view toward the project site from the Waimea Valley Entrance during project's operational period.

Figure 21
KOP-01: View from Waimea Valley Entrance
Kawailoa First Wind Farm Project
Oahu, Hawaii

A. KOP-02. Existing view toward the project site from within Waimea Valley.

B. KOP-02. Simulated view toward the project site from within Waimea Valley during the project's operational period.

Note: It is acknowledged that this KOP does not represent an unobstructed view of the turbines. To more broadly assess the extent to which the turbines would be visible within Waimea Valley, a line-of sight analysis was conducted, as described in Section 3.7.2.1 of the Draft EIS. Simulations from additional KOPs will be conducted to capture unobstructed views of the turbines and will be included in the Final EIS.

Figure 22
KOP-02: View from Within Waimea Valley
Kawailoa First Wind Farm Project
Oahu, Hawaii

A. KOP-03. Existing view toward the project site from Kamehameha Highway above Waimea Bay.

B. KOP-03. Simulated view toward the project site from Kamehameha Highway above Waimea Bay during the project's operational period.

Figure 23
KOP-03: View from Kamehameha Highway above Waimea Bay
Kawailoa First Wind Farm Project
Oahu, Hawaii

A. KOP-04. Existing view toward the project site from the Pu`u O Mahuka Heiau.

B. KOP-04. Simulated view toward the project site from the Pu`u O Mahuka Heiau during the project's operational period.

Figure 24
KOP-04: View from Pu`u O Mahuka Heiau
Kawailoa First Wind Farm Project
Oahu, Hawaii

A. KOP-05. Existing view toward the project site from Kamehameha Highway at Turtle Beach.

B. KOP-05. Simulated view toward the project site from Kamehameha Highway at Turtle Beach during the project's operational period.

Figure 25
KOP-05: View from Kamehameha Highway at Turtle Beach
Kawailoa First Wind Farm Project
Oahu, Hawaii

A. KOP-06. Existing view toward the project site from Mokuleia Beach Park.

B. KOP-06. Simulated view toward the project site from Mokuleia Beach Park during the project's operational period.

Figure 26
KOP-6: View from Mokuleia Beach Park
Kawailoa First Wind Farm Project
Oahu, Hawai

A. KOP-07. Existing view toward the project site from Waialua District Park.

B. KOP-07. Simulated view toward the project site from Waialua District Park during the project's operational period.

Figure 27
KOP-7: View from Waialua District Park
Kawailoa First Wind Farm Project
Oahu, Hawaii

A. KOP-08. Existing view toward the project site from Kamehameha Highway at Matsumoto's Shave Ice Shop.

B. KOP-08. Simulated view toward the project site from Kamehameha Highway at Matsumoto's Shave Ice Shop during the project's operational period.

Figure 28
KOP-08: View from Kamehameha Highway at Matsumoto's Shave Ice Shop
Kawailoa First Wind Farm Project
Oahu, Hawaii

A. KOP-09. Existing view toward the project site from the Dole Plantation Visitor's Center.

B. KOP-09. Simulated view toward the project site from the Dole Plantation Visitor's Center during the project's operational period.

Figure 29
KOP-09: View from Dole Plantation Visitor's Center
Kawailoa First Wind Farm Project
Oahu, Hawaii


A. KOP-10. Existing view toward the project site from a Pupukea residence on Holike Road.

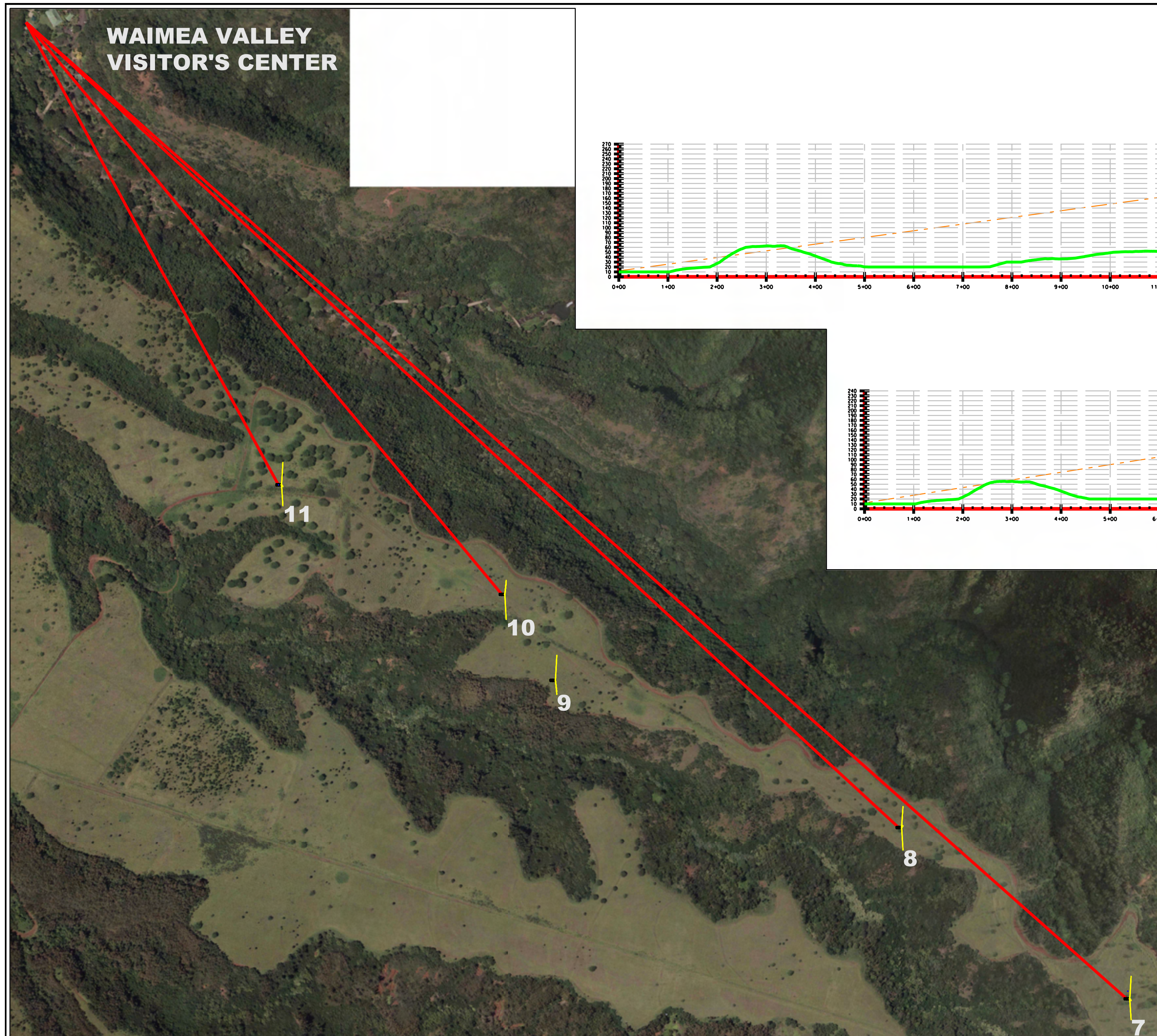

B. KOP-10. Simulated view toward project site from a Pupukea residence on Holike Road during operational period of the project.

Figure 30
KOP-10: View from a Pupukea Residence on Holike Road
Kawailoa First Wind Farm Project
Oahu, Hawaii


A. KOP-11. Existing view toward the project site from a Pupukea property on Maulukua Road.


B. KOP-11. Simulated view toward the project site from a Pupukea property on Maulukua Road during the project's operational period.

Figure 31
KOP-11: View from Pupukea Private Property on Maulukua Road
Kawailoa First Wind Farm Project
Oahu, Hawaii



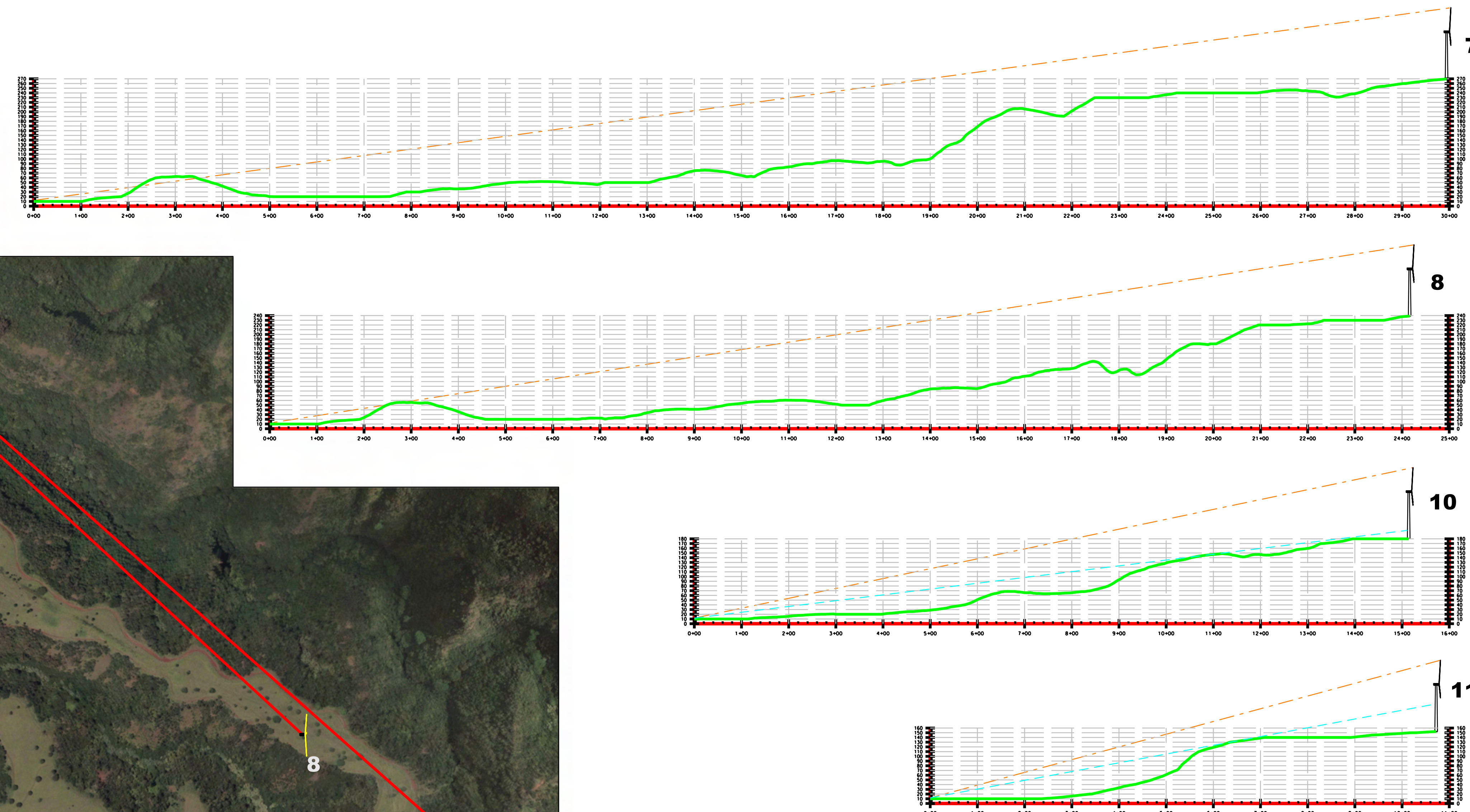


Figure 32
LOS-01: Waimea Valley Visitor's Center
Line of Sight Profile Assessment
Kawailoa First Wind Farm Project
Oahu, Hawaii

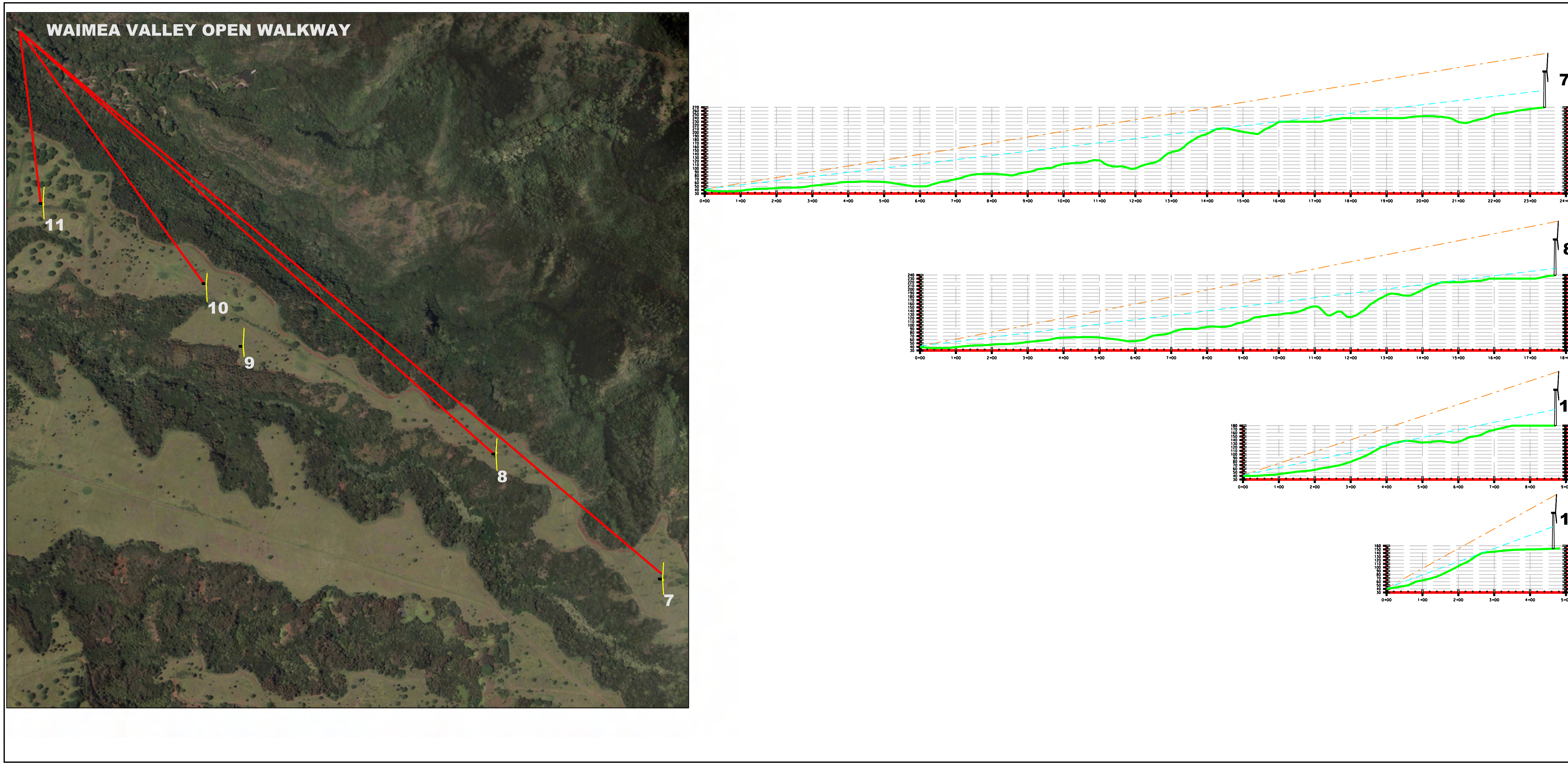


Figure 33
LOS-02: KOP-02
(Waimea Valley Walkway)
Line of Sight Profile Assessment
Kawailoa First Wind Farm Project
Oahu, Hawaii

CH2MHILL

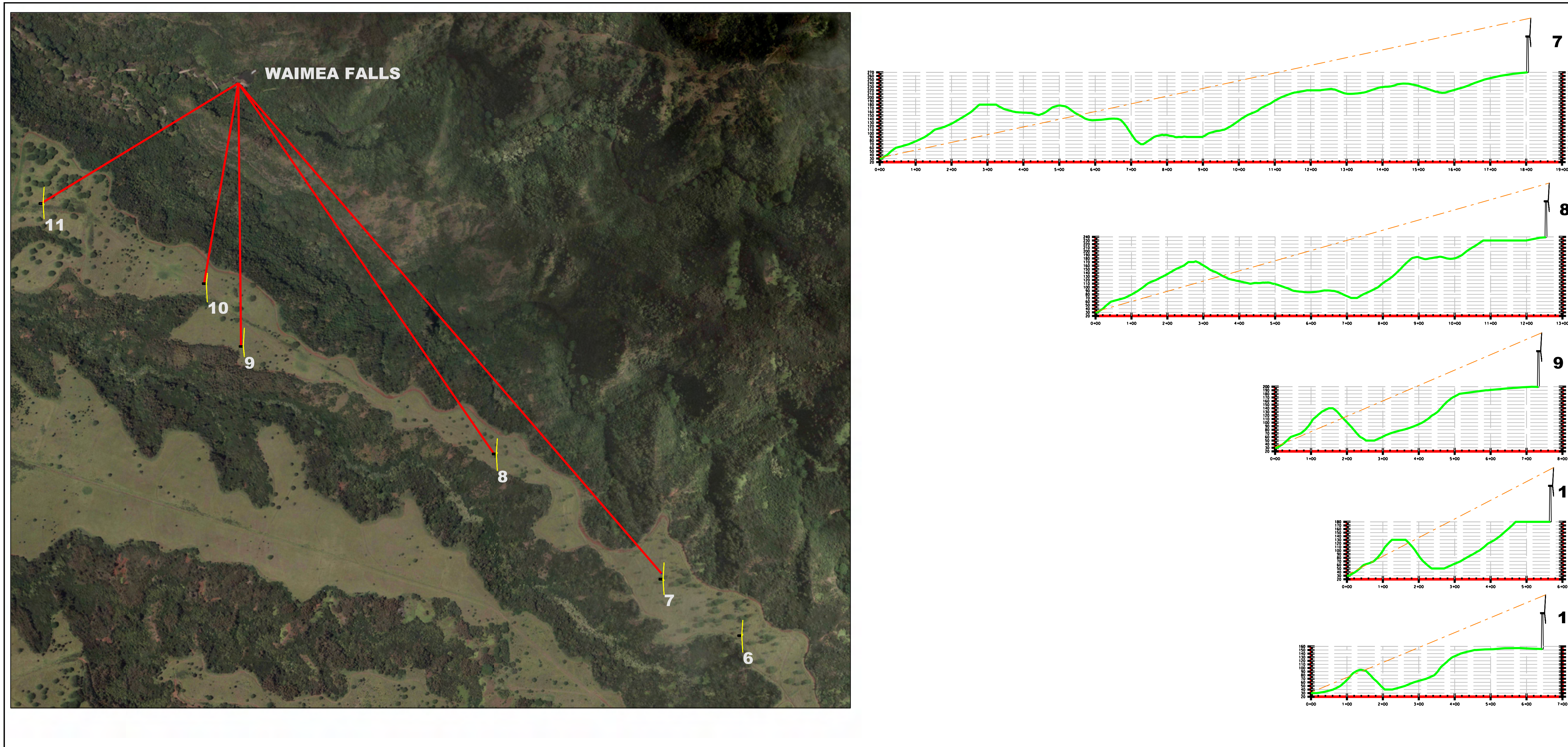


Figure 34
LOS-03 Waimea Falls
Line of Sight Profile Assessment
Kawailoa First Wind Farm Project
Oahu, Hawaii

Mt. Ka`ala Communication Sites

Installation of the communications antennae at the Mt. Ka`ala site would not be readily visible from any public vantage points, given the distance of the site and the small size of the structures. They would be visible from the Mt. Ka`ala summit access road and the nearby hiking trails; however, the equipment is visually consistent with the existing communication facilities. As such, visual impacts associated with the additional antennae are expected to be insignificant.

3.7.2.2 Alternative Communication Site Layout

Similar to the Proposed Action, installation of two communications towers at the Mt. Ka`ala site would not be readily visible from any public vantage points, given the distance of the site and the small size of the structures. They would be visible from the Mt. Ka`ala summit access road and the nearby hiking trails; however, these features are visually consistent with the existing communication facilities. As such, visual impacts associated with this alternative are expected to be insignificant.

3.7.2.3 No Action Alternative

Under the No Action alternative, the wind farm facility and Mt. Ka`ala communications facilities would not be constructed, and therefore, no changes in the existing visual landscape would occur.

3.8 Noise

Acoustics is the study of sound, and noise is defined as unwanted sound. Airborne sound is a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure creating a sound wave. Acoustical terms used in this section are summarized in Table 25.

TABLE 25
Definitions of Acoustical Terms

Term	Definition
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise or sound at a given location.
Background Noise Level	The underlying ever-present lower level noise that remains in the absence of intrusive or intermittent sounds. Distant sources, such as traffic, typically makeup the background.
Intrusive	Noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, tonal content, the prevailing ambient noise level as well as the sensitivity of the receiver.
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
A-Weighted Sound Level (dBA)	The sound level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighted filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this discussion are A-weighted, unless otherwise specified (for example, dB).

TABLE 25
Definitions of Acoustical Terms

Term	Definition
Equivalent Noise Level (L_{eq})	The average A-weighted noise level, on an equal energy basis, during a stated period of time.
Percentile Noise Level (L_n)	The noise level exceeded during n percent of the measurement period, where n is a number between 0 and 100 (for example, L_{90})

The most common metric is the overall A-weighted sound level measurement (dBA) that has been adopted by regulatory bodies worldwide. The A-weighting network measures sound in a similar fashion to how a person perceives or hears sound, thus achieving a very good correlation in terms of how to evaluate acceptable and unacceptable sound levels.

A-weighted sound levels are typically measured or presented as equivalent sound pressure level (Leq), which is defined as the average noise level, on an equal energy basis for a stated period of time and is commonly used to measure steady state sound or noise that is usually dominant. Statistical methods are used to capture the dynamics of a changing acoustical environment. Statistical measurements are typically denoted by Lxx, where "xx" represents the percentile of time the sound level is exceeded. The L_{90} is a measurement that represents the noise level that is exceeded during 90 percent of the measurement period. Similarly, the L_{10} represents the noise level exceeded for 10 percent of the measurement period.

Figure 35 shows the relative A-weighted noise values of common indoor and outdoor noise sources.

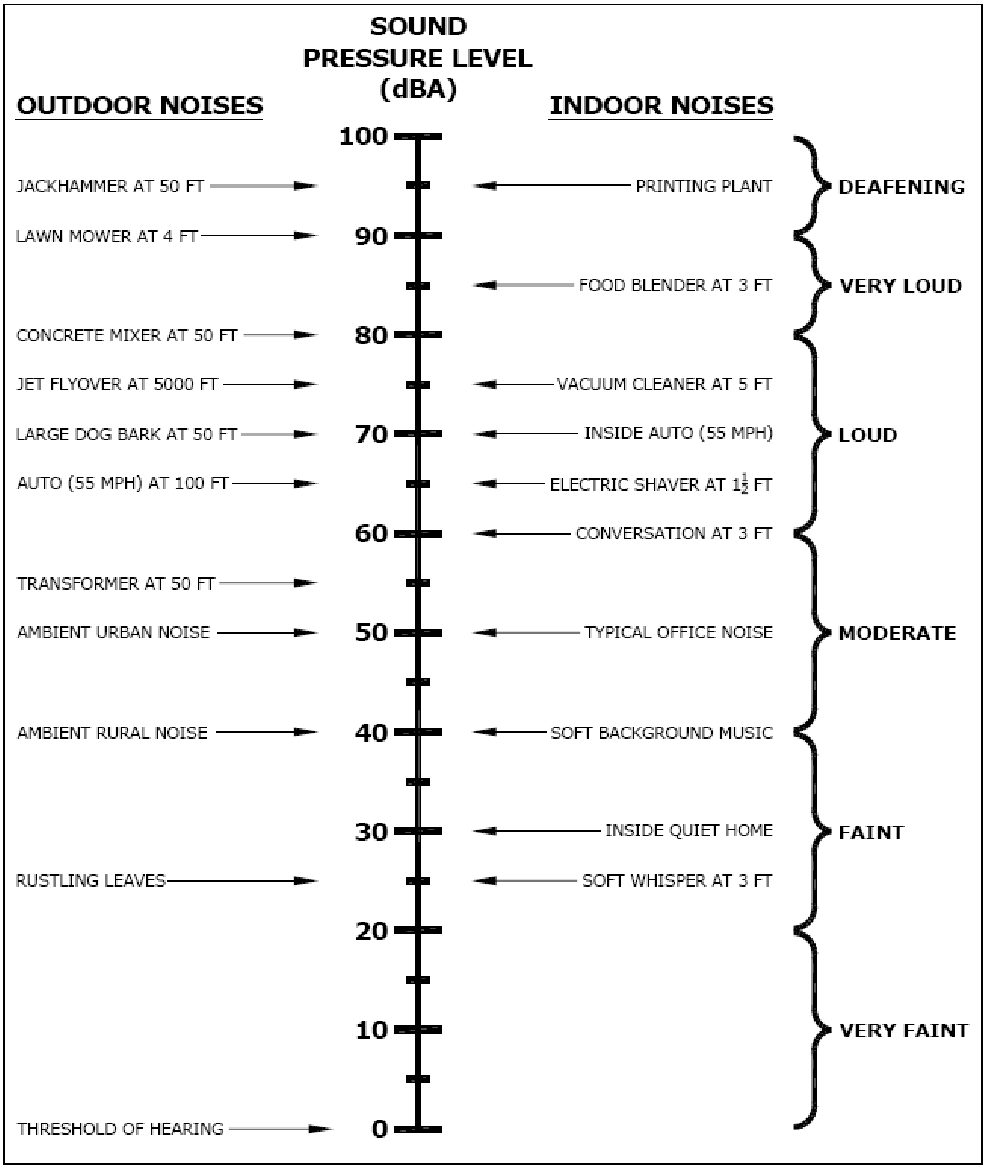


FIGURE 35
Typical dBA Values of Common Indoor and Outdoor Noise Sources (DLAA, 2009)

The effects of noise on people can be listed in three general categories:

- Subjective effects of annoyance, nuisance, dissatisfaction
- Interference with activities such as speech, sleep, learning
- Physiological effects such as startling and hearing loss

In most cases, environmental noise may produce effects in the first two categories only. However, workers in industrial plants may experience noise effects in the last category. No completely satisfactory way exists to measure the subjective effects of noise, or to measure the corresponding reactions of annoyance and dissatisfaction. This lack of a common standard is primarily because of the wide variation in individual thresholds of annoyance and habituation to noise. Thus, one way of determining a person's subjective reaction to a new noise is by comparing it to the existing or "ambient" environment to which that person has adapted. In general, the more the level or the tonal (frequency) variations of a noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise would be, as judged by the exposed individual. The average ability of an individual to perceive changes in sound levels is well documented (U.S. Department of Transportation Federal Highway Administration [DOT FHWA], June 1995) and has been summarized in Table 26.

TABLE 26
Average Ability to Perceive Changes in Sound Level

Sound Level Change (dB)	Human Perception of Sound
0	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	Two times (or ½) as loud
20	Four times (or ¼) as loud

The Noise Control Act of 1972, along with its subsequent amendments (Quiet Communities Act of 1978 [42 United States Code { U.S.C.} Parts 4901-4918]), delegates the authority to regulate environmental noise to each state. The State of Hawai`i has adopted statewide noise standards, set forth in HAR §11- 46 ("Community Noise Control"); these are administered by HDOH. The stated purpose of the standards is to "provide for the prevention, control, and abatement of noise pollution in the State from the following noise sources: stationary noise sources (such as air-conditioning units, exhaust systems, generators, compressors, and pumps); and equipment related to agricultural, construction, and industrial activities" (HAR §11-46). The noise standards are the maximum permissible sound levels (as measured from the property line) and vary according to land use district. The maximum permissible sound levels for each class of land uses are listed in Table 27.

TABLE 27
Maximum Permissible Sound Levels By Zoning District

Zoning District	Maximum Permissible Sound Levels [dB(A)] [a]	
	Daytime (7am—10pm)	Nighttime (10pm—7am)
Class A: All areas equivalent to lands zoned residential, conservation, preservation, public space, open space or similar type	55	45
Class B: All areas equivalent to lands zoned for multi-family dwellings, apartment, business, commercial, hotel, resort, or similar type	60	50
Class C: All areas equivalent to lands zoned agriculture, country, industrial, or similar type	70	70

NOTES:
[a] These maximum permissible sound levels apply to the following excessive noise sources: stationary noise sources; and equipment related to agricultural, construction and industrial activities (HAR §11-46-4).

Pursuant to HAR §11-46-7, a permit may be obtained for operation of an excessive noise source beyond the maximum permissible sound levels. Factors that are considered in granting of such permits include whether the activity is in the public interest and whether the best available noise control technology has been incorporated into the activity.

In addition, the U.S. EPA has identified a range of yearly day-night equivalent sound levels, L_{dn}, sufficient to protect public health and welfare from the effects of environmental noise (U.S. EPA, 1977). The EPA has established a goal to reduce exterior environmental noise to an L_{dn} not exceeding 65 dBA and a future goal to further reduce exterior environmental noise to an L_{dn} not exceeding 55 dBA. In addition, the EPA states that these goals are not intended as regulations as it has no authority to regulate noise levels, but rather they are intended to be viewed as levels below which the general population would not be at risk from any of the identified effects of noise.

In addition, a commonly applied criterion for estimating a community's response to changes in sound level is the "community response scale" proposed by the International Standards Organization (ISO) of the United Nations (ISO, 1969). The scale shown in Table 28 relates changes in sound level to the degree of community response and allows for direct estimation of the probable response of a community to a predicted change in sound level.

TABLE 28
Community Response to Increases in Sound Levels

Sound Level Change (dB)	Category	Response Description
0	None	No observed reaction
5	Little	Sporadic complaints
10	Medium	Widespread complaints
15	Strong	Threats of community action
20	Very strong	Vigorous community action

3.8.1 Existing Conditions

Ambient sound level measurements and wind speed data are currently being collected to assess the existing acoustical environment within various representative areas within project site and the community. Data are being collected from various locations within the project site, as well as in community areas, including areas readily accessible to the public or residential areas. The community sampling locations include:

- Pu`u O Mahuka Heiau
- Pūpūkea Residence
- Waimea Valley
- Punalau Residence (adjacent to Ashley Road and Kamehameha Highway)
- Kawailoa Road (*mauka* of Transfer Station)
- Hale`iwa (*mauka* of Joseph P. Leong Highway)
- Dole Plantation (along Kamehameha Highway

At each location, continuous, 15-minute, statistical sound levels are being recorded for up to two weeks with a tripod-mounted microphone located generally about 5 feet above grade, and covered by a windscreen. Simultaneous weather data (such as wind speed, direction, and temperature) is also being collected in 15-minute intervals with a tripod-mounted anemometer near the sound level meter, generally about 7 feet above grade. A handheld Garmin GPS are being used to adjust the wind vane to accurately measure wind direction. Wind speed measurements are being validated using a handheld Kestrel 3000 Pocket Weather Meter.

Analysis of the data is expected to be completed in March 2011, and results of the ambient sound level measurements will be presented in the Final EIS.

3.8.2 Potential Impacts and Mitigation Measures

3.8.2.1 Proposed Action

Wind Farm

Construction

Construction of the proposed project would require operation of heavy equipment and construction vehicles for various activities, including construction of the access roads, excavation and pouring of foundations, installation of buried and aboveground electrical interconnection lines, and erection of turbine components. Earth-moving equipment is expected to be the loudest equipment used during construction; typical sound levels produced by construction equipment are shown in Figure 35.

Construction noise levels would be expected to exceed the State's maximum permissible property line noise levels (Table 27) and, as such, a permit would be obtained from the HDOH to allow the operation of vehicles, cranes, construction equipment, and power tools. This permit would place restrictions on the time of day when construction activities may emit noise in excess of the maximum permissible sound levels, but would not restrict the amount of noise that can be generated. The HDOH may also require the incorporation of noise mitigation into the construction plan and/or community meetings to discuss construction noise with the neighboring residents and business owners. BMPs would be implemented to mitigate construction noise, as needed. These would include the use of noise barriers, mufflers on diesel and gasoline engines, using properly tuned and balanced machines, and time of day usage limits for select construction activities.

Operation

Following construction, the only project components expected to generate sound on a regular basis would be the wind turbines. Wind turbines generate sound via various routes, both mechanical and aerodynamic. Wind turbines potentially produce four types of sound: broadband, tonal, low frequency (including infrasound), and impulsive. Sound emission from modern wind turbines is dominated by the aerodynamic broadband type, which occurs as the revolving rotor blades encounter atmospheric turbulence, creating a rhythmical "swishing" sound. Tonal sounds are typically mechanical in origin and occur at discrete frequencies; examples of these might be generator hum or other mechanical sounds. Low frequency sound is the portion of broadband sound at the low end of the frequency spectrum, near the lower limit of human hearing. Low frequency sound can also include infrasound, which is defined as sound below the limit of human hearing (commonly known as vibration). Impulsive noise, or short acoustic impulses, can be caused by the interaction of wind turbine blades with disturbed air flowing around the tower of a downwind machine (Rogers and Manwell, 2004; Pedersen and Waye, 2007), although such machines are not typical of facilities such as Kawailoa, which use upwind-mounted rotor technology. As wind speed varies, lower or higher rotational speed of the turbines would typically result in lower or higher sound levels (van den Berg, 2004).

The wind turbines are considered stationary sources and would be subject to the State of Hawai`i Community Noise Control standards. The maximum permissible noise levels would be enforced by the HDOH for any location at or beyond the First Wind property line and should not be exceeded for more than 10 percent of the time during any 20-minute period. The specified noise limits that apply are a function of the zoning and time of day; with respect to mixed zoning districts, the rule specifies that the primary land use designation shall be used to determine the applicable zoning district class and the maximum permissible noise level. For enforcement purposes, noise levels are typically measured at the property line or on the property of the complainant; the maximum permissible noise level corresponds with the zoning of the complainant's property. HDOH also takes the ambient noise environment into account when enforcing the noise limits and typically allows for a 3 dB increase in noise level over the ambient noise when the ambient noise is combined with the noise source of interest.

Based on the zoning surrounding the proposed project site, the following primary design goals would be met to comply with the State of Hawai`i Community Noise Control standards:

A) Class C sound level limits apply to the areas surrounding the project site that are zoned as agriculture. Therefore, sound levels from the wind turbines cannot exceed 70 dBA at the site property lines. If this requirement is met at the project site property line, sound levels will generally be lower and in compliance for agricultural areas further from the site. Ambient noise levels are expected to be below 70 dBA and are not expected to change this requirement.

B) The project site is also situated adjacent to areas zoned as preservation. Therefore, Class A sound level limits may apply, where sound levels from the wind turbines cannot exceed 55 dBA during the day or 45 dBA during the night at the property lines. However, ambient sound at these locations may be close to these limits and would be taken into account by the HDOH in determining the maximum permissible sound level.

The noise impact of the turbines is dependent in part on the ambient sound levels. Assessments of the existing background noise levels will help to determine whether turbine sound would be audible over background noise levels and is taken into account by the HDOH in determining the maximum permissible sound level. If ambient sound is high, wind turbine sound gets lost in the background (Rogers and Manwell, 2004). Although increases over existing ambient noise levels can be evaluated, it is important to note that the public's perception of the noise impact (that is, unwanted sound) of turbines is, at least in part, a subjective determination. Because of the variation in the levels of individual tolerance for noise, there is no completely satisfactory way to predict the subjective impacts of noise that may result from the proposed facility (Rogers and Manwell, 2004).

Analysis of ambient noise level measurements and wind speed data are expected to be completed in March 2011; the results will be presented in the Final EIS. Figure 36 shows the predicted sound level contours in the vicinity of the project site due to the wind turbines. Wind turbine noise is not expected to exceed the HDOH maximum permissible noise limit in the areas to the west of the project site that are zoned Agriculture. The preliminary analysis suggests that wind turbine noise would not comply with the HDOH maximum permissible noise limits at the north, east and south property lines where the project site borders preservation land. Because there are no inhabitants in these areas, it is unlikely that there would be noise complaints at the property line of the site. However, to comply with the Community Noise Rule, a variance may need to be obtained from the Department of Health. The results of the ambient noise measurements will provide further assessment of potential noise impacts to these preservation lands.

Based on the preliminary output of the sound propagation model, noise from the wind turbines is expected to be less than the ambient levels measured in the communities surrounding the project site (for example, Pūpūkea, Punalau, and Pohaku Loa) and would not likely be audible at these locations. However, this conclusion will need to be confirmed based on the results of the ambient noise measurements.

Mt. Ka`ala Communication Sites

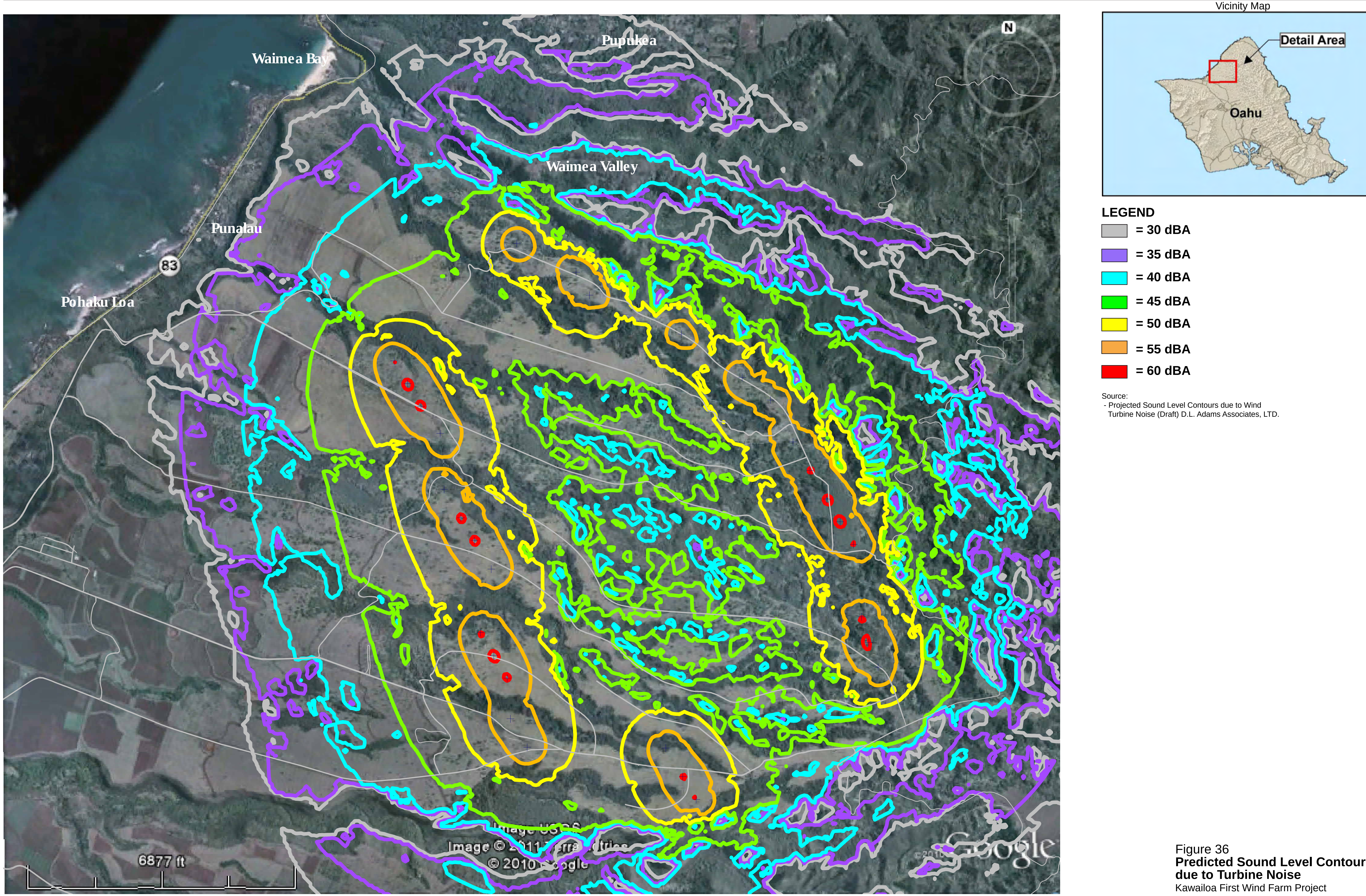
The proposed communication equipment near Mt. Ka`ala would be installed on existing Hawaiian Telcom structures; no excavation or ground disturbing activities would be required. Installation would involve trucks to transport the components and necessary tools to the site. Only very minor noise would be generated by these activities and would be very short in duration (occurring over the course of approximately 15 days). Operation of the communications equipment would not be expected to generate any significant noise.

3.8.2.2 Alternative Communication Site Layout

Under this alternative, a new tower would be constructed in the areas adjacent to the existing Hawaiian Telcom structures, and communications equipment would be mounted on each tower. Construction of the towers would involve the use of heavy equipment to transport the materials to the site and to excavate footings for the tower. Although this equipment would generate moderate levels of noise, the activities are expected to be very short in duration (occurring over the course of approximately 15 days). Operation of the communications equipment would not be expected to generate any significant noise.

3.8.2.3 No Action Alternative

Under the No Action alternative, the wind farm facility and Mt. Ka`ala communications facilities would not be constructed, and therefore, no changes in the existing noise levels would occur.



LEGEND

- = 30 dBA
- = 35 dBA
- = 40 dBA
- = 45 dBA
- = 50 dBA
- = 55 dBA
- = 60 dBA

Source:
- Projected Sound Level Contours due to Wind Turbine Noise (Draft) D.L. Adams Associates, LTD.

Figure 36
Predicted Sound Level Contours due to Turbine Noise
Kawailoa First Wind Farm Project
Oahu, Hawaii

3.9 Land Use

Land use is typically classified to reflect either natural or human activities that occur, or could occur, at a given location. Natural land uses include forest, open water, agriculture, conservation and other undeveloped areas. Developed land uses are generally classified as residential, commercial, industrial, and other types of development. Comprehensive plans, policies, and zoning regulations regulate the type and extent of land uses allowable in specific areas and often protect environmentally sensitive land uses. Land use impacts can result from actions that negatively affect or displace an existing use, or from the suitability of an area for its current, designated, or formally planned use.

3.9.1 Existing Conditions

3.9.1.1 Wind Farm

The wind farm site is located on lands that were bequeathed to Kamehameha Schools by Bernice Pauahi Bishop upon her death in 1884. As early as 1889, the *makai* portion of these lands, including the project site, was leased to Waialua Sugar Company for the cultivation of sugar cane. Given the coastal alluvial terrain that exists in this area, it was considered prime land for growing sugar cane. Production continued until 1996, when Waialua Sugar Company shut down because of Hawai`i's failing sugar industry (Kamehameha Schools, 2008). Throughout the period of cultivation, the fields were repeatedly disked and graded, and site features such as rocks and native vegetation were eliminated. Since 1996, the fields with access to irrigation have been leased for a variety of small farming operations, which cultivate diversified agricultural products such as papaya, banana, lettuce, seed corn, and tuberose. The fields without access to irrigation, which includes most of the wind project site, have been left fallow.

The area within the project boundary is designated by the State of Hawai`i as an agricultural district and is zoned by the City and County of Honolulu as an AG-1 Restricted Agricultural District (Figures 37 and 38, respectively). A very small area along the northern edge of the site is zoned as P-1, Restricted Preservation; however, pursuant to the Land Use Ordinance (LUO), regulatory authority within the P-1 District is delegated to the appropriate State agency. In this case, the area identified as part of the P-1 District is within the State Agricultural District. The lower portions of the wind farm site along Kamehameha Highway are in the city's Special Management Area (SMA); no improvements are planned within the SMA.

Agricultural Lands of Importance to the State of Hawai`i

Agricultural lands of importance to the State of Hawai`i (ALISH) is a system that identifies and classifies agriculturally suitable land based on a wide range of factors including soil characteristics, climate, moisture supply, and other general production-related factors. A large portion of the Kawailoa parcel, including the wind farm site, is located on land classified under the ALISH system as prime agricultural land (Figure 39). Prime agricultural land is land best suited for the production of food, feed, forage and fiber crops. The land has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when properly managed (including water management), according to modern farming methods (Hawai`i Department of Agriculture, 1977).

Land Study Bureau Detailed Land Classification

The University of Hawai`i (UH) Land Study Bureau rates the agricultural productivity of soils throughout the State, based on characteristics including texture, slope, salinity, erodibility, and rainfall. The productivity ratings are used to designate each area as Category A, B, C, D, or E, with Category A representing the most productive soils and Category E representing the least productive soils. The classification also includes Category U, which is for soils that were not rated.

Based on the current project layout, the wind farm facilities would be located in soils classified as Categories B, C, D, and E (Figure 40). Turbine and tower facilities would be distributed as follows: 15 of the turbines and one meteorological tower would be located in B soils, 8 turbines and one meteorological tower would be located in C soils, and 7 turbines and two meteorological would be located in D soils. Other appurtenant facilities essential to the operation of the wind farm may be located in soils classified as Categories B, C, D, or E.

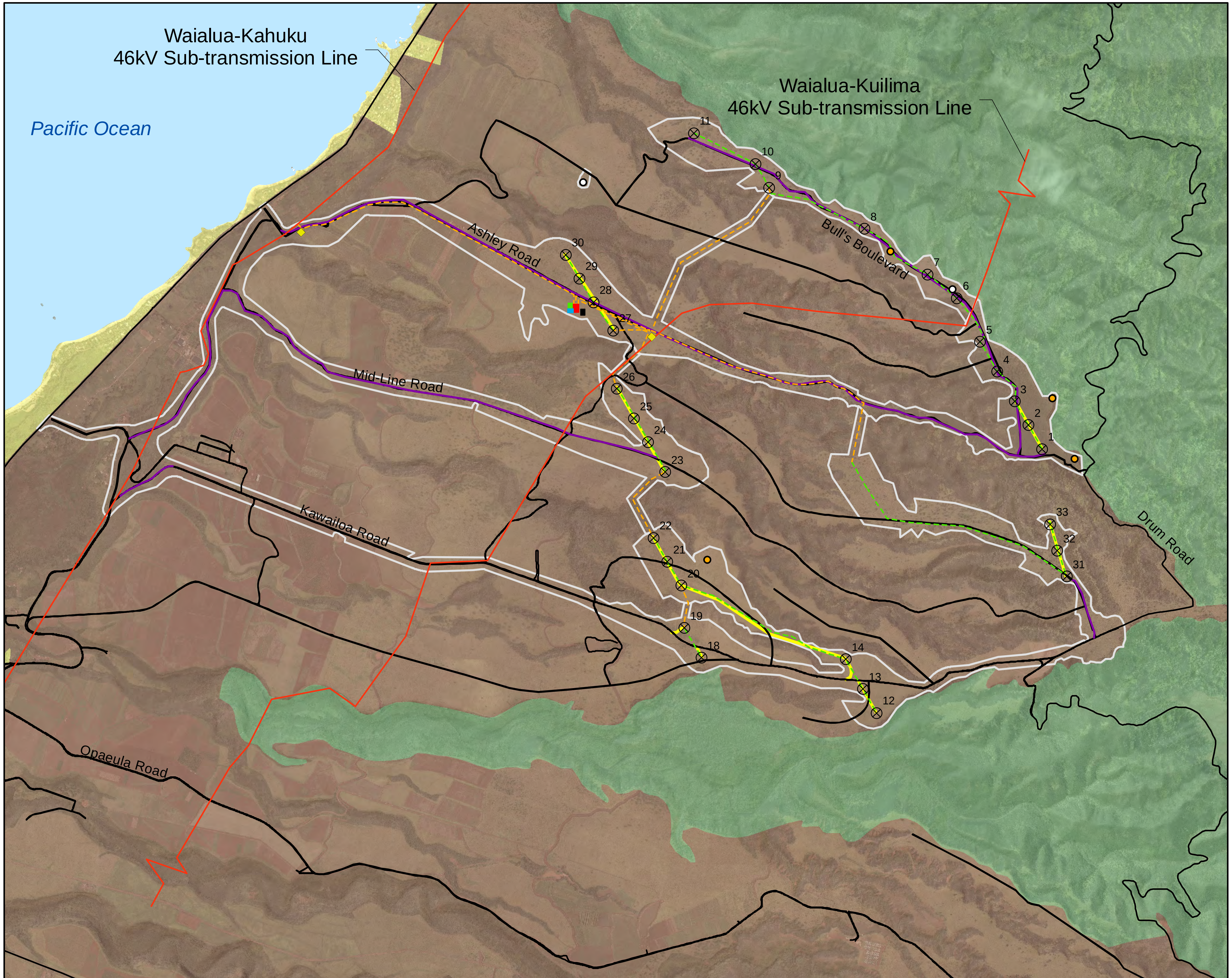
3.9.1.2 Mt. Ka`ala Communication Sites

The Mt. Ka`ala communication sites are located on two small parcels of State-owned land situated on adjacent ridgetops. The proposed sites are currently being used as communication facilities by Hawaiian Telcom, and are accessed via a paved single-lane road. The sites are adjacent to the Mt. Ka`ala NAR.[14] The NAR, administered by the DLNR Division of Forestry and Wildlife, is part of a statewide system aimed at preserving specific land and water areas which support communities, as relatively unmodified as possible, of the natural flora, fauna, and geological sites of Hawai`i.

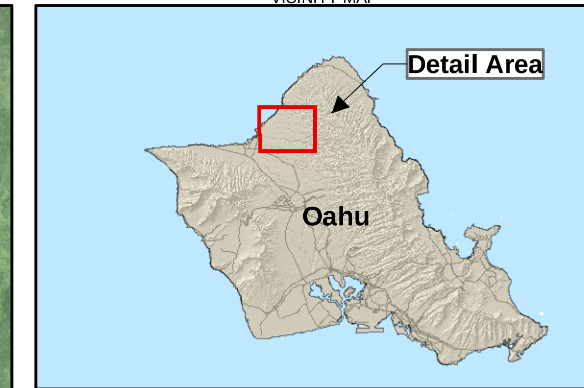
The two communication facility sites are each approximately 0.1 acre and presently have small structures that have been in place for several decades. The first site, which is adjacent to the paved access road at 3,600 feet elevation, contains a small building that supports a metal scaffold tower, as well as several antennas. The second site is located approximately 0.25 mile from the access road down an adjacent mountain ridge, and is accessed from the paved road via an existing trail (Dupont Trail). The trail has been improved in sections, such as concrete steps placed in areas with steep grades. This site lies at about 3,200 feet elevation and has two metal scaffold towers, one of which supports two existing antennae dishes. Both sites have been used as communication facilities. Before establishment of the existing communications facilities the sites were forested.

This area is designated by the State of Hawai`i as a conservation district, and is zoned by the County as P-1 Preservation District. Neither site is located on land classified as ALISH; the Land Study Bureau has classified the soils within both sites as Category E.

[14] Based on a review of the State's GIS data, the existing Hawaiian Telcom repeater station appears to be just outside the western boundary of the NAR.



VICINITY MAP



LEGEND

- Turbine
- Existing Meteorological Tower
- Proposed Meteorological Tower
- Substation
- Battery Energy Storage System (BESS)
- O&M Building
- Laydown Area
- Interconnection Facility
- Existing HECO 46kV Sub-transmission Line
- Overhead Collector Line
- Underground Collector Line
- Existing Roads
- Existing Roads to be Improved
- New Roads
- Maximum Project Envelope
- Ocean

Land Use Districts

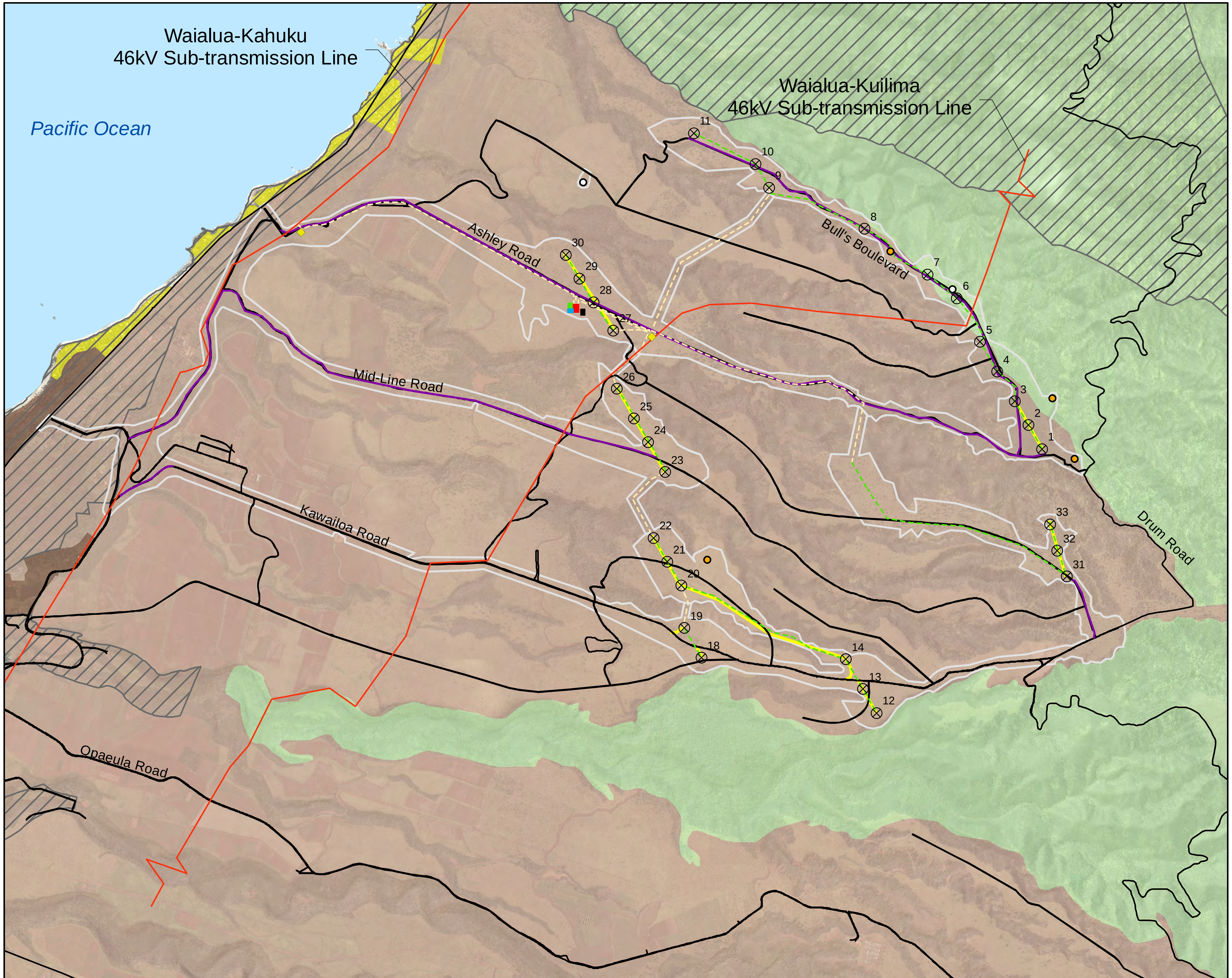
- Agriculture District
- Conservation District
- Urban District

Source:
Project Facilities - First Wind
Existing Hawaiian Electric Lines - First Wind
Basemap - Hawaii Statewide GIS Program (http://hawaii.gov/dbedt/gis)

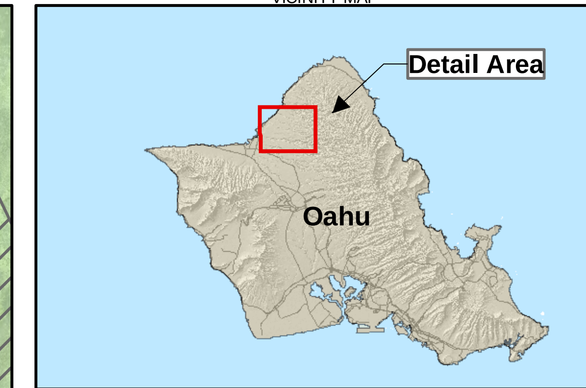
N

0 0.25 0.5 1
Miles

Figure 37
State Land Use Districts
Kawailoa Wind Farm Project
Oahu, Hawaii



VICINITY MAP



LEGEND

- Turbine
- Existing Meteorological Tower
- Proposed Meteorological Tower
- Substation
- Battery Energy Storage System (BESS)
- O&M Building
- Laydown Area
- Interconnection Facility
- Existing HECO 46kV Sub-transmission Line
- Overhead Collector Line
- Underground Collector Line
- Existing Roads
- Existing Road to be Improved
- New Roads
- Maximum Project Envelope
- Ocean

County Zoning

- AG-1 Restricted Agriculture District
- AG-2 General Agriculture District
- P-1 Restricted Preservation District
- R-5 Residential District
- Special Management Area

Source:
Project Facilities - First Wind
Existing Hawaiian Electric Lines - First Wind
Basemap - Hawaii Statewide GIS Program (http://hawaii.gov/dbedt/gis)

N

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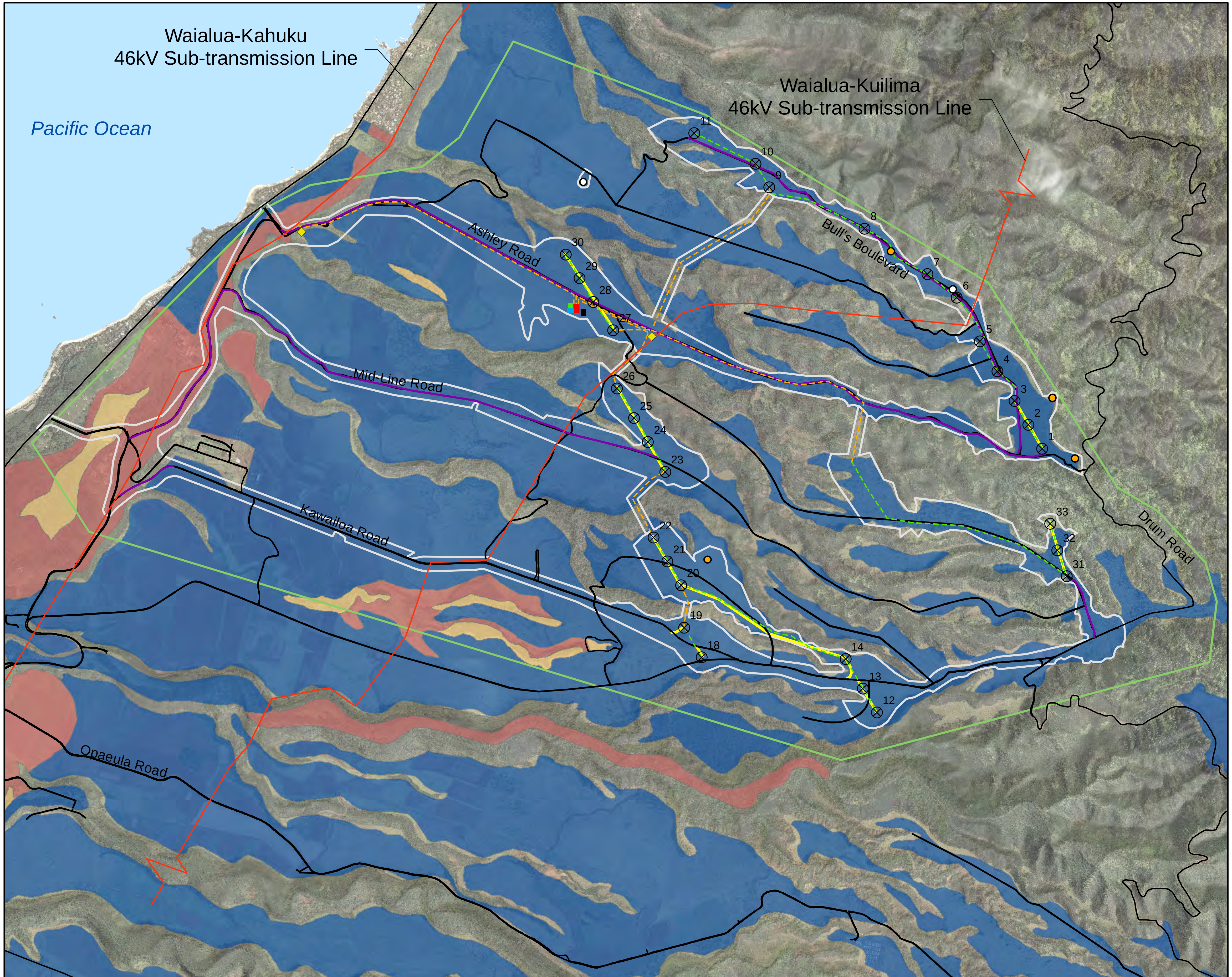
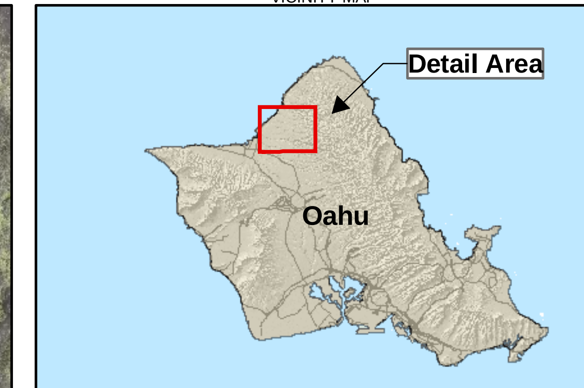
Miles

Figure 38
City and County Zoning
Kawailoa Wind Farm Project
Oahu, Hawaii

CH2MHILL



VICINITY MAP



LEGEND

- Turbine
- Existing Meteorological Tower
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- Substation
- Battery Energy Storage System (BESS)
- O&M Building
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- Interconnection Facility
- Existing HECO 46kV Sub-transmission Line
- Overhead Collector Line
- Underground Collector Line
- Existing Roads
- Existing Roads to be Improved
- New Roads
- General Location of Proposed Wind Farm
- Maximum Project Envelope
- Ocean

Agriculture Lands of Importance

- Unclassified Agriculture Lands
- Prime Agriculture Lands
- Other Agriculture Lands

Source:
Project Facilities - First Wind
Existing Hawaiian Electric Lines - First Wind
Basemap - Hawaii Statewide GIS Program (http://hawaii.gov/dbedt/gis)

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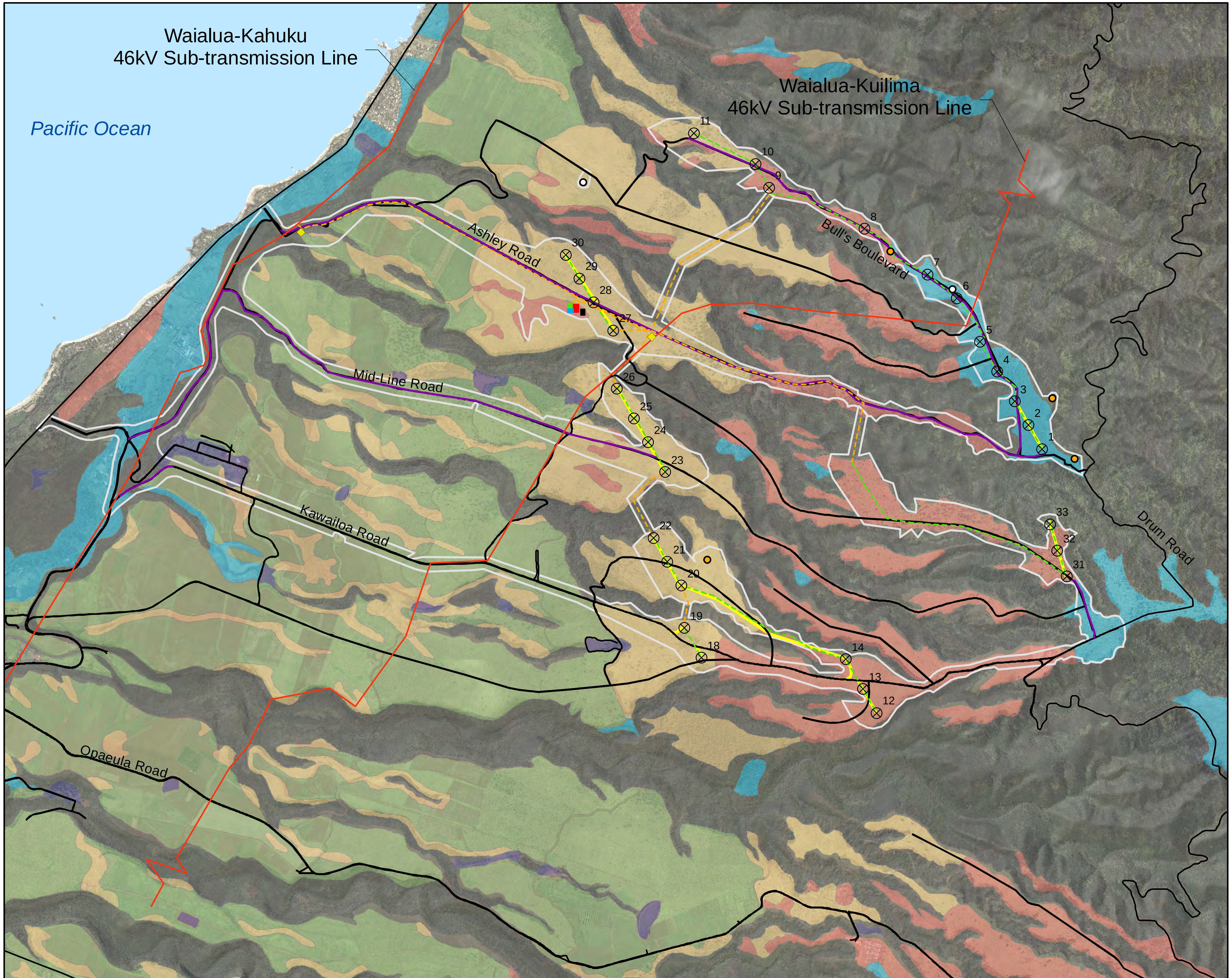
Figure 39
Agricultural Lands Of Importance to the State of Hawaii (ALISH)
Kawailoa Wind Farm Project
Oahu, Hawaii



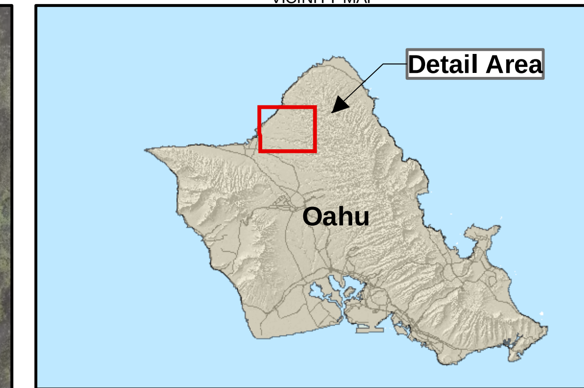


Figure 40
Agricultural Productivity Ratings
Kawailoa Wind Farm Project
Oahu, Hawaii

3.9.2 Land Use Regulations

3.9.2.1 Wind Farm Site

State Land Use Law

The State Land Use Law (HRS Chapter 205) gives the State Land Use Commission (LUC) the authority to designate all land within the State into one of four districts—urban, rural, agricultural, or conservation—based on the general activities and uses of the land, as outlined in HRS §205-2.

HRS §205-2(d) states that agricultural districts shall include:

> "(4) Wind generated energy production for public, private and commercial use; and… (7) Wind machines and wind farms;"

Permitted uses within the agricultural district are further defined in HRS §205-4.5 and the State LUC's Administrative Rules (HAR Title 15, Subtitle 3, Chapter 15), and take into consideration the Land Study Bureau (LSB) land classification system. Pursuant to HRS §205-4.5(a) and HAR §15-15-25, permissible uses on agricultural district lands with an overall LSB productivity rating of A or B include:

> "Wind energy facilities, including the appurtenances associated with the production and transmission of wind generated energy; provided that such facilities and appurtenances are compatible with agriculture uses and cause minimal adverse impact on agricultural land."

HRS §205-4.5(c) and HAR §15-15-25 state that permissible uses on agricultural district lands with an overall LSB productivity rating of C, D, E, or N (unrated) are those uses permitted in A and B lands, and also those uses set forth in HRS §205-2(d), as described above.

The LSB productivity rating of the soils within the proposed site are shown in Figure 40.

County Land Use

The City and County of Honolulu's LUO regulates land use and specifies development and design standards for activities within each of the City and County zoning districts. Under Section 21-10.1 of the LUO, wind machines are defined as "devices and facilities, including appurtenances, associated with the production and transmission of wind-generated energy." As shown in the LUO Master Use Table, within the AG-1 Restricted Agricultural District, wind machines are considered a Special Accessory Use, subject to the development standards contained in Section 21-5. The development standards for wind machines, as listed in LUO Section 21-5.700, require that "all wind machines shall be setback from all property lines a minimum distance equal to the height of the system. Height shall include the height of the tower and the farthest vertical extension of the wind machine." Wind machines with a rated capacity of more than 100 kilowatts also require a Conditional Use Permit (minor). Within the proposed wind farm site, a Joint Development Agreement will be developed to establish a single legal lot, for the purposes of zoning for the project. All the turbines have been set back a minimum of 500 feet from the boundary of the area that will be covered by that agreement.

The wind power facilities are located within an area addressed by both the North Shore Sustainable Communities Plan (City and County of Honolulu, 2000) and the North Shore Master Plan (Kamehameha Schools, 2008). The North Shore Sustainable Communities Plan describes the vision for the future of the North Shore region, provides policy guidance for specific land use elements, and lists specific actions to support those policies. Some of the key elements include preservation of open space and the region's rural character, maintenance of agricultural uses, and protection of cultural resources. As previously described, the North Shore Master Plan provides the framework for management of approximately 26,000 acres of Kamehameha Schools' property on the North Shore. The Master Plan identifies specific uses and opportunities that integrate the tenets of Kamehameha Schools' strategic vision relative to culture, education, environment, economics, and community. Implementation of the Master Plan revolves around seven catalyst projects, including the development of a wind energy project in the Kawailoa region.

3.9.2.2 Mt. Ka`ala Communication Sites

Pursuant to HRS Chapter 183C, HAR §13-5-22 states that permissible uses on conservation district lands shall be restricted to specific uses, which include:

> "(D-2) Transportation systems, transmission facilities for public utilities, water systems, energy generation facilities utilizing the renewable resource of the area (e.g. hydroelectric or wind farms) and communications systems and other such land uses which are undertaken by non-governmental entities which benefit the public and are consistent with the purpose of the conservation district."

The communication sites are considered to be compatible with such Conservation District uses and would not be expected to result in more than a minimal adverse effect on conservation lands in the site area. Construction of these facilities is expected to require a Conservation District Use Permit.

3.9.3 Potential Impacts and Mitigation Measures

3.9.3.1 Proposed Action

Wind Farm

The majority of the proposed project area is not currently cultivated, but implementation of the proposed project would not preclude agricultural uses. The project has been sited to avoid areas that are currently in agricultural production and, as such, no impacts to current agricultural operations are anticipated. In addition, Kamehameha Schools is pursuing agricultural operations (for example, cattle ranching) within undeveloped portions of the wind farm site, as part of the diversified agriculture project identified in the North Shore Master Plan. Approximately 22.0 acres are within the permanent footprint of the project infrastructure, and would no longer be available for agricultural purposes; however, given that approximately 339 acres of prime agricultural land (as classified under the ALISH system [see Figure 39]) is available for cultivation in the general location of the wind farm site, the project would not be expected to adversely affect agricultural production.

Mt. Ka`ala Communication Facility Sites

The current and anticipated future uses of the communication sites are for communication facilities and as such the proposed project would not have a land use impact.

3.9.3.2 Alternative Communication Site Layout

As with the Proposed Action, the current and anticipated future uses of the communication sites are for communication facilities and as such the proposed project would not have a land use impact.

3.9.3.3 No Action Alternative

Under the No Action alternative, the wind farm facility and Mt. Ka`ala communications facilities would not be constructed, and therefore, no changes in the existing land use would occur.

3.10 Transportation and Traffic

This section addresses publicly-accessible transportation infrastructure, including harbors, airports and roadways as well as privately-owned project site roadways.

3.10.1 Existing Conditions

3.10.1.1 Harbors

Kalaeloa Harbor on O`ahu is a heavy lift berthing facility located on the western coast of O`ahu, suitable for unloading and temporary storage of the large turbine components needed for the proposed project. Turbine blades, nacelles, and tower components would be removed from barges at Kalaeloa Harbor and loaded onto vehicles for transport to the wind farm site.

Honolulu Harbor is a heavy lift berthing facility located on the southern coast of O`ahu suitable for unloading and temporary storage of heavy equipment and construction materials needed for the proposed project. Rotor hubs, drive trains, and all other miscellaneous turbine components and construction equipment would be unloaded from barges at Honolulu Harbor and transported to the site.

3.10.1.2 Roadways

Access to the wind farm site is provided via a network of state, county, and privately-owned roadways. These roads range from multi-lane highways with paved shoulders to privately-owned paved or dirt roads. The existing roads within the proposed wind farm project area are owned and maintained by Kamehameha Schools; these are shown in Figure 4. Based on the size and weight of the turbine components and the dimensions and capacities of existing roadway infrastructure (including bridges and overpasses), transportation routes between Kalaeloa Harbor and the wind farm site was identified by ATS International. The following routes are proposed for transporting the various turbine components to the project site.

The proposed route from Kalaeloa Harbor to the wind farm site, for the transport of large turbine components other than the nacelles, blades and tower sections, is as follows:

- Take Kalaeloa Harbor to Malokili Drive
- Left on Malokili Drive toward Kalaeloa Boulevard
- Left on Kalaeloa Boulevard
- Merge on to H-1 East

- Exit H-1 East to Wahiawā heading northeast
- Exit on to H-2 north
- Continue on H-2 north to Wilikina Drive
- Right on Kamananui Road
- Turn west on Kamehameha Highway
- Continue on Kamehameha Highway west to Joseph P. Leong Highway (Highway 99)
- Continue on Highway 99 to Kamehameha Highway west (Highway 83)
- Continue on Highway 83 to proposed entrance on Kawailoa Drive
- Right from Kamehameha Highway into the wind farm site

No modifications to infrastructure or tree trimming is expected to be required along this route.

The proposed route from Kalaeloa Harbor to the wind farm site for the transport of the turbine blades and tower sections:

- Take Kalaeloa Harbor to Malokili Drive
- Left on Malokili Drive toward Kalaeloa Boulevard
- Left on Kalaeloa Boulevard
- Merge on to H-1 East
- Exit H-1 East to Kamehameha Highway west
- Take Exit 8 from Kamehameha Highway
- Right on Ka Uka Road
- Left on to H-2 North
- Continue on H-2 North to Wilikina Drive
- Right on Kamananui Road
- Turn west on Kamehameha Highway
- Continue on Kamehameha Highway west to Joseph P. Leong Highway (Highway 99)
- Continue on Highway 99 to Kamehameha Highway west (Highway 83)
- Continue on Highway 83 to proposed entrance on Kawailoa Drive
- Right from Kamehameha Highway into the wind farm site

All trees along the section of Kamehameha Highway in Waipahu would require trimming to a clearance height of 17 feet. In addition, police escorts would be needed to stop traffic at the intersection of Kamehameha Highway and Ka Uka Road in order for the trailers carrying oversized loads to navigate the right hand turn.

The transport of the oversized turbine components would require 19-axle trailers; the proposed route from Kalaeloa Harbor to the wind farm site for this equipment is as follows:

- Take Kalaeloa Harbor to Malokili Drive
- Left on Malokili Drive toward Kalaeloa Boulevard
- Left on Kalaeloa Boulevard
- Merge on to H-1 East
- Exit H-1 East to Kunia Road exit

- Left on to Kunia Road
- Continue on Kunia Road to Wilikina Drive
- Left on to Wilikina Drive
- Right on Kamananui Road
- Turn west on Kamehameha Highway
- Continue on Kamehameha Highway west to Joseph P. Leong Highway (Highway 99)
- Continue on Highway 99 to Kamehameha Highway west (Highway 83)
- Continue on Highway 83 to proposed entrance on Kawailoa Drive
- Right from Kamehameha Highway on to Kawailoa Drive

Trees along the golf driving range on Kunia Road and trees approximately 0.3 mile before Foote Avenue would require trimming to a clearance height of 17 feet. In addition, police escorts would be required to stop east-west bound traffic at the intersection of Kunia Road and Wilikina Drive in order for the trailers carrying oversized loads to navigate the left hand turn.

Access to the Mt. Ka`ala communication site is via an existing single-lane access road, which is owned and maintained by the Ka`ala Joint Use Coordinating Committee (JUCC).

3.10.1.3 Airports and Airfields

The nearest airfield to the Kawailoa wind farm site is Dillingham Airfield, approximately 9 miles away to the west. Wheeler Army Airfield is located approximately 12 miles away to the south, in central O`ahu. The Honolulu International Airport is approximately 25 miles away on the south coast of the island. Kawailoa Wind is required to submit a Notice of Intent to the Federal Aviation Administration (FAA) for construction of the proposed Kawailoa wind power facility.

Components of the Kawailoa wind farm overlap with a TFTA currently used by the Department of Defense (DoD). As further discussed in Section 3.11, Kawailoa Wind is working with the DoD and other applicable departments and agencies to ensure that construction and operation of the facility would not conflict with military exercises that are conducted in the area.

3.10.2 Potential Impacts and Mitigation Measures

3.10.2.1 Proposed Action

Wind Farm

Harbors

The major components of the wind farm, such as the blades, towers, and nacelles, would be transported by sea and offloaded at Kalaeloa Harbor. Temporary storage of these components would require the use of vacant areas at Kalaeloa Harbor for a minimal amount of time to conduct inspections of the equipment and to prepare them for transport to the Kawailoa Site. It is anticipated that the smaller turbine components and other equipment required for the project would be offloaded and transported from Honolulu Harbor. In general, the individual pieces of equipment are of a size and nature that allows them to be handled as general containerized cargo; therefore, import of equipment for the project is not expected to place an unusual demand on the harbor facilities.

Roadways

Delivery of the turbine components and other project equipment would require the use of existing State and County roadways by oversized vehicles. The number of oversized equipment delivery trips is estimated to average 20 one-way trips per day, with a total of 150 one-way trips during the 12-month construction period. The proposed routes (described above) have been evaluated and the existing infrastructure and adjacent utility lines are expected to be of sufficient capacity and dimension to accommodate the oversized loads. Potential impacts associated with oversized equipment transport include traffic delays and delays in emergency services caused by periods where traffic flow must be stopped to allow oversized trailers to navigate turns. To mitigate these impacts, the following measures would be implemented:

- All tower and blade components would have a minimum of four police escorts per load. Police escorts would direct traffic at intersections along each proposed route where necessary to allow oversized trailers to navigate turns.
- Police escorts and/or flagmen would provide traffic direction at the entrance to the wind farm site during construction.
- Hours of transport would be restricted to periods of the day when vehicular traffic is typically light, as follows:
  - Monday through Saturday from 9:00 p.m. to 5:00 a.m.; loaded equipment must be off of the roadways between the hours of 5:00 a.m. and 9:00 p.m.
  - No oversized loads would be transported on Sundays or holidays.

Transport of oversized equipment would be coordinated with and permitted through the Hawai`i State Department of Transportation Highways Division.

Other project-related traffic would vary greatly over the course of construction. Delivery of other equipment for the wind farm (such as materials for the substation and BESS facilities) would require approximately 700 one-way trips between Honolulu Harbor and the wind farm site. Select material (such as cement) would also be brought from the plant to the project area for construction of the turbine pads and other purposes. Approximately 900 one-way cement truck trips would be needed during the construction period, and most deliveries would occur at night or in the early morning, between approximately 9:00 p.m. and 5:00 a.m. In addition, approximately 60 one-way dump truck trips would be required to transport aggregate to the site, and most deliveries would occur at night or in the early morning, between approximately 9:00 p.m. and 5:00 a.m. During the 12-month construction period, an average of 40 employees would be onsite, with an anticipated maximum level of 150 employees. It is anticipated that employees would generate a maximum of 80 one-way vehicle trips daily during the construction period. These trips would likely occur between 6:00 and 7:00 a.m. and 3:00 and 4:00 p.m. Additional trips to Hale`iwa town would likely occur during lunch time. These activities would increase traffic levels during project construction, but in general, the impacts would be short-term and localized in nature. Improvements to the existing onsite roadways would periodically inconvenience others who use the roadways to access to farm plots or other permitted uses in the project area. However, the amount of local onsite vehicle movement is negligible and prior coordination with other users of the roadways would be expected to mitigate any impacts to other roadway users.

During operation, the majority of the vehicular traffic associated with the proposed wind farm would be employees reporting to or leaving the facility and service trips by HECO maintenance personnel. Typically, the maximum number of vehicle trips during operation would be 16 one-way vehicle trips per day. The amount of vehicular traffic associated with the proposed facilities during operation would be minimal and the proposed project would not be anticipated to noticeably increase traffic volumes on Kamehameha Highway or roadways in the area over the long-term. Operation of the wind farm would not impact access for other users who use or transit through Kamehameha School's Kawailoa properties.

Airports and Airfields

Under the provisions of 49 U.S.C. 44718 and CFR Title 14, Part 77, the FAA conducts an aeronautical study of the temporary and permanent met towers for the project, as well as the proposed WTG. Kawailoa Wind has filed an application with the FAA to begin this process. Kawailoa Wind has been working with the appropriate government agencies, including DoD services which would also be consulted in the FAA process, to ensure that the project would not create a significant aircraft collision hazard or have a significant impact on the safe and efficient use of navigable airspace by military and commercial aircraft.

Mt. Ka`ala Communication Sites

Use of the existing single-lane access road at Mt. Ka`ala would be coordinated with the Ka`ala JUCC to avoid or minimize disruptions to the use of the access road by the proposed project's construction and operations activities. Impacts to the roadway are not anticipated.

3.10.2.2 Alternative Communication Site Layout

As with the Proposed Action, use of the existing single-lane access road would be coordinated with the Ka`ala JUCC to avoid or minimize disruptions to the use of the access road during construction and operations; no impacts are anticipated.

3.10.2.3 No Action Alternative

If the proposed project were not built, there would be no change from existing conditions.

3.11 Military Operations

3.11.1 Existing Conditions

Wind Farm Site

The *mauka,* or eastern, portion of the wind farm site overlaps with an FAA-designated Alert Area in the Kawailoa Training Area (KTA) of high-density air traffic from the ground surface to 500 feet above ground level known as the A-311 TFTA. These areas are used by several branches, or services, of the DoD including the U.S. Army, Marine Corps, Navy, and Air Force. The services fly thousands of hours in day, night, and multi-ship helicopter operations at low altitudes in the area for aviation and ground training. The TFTA includes flight routes and helicopter landing zones. Drum Road, which is used by the military for training and was recently improved with a pavement surface, is in the TFTA and portions of the road pass through the wind farm site.

As indicated in an EISPN consultation letter from Marine Corps Base Hawaii (Appendix C), roughly 70 percent of all Marine Corps Hawaii unit aviation training takes place within the TFTA. Continued access by aircraft to the KTA in support of ground combat training operations is vital because the existing road network is limited and often impassable because of wet weather conditions. The U.S. Army 25th Combat Aviation Brigade also conducts aviation and ground training in the area.

Wheeler Army Airfield maintains a non-directional beacon as a navigational aid for aircraft approaches to its airfield in central Oahu. This instrument approach is used primarily for instrument recovery to the airfield from the TFTA and the Kahuku Training Area. The services also operate radars that may be affected by the wind farm turbines.

Mt. Ka`ala Communication Sites

The FAA maintains Air Route Surveillance Radar (ARSR) on Mt. Ka`ala. As noted in the MCBH consultation letter, DoD armed services also use Mt. Ka`ala.

3.11.2 Potential Impacts and Mitigation Measures

3.11.2.1 Proposed Action

Wind Farm

To address concerns of the wind farm's impacts on military training and to explore alternatives that could resolve those concerns while still allowing for a wind farm development at Kawailoa, the DoD services formed a working group composed of the affected DoD services, First Wind, and the site's landowner, Kamehameha Schools. The working group has met three times so far (on November 10, 2010, December 15, 2010, and January 24, 2011) to discuss alternative solutions. These meetings have resulted in changes to the initial wind farm layout, such as the relocation of wind turbines away from the training areas and the undergrounding of proposed electrical lines to avoid and minimize potential conflicts with flight and ground training. The layout in this Draft EIS reflects those changes.

At the January 24 meeting, the group's named was changed to the Regional Mission Compatibility Review Team (RMCRT) to reflect recent Federal legislation (Section 358 of the 2011 National Defense Authorization Act). The DoD is developing an interim policy to enable a central clearinghouse, the Energy Siting Clearinghouse, in the Office of the Secretary of Defense, to evaluate whether proposed renewable energy projects would interfere with mission capabilities across the DoD. Issues that the local RMCRT has and will continue to address to avoid, minimize, or mitigate potential conflicts related to the Kawailoa wind farm project are as follows:

- Effect on day and night aviation training
- Effect on day and night ground training
- Non-directional beacon and use of airspace over the wind farm
- Lighting on the wind turbine towers

- Markings on the towers and blades to alert pilots during the day, night, and during night-vision device training
- Radar interference
- Electromagnetic interference
- Overhead electrical lines

In as much as First Wind is also the developer of the already constructed Kahuku Wind Farm project, cumulative issues related to both wind farm projects on military operations and training can be discussed by the RMCRT. In one instance, the wind turbines at Kahuku have been identified to test concepts to mark the towers without resulting in a visual impact.

Construction

The potential construction impacts to military operations and training have not yet been discussed by the RMCRT. It is anticipated that the group would develop measures to mitigate impacts, such as scheduling of construction activities and placement of construction equipment so as not be in conflict with military training.

Operations and Maintenance

Operation and maintenance activities of the wind farm are being addressed by the RMCRT as described above. Information on the progress of the RMCRT will be provided in the Final EIS.

Mt. Ka`ala Communication Facility Sites

Access to, as well as radar and communications activities within, the Mt. Ka`ala area are managed by the multi-agency Ka`ala JUCC, which includes representatives from the U.S. Armed Services, FAA, and State DLNR. A license agreement with Hawaiian Telcom would require siting approval from the JUCC, as well as approval from the Board of Land and Natural Resources (BLNR) and PUC. As part of the Kahuku project, First Wind sought and received approval from the JUCC to install its microwave equipment at the Hawaiian Telcom site and to share the use and cost of the access road to the facility. Both the physical location and the frequency impacts of the Kahuku Wind microwave site were reviewed by the JUCC and approved for installation at the site. The equipment has since been installed. A similar process would be required to gain approval from the Ka`ala JUCC for the microwave antennas for the Kawailoa Wind Farm project.

3.11.2.2 Alternative Communication Site Layout

Impacts associated with this alternative would be similar to those described for installation of the Mt. Ka`ala communication facilities under the Proposed Action.

3.11.2.3 No Action Alternative

Under the No Action alternative, the wind farm facility and Mt. Ka`ala communications facilities would not be constructed, and therefore, no impacts relative to military training would occur.

3.12 Hazardous Materials

The term "hazardous materials" refers to any biological, chemical or physical material that has the potential to harm humans, animals, or the environment, either by itself or through interaction with other factors. Issues associated with hazardous materials typically center around waste streams, underground storage tanks (USTs), aboveground storage tanks (ASTs), and the storage, transport, use, and disposal of pesticides, fuels, lubricants, and other industrial substances.

3.12.1 Existing Conditions

Wind Farm Site

The Kawailoa site is located on land currently owned by Kamehameha Schools and formerly managed as agricultural plantation lands (former Kawailoa Plantation). There have been no known activities conducted that suggest hazardous waste was generated or that any hazardous materials were disposed of within this area. It is possible that contaminants related to former agricultural use of the property are present in surface and shallow subsurface soils at the site. A Phase I Environmental Site Assessment has not yet been prepared for the proposed wind farm area.

Mt. Ka`ala Communication Site

The communications facilities are located on State land currently leased by Hawaiian Telcom. A subsurface UST is located at the current site of the Hawaiian Telcom communications facility. Based on available information, it appears that a release from the UST may have been documented. Available information indicates that response actions for documented UST releases at Mt. Ka`ala have been completed. There have been no other known activities conducted that suggest hazardous waste was generated or that any hazardous materials were disposed of at either of the two proposed communication facility sites.

3.12.2 Potential Impacts and Mitigation Measures

3.12.2.1 Proposed Action

Wind Farm

Construction

Other than the potential that chemicals related to former agricultural use of the property are present, no hazardous material or hazardous wastes are known to be present within the proposed wind farm project site. With the exception that chemicals related to former agricultural practices may be encountered, construction of the project is not expected to uncover or result in the release of an existing contaminant into the environment. An evaluation would be conducted before construction to evaluate for the presence of agricultural-related chemicals in site soils. If chemicals of potential concern are detected, mitigation measures would be implemented based on the nature and extent of contamination. Mitigation measures would include BMPs to minimize exposure of workers to contaminants during construction, and measures to store excavated materials using methods that would prevent release of potentially hazardous chemicals to the environment. Mitigation measures may include onsite monitoring and use of exclusion zones during construction, use of proper personal protective equipment by personnel at the site, placing stockpiled soils on bermed liners, covering stockpiled materials with impermeable liners, and proper characterization and disposal of contaminated materials.

Construction, operation, and decommissioning activities associated with the proposed project would require the use of some hazardous materials. Types of hazardous materials to be used would include fuels (for example, gasoline, diesel fuel), lubricants, cleaning solvents, and paints. Facility construction personnel will follow best management practices to prevent spills or releases of hazardous materials during construction activities.

Construction activities (which include soil disturbing activities such as clearing, grading, excavating, stockpiling, etc.) that disturb one or more acres, or smaller sites that are part of a larger common plan of development or sale, are regulated under the NPDES stormwater program. Operators of regulated construction sites are required to develop stormwater pollution prevention plans; to implement sediment, erosion, and pollution prevention control measures; and to obtain coverage under a state or EPA NPDES permit. Kawailoa Wind will obtain a NPDES permit for construction activities. Incorporated in the NPDES permit for the wind farm construction will be effluent limitations guidelines (ELGs) and new source performance standards (NSPS) to control the discharge of pollutants from the construction site.

Operations and Maintenance

Operation of the proposed project would require the use of a battery storage system, electrical transformers, and the potential need for heavy equipment for maintenance and replacement activities. These activities would involve the use of hazardous materials, including oil, diesel fuel, mineral oil, petroleum-based lubricants and/or solvents, and coolants, as well as the contents of the battery system.

SPCC plans are required by EPA's SPCC regulations for regulated facilities to avoid oil spills and minimize impacts of spills on public health and the environment. Regulated facilities are non-transportation-related facilities with an aboveground oil storage capacity greater than 1,320 gallons or underground tanks with an oil storage capacity greater than 42,000 gallons that can be reasonably expected to discharge oil into navigable U.S. waters or shorelines.

Because the wind farm will have aboveground oil storage (mineral oil in electrical transformers), and smaller quantities of other oils and hazardous materials, the wind farm facility will be designed in accordance with good engineering practices including applicable industry standards and applicable Federal Regulations.

In addition, Kawailoa Wind would prepare and implement a SPCC Plan for the facility to prevent oil spills from occurring, and to perform safe, efficient and timely response in the event of a spill or leak. The SPCC Plan would identify the following:

- Where hazardous materials and wastes are stored or located onsite
- Volume of each type of hazardous material stored or located onsite
- Spill prevention measures to be implemented, training requirements during routine operations

- Periodic training requirements for facility operations personnel, and records of training completed
- Appropriate spill response actions for each material or waste
- Locations of spill response kits onsite
- A procedure for ensuring that the spill response kits are adequately stocked at all times
- Procedures for making timely notifications to authorities.

The plan would identify and address storage, use, transportation, and disposal of each hazardous material anticipated to be used at the facility. It would establish inspection procedures, storage requirements, storage quantity limits, inventory control, nonhazardous product substitutes, and disposition of excess materials, and would include material safety data sheets of hazardous materials. The SPCC plan would also identify key Kawailoa Wind management, State and Federal regulatory contacts, and appropriate spill reporting requirements. The plan would provide instructions for notification of local emergency response authorities (Fire and Police) and include emergency response plans.

Facility operations personnel will receive periodic training including:

- An introduction to pollution control laws
- Rules and regulations pertaining to the use and storage of petroleum products
- BMPs during routine operations and maintenance procedures in order to prevent spills
- Periodic inspection of spill control or containment equipment to ensure it is adequately maintained and functional
- Periodic inspection and maintenance of spill response kits
- Spill response and cleanup
- Spill notification and recordkeeping

In addition, in the event of a spill, Kawailoa Wind will provide the manpower, equipment and materials required to expeditiously control and remove any quantity of oil discharged that may be harmful to the environment. If waste management is required, First Wind would hire licensed contractors to characterize, transport, and properly dispose of contaminated materials.

Mt. Ka`ala Communication Facility Sites

Construction

Because there are no known existing environmental conditions at the two communications facilities sites at Mt. Ka`ala, it is not expected that installation of the new microwave dishes would uncover or result in the release of an existing contaminant into the environment. However, because a UST release was reported at the existing Hawaiian Telcom facility, measures will be taken to identify and mitigate potential issues that could arise during construction if residual contamination is encountered. Mitigation measures could include BMPs to minimize exposure of workers to contaminants during construction, and measures to store excavated materials using methods that would prevent release of potentially hazardous chemicals to the environment. Mitigation measures may include onsite monitoring and use of exclusion zones during construction, use of proper personal protective equipment by personnel at the site, placing stockpiled soils on bermed liners, covering stockpiled materials with impermeable liners, and proper characterization and disposal of contaminated materials.

Operations and Maintenance

Operation of the proposed project would require the potential need for heavy equipment, and potentially hazardous materials for maintenance and replacement activities. These activities would involve the use of hazardous materials, including oil, diesel fuel, petroleum-based lubricants and/or solvents, coolants, and paint. It is anticipated that these types of materials would be transported to the site during maintenance and replacement activities.

If hazardous materials are stored at the site that are of a nature or at volumes that trigger SPCC regulations, Kawailoa Wind would prepare and implement a SPCC Plan for the facility.

The SPCC Plan would identify the following:

- Where hazardous materials and wastes are stored or located onsite
- Volume of each type of hazardous material stored or located onsite
- Spill prevention measures to be implemented during routine operations
- Periodic training requirements for facility operations personnel, and records of training completed
- Appropriate spill response actions for each material or waste
- Locations of spill response kits onsite
- A procedure for ensuring that the spill response kits are adequately stocked at all times
- Procedures for making timely notifications to authorities.

The plan will identify and address storage, use, transportation, and disposal of each hazardous material anticipated to be used at the facility. It will establish inspection procedures, storage requirements, storage quantity limits, inventory control, nonhazardous product substitutes, and disposition of excess materials, and would include material safety data sheets of hazardous materials. The SPCC plan would also identify key Kawailoa Wind management, State and Federal regulatory contacts, and appropriate spill reporting requirements. The plan will provide instructions for notification of local emergency response authorities (Fire and Police) and include emergency response plans.

Facility operations personnel will receive periodic training including:

- An introduction to pollution control laws
- Rules and regulations pertaining to the use and storage of petroleum products

- Best management practices during routine operations and maintenance procedures in order to prevent spills,
- Periodic inspection of spill control or containment equipment to ensure it is adequately maintained and functional
- Periodic inspection and maintenance of spill response kits
- Spill response and cleanup
- Spill notification and record keeping

In addition, in the event of a spill, Kawailoa Wind will provide the manpower, equipment and materials required to expeditiously control and remove any quantity of oil discharged that may be harmful to the environment. If waste management is required, First Wind would hire licensed contractors to characterize, transport, and properly dispose of contaminated materials.

3.12.2.2 Alternative Communication Site Layout

Impacts associated with this alternative would be similar to those described for installation of the Mt. Ka`ala communication facilities under the Proposed Action.

3.12.2.3 No Action Alternative

Under the No Action alternative, the facilities at the wind farm site and Mt. Ka`ala communication sites would not be constructed, and therefore, no impacts relative to hazardous materials would occur.

3.13 Socioeconomic Characteristics

Socioeconomic data describe the population, economic condition, and quality of life within the project area. Population data include the number of residents in the area and the recent changes in population growth. Data on employment, labor force, unemployment trends, income, and industrial earnings describe the economic health of a region. Income information is provided as an annual total by county and per capita. The number and type of housing units, ownership, and vacancy rate can be indicators of the regional quality of life. The geographic area that was selected as the basis on which socioeconomic impacts of the project will be analyzed are the four Census Designated Places (CDPs), which are within the vicinity of the project location. The CDPs includes areas within Mokuleia, Waialua, Hale`iwa and Pūpūkea, as defined by the U.S. Census Bureau (DBEDT, 2008a).

3.13.1 Existing Conditions

The proposed Kawailoa wind farm is located in the community of Hale`iwa-Kawailoa, within the Waialua District, on the island of O`ahu. The communications facility is located in the community of Waialua-Mokuleia, which is also within the Waialua District. The total resident population of O`ahu is approximately 905,034 individuals (DBEDT, 2008a). The majority of the resident population on O`ahu lives in the District of Honolulu.

The Waialua District is not heavily populated compared to other districts on the island, representing approximately 1.6 percent of the entire island’s population in 2000 (DBEDT, 2009). The district experienced a 21.5 percent change in population from 1990 to 2000. The economy of the area is based primarily on tourism. Hale`iwa is the commercial center for the North Shore, consisting of local employment such as commerce, small shops, restaurants, banking, real estate, and insurance. The community shopping area at Hale`iwa attracts and employs persons from many communities along the North Shore of O`ahu.

In 1999, the estimated median household income for the Mokuleia, Waialua, Hale`iwa and Pūpūkea CDPs area was $48,432 and the estimated median per capita income was $20,932. In 1999, approximately 11.1 percent of families and 13.9 percent of individuals in the Mokuleia, Waialua, Hale`iwa and Pūpūkea CDPs had an income below the poverty level, compared to O`ahu's 7 percent of families and 9.9 percent of individuals who had income below poverty level. Approximately 7.6 percent of families and 10.7 percent of individuals of the State of Hawai`i are considered to be living below the poverty level.

The population of the CDPs in 2000 was primarily composed of Caucasians (37.7 percent alone, 56.4 percent in combination) and Asians (28.3 percent alone, 47.6 percent in combination). The population of Native Hawaiians and other Pacific Islanders in the CDPs (6.2 percent alone, 22.8 percent in combination) represent a smaller a much smaller portion of the CDPs' population, as it does for the island of O`ahu (8.9 percent alone, 12.7 percent in combination) (U.S. Census Bureau).

3.13.2 Potential Impacts and Mitigation Measures

3.13.2.1 Proposed Action

Wind Farm

Potential direct socioeconomic effects of the proposed facilities would include (1) construction employment and business activity; (2) lease revenue for use of the project sites; (3) revenues for the State in the form of excise taxes and property taxes; (4) substantial fuel cost savings to HECO, which potentially translate into ratepayer savings; (5) ongoing employment of facility operation and maintenance staff (which would be relatively limited); and (6) ongoing expenditures for materials and outside services. During the construction phase, Kawailoa Wind may employ an average of 40 people per day, with an anticipated maximum level of 150 employees. The work would include general construction and more specialized installation of electrical equipment and wind turbine components. Local residents of the North Shore or O`ahu may be employed during the general construction of the project. Following construction, the operation of the wind facility would be staffed by four to eight full-time, regular employees working onsite Monday through Friday. These employees would include biologists, road maintenance workers, engineers, and technicians. Local residents of the North Shore or O`ahu may be employed during operation of Kawailoa Wind; however, because the operations staff would be small, the project is not expected to result in a substantial long- term employment increase for the area. Collectively, these effects would be expected to provide socioeconomic benefits at both the regional and State-wide scale.

Adverse short-term or long-term impacts to the social or economic condition of the area are not expected to occur as a result of the Proposed Action. The Proposed Action would not result in a large number of new residents moving to the North Shore or the Island of O`ahu. Energy generated from the facility would provide power "as available" and would be used to substitute other energy sources. The population of the area is not expected to increase because of increase energy availability; therefore, the project would not be considered growth inducing. The Proposed Action is not anticipated to impact housing costs or availability.

Mt. Ka`ala Communication Sites

Similar to construction of the wind farm site, the construction phase of the communication sites would require short-term employment to conduct general construction and more specialized installation of electrical equipment and microwave communication components. During the operation phase, the proposed communication facility would be serviced intermittently by maintenance personnel. Local residents of the North Shore or O`ahu may be employed during the general construction and operation of the project.

Adverse short-term or long-term impacts to the social or economic condition of the area surrounding Mt. Ka`ala are not expected to occur as a result of the Proposed Action. The Proposed Action would not result in a large number of new residents moving to Waialua or Mokuleia. The population of the area is not expected to increase because of increased energy availability; therefore, the project would not be considered growth inducing. The Proposed Action is not anticipated to impact housing costs or availability.

3.13.2.2 Alternative Communications Site Layout

This alternative would result in siting either one or both of the Mt. Ka`ala communications facilities in a previously undisturbed area. Implementation of this alternative would still involve construction of the wind farm site, thus resulting in a net benefit relative to greenhouse gas emissions and climatic conditions, similar to that described for the Proposed Action.

3.13.2.3 No Action Alternative

Under the No Action alternative, the project would not be constructed or operated, and therefore, no changes in existing social or economic conditions would occur. As such, no social or economic benefits associated with increased employment and revenues would be provided.

3.14 Natural Hazards

A natural hazard is a threat of a naturally-occurring event that could negatively affect people or the environment. Many natural hazards can be triggered by another event, though they may occur in different geographical locations (for example, an earthquake can trigger a tsunami).

3.14.1 Existing Conditions

Natural hazards that can affect Hawai`i include hurricanes and tropical storms, tsunamis, volcanic eruptions, earthquakes, flooding, and wildfire.

3.14.1.1 Hurricanes and Tropical Storms

Hurricanes develop over warm tropical oceans, and have sustained winds that exceed 74 mph. Tropical storms are similar to hurricanes, except that the sustained winds are below 74 mph. These events can also produce torrential rains. Given the steep and complex topography of the islands, wind can amplify across ridges and through channels, and rain can be focused down valleys, resulting in destructive flash floods and landslides. As a result, even a relatively weak tropical storm can potentially result in considerable damage (Businger, 1998). The Central Pacific Hurricane season runs from June 1 to November 30.

True hurricanes are very rare in Hawai`i, indicated by the fact that only five have affected the islands over the last 50 years (Businger, 1998). Tropical storms occur more frequently than hurricanes, and typically pass sufficiently close to Hawai`i every 1 to 2 years to affect the weather in some part of the Islands (WRCC, 2008). Historically, the hurricanes have made landfall at (or passed more closely to) the northern Hawaiian Islands, such as Kaua`i (Businger, 1998). No hurricane or tropical storm has historically made landfall on O`ahu.

3.14.1.3 Tsunamis

Tsunamis are large, rapidly moving ocean waves triggered both by disturbances around the Pacific Rim (that is, teletsunamis) and earthquakes and landslides near Hawai`i (that is, local tsunamis). The Pacific Disaster Center reports that tsunamis have resulted in more lost lives in Hawai`i than the total of all other natural disasters (Pacific Disaster Center, 2010a). In the 20th century, an estimated 221 people have been killed in Hawai`i by tsunamis. One of the largest and most devastating tsunamis to hit Hawai'i occurred in 1946, resulting from an earthquake along the Aleutian subduction zone. Wave runup heights reached a maximum of 33 to 55 feet and 159 people were killed. A total of 32 tsunamis with run-up greater than 1 meter have occurred in Hawai'i since 1811 [U.S. Geological Survey (USGS), 2010]. The western-most edge of the wind power facility, consisting of onsite access roads, is within the Civil Defense Tsunami Evacuation Zone (Hawai`i State Civil Defense, 2010).

3.14.1.4 Volcanic Eruptions

There are no active volcanoes on O`ahu.

3.14.1.5 Earthquakes and Seismicity

Earthquakes in Hawai`i are linked with volcanic activity. Small earthquakes are generally triggered by eruptions and magma movement within the active volcanoes (for example, Kilauea, Mauna Loa). Larger earthquakes (that is, tectonic earthquakes) tend to occur in areas of structural weakness at the base of these volcanoes or deep within the Earth's crust beneath the island. Several strong tectonic earthquakes (magnitude 6 to 8) have occurred in Hawai`i and caused extensive damage to roads, buildings, and homes, triggered local tsunami, and resulted in loss of life. The most destructive earthquake in Hawai`i had a magnitude 7.9 and occurred on April 2, 1868, when 81 people lost their lives (USGS, 2001).

3.14.1.6 Flooding

Potential flood hazards are identified by the Federal Emergency Management Agency (FEMA) National Flood Insurance Program and are mapped on the Flood Insurance Rate Maps (FIRM). The maps classify land into four zones depending on the potential for flood inundation.

According to 2005 FEMA data, the project area is almost entirely within Flood Zone D, where analysis of flood hazards has not been conducted and flood hazards are undetermined. The western-most edge of the wind farm site, near the mouths of several streams (Kawailoa, Laniakea, Loko Ea, and Anahulu), is designated as Flood Zone X and Flood Zone X500. Zone X is assigned to those areas that are determined to be outside the 500-year floodplain with less than 0.2 percent annual probability of flooding (FEMA, 2010).

The X500 designation is assigned to areas that are between the limits of the 100-year and 500-year flood.

The proposed Mt. Ka`ala communications sites are in an area designated by FEMA as unstudied, and therefore has not been classified for flood hazard.

3.14.1.7 Wildfire

Wildfire occurs on all of the major Hawaiian Islands, with human activity as the primary cause. Because Hawai`i's native ecosystems are not adaptive to wildlife, they can result in extinction of native species and increased coverage of nonnative, invasive species. Other effects include soil erosion, increased runoff and decreased water quality (Pacific Disaster Center, 2010b).

3.14.2 Potential Impacts and Mitigation Measures

3.14.2.1 Proposed Action

Wind Farm

Neither construction nor operation of the proposed project is expected to affect the incidence rate of a natural hazard, with the exception of an increased potential for wildfires associated with use of vehicles and electrical equipment in the project area. Although the occurrence rate is very low, construction and operation of the project could be adversely affected by a natural hazard, such as a hurricane or earthquake, should one occur.

Wind turbines are not generally susceptible to wildfires, and grass and other flammable materials are kept well back from the base of the tower as a matter of regular maintenance. The O&M Building and BESS would be supported by an external fire hydrant, supplied from two water tanks with a total capacity of approximately 120,000 gallons. Interior areas would include accessible fire extinguishers.

Mount Ka`ala Communication Facility Sites

Construction and operation of the communication equipment on Mt. Ka`ala is not expected to affect the incidence rate of a natural hazard, nor is the equipment expected to be particularly susceptible to damage by a natural hazard. The site is subject to relatively high rates of precipitation and does not support vegetation that is prone to wildfire. As such, construction and operation of this site is not expected to result in impacts related to natural hazards.

3.14.2.2 Alternative Communication Site Layout

Similar to the discussion of construction and operations of the Mt. Ka`ala communication facilities under the Proposed Action, implementation of this alternative would not be expected to result in impacts related to natural hazards.

3.14.2.3 No Action Alternative

Under the No Action alternative, the wind farm facility and Mt. Ka`ala communications facilities would not be constructed, and therefore, there would be no change in the existing condition relative to natural hazards.

3.15 Public Safety

Public safety concerns associated with the construction of a wind power project involve fairly standard construction-related concerns. These include the potential for injuries to workers and the general public from (1) the movement of construction vehicles, equipment, and materials; (2) falling overhead objects; (3) falls into open excavations; and (4) electrocution. These types of incidents are well understood, and do not require extensive background information. Public safety concerns associated with the operation of a wind power project are somewhat more unique, and are the focus of this section.

In many ways, wind energy facilities are safer than other forms of energy production because a combustible fuel source and fuel storage are not required. In addition, use and/or generation of toxic or hazardous materials are minor when compared to other types of generating facilities. However, wind turbines are generally more accessible to the public, and risks to public health and safety can be associated with these facilities. Examples of such safety concerns include tower collapse, blade throw, stray voltage, fire in the nacelle, and lighting strikes.

3.15.1 Existing Conditions

The proposed project area is currently comprised of private pastureland formerly used for agricultural operations. There are no significant public safety hazards associated with the existing pastureland.

3.15.2 Potential Safety Risks

3.15.2.1 Tower Collapse/Blade Throw

It is very rare for a wind turbine tower to collapse or a rotor blade to be dropped or thrown from the nacelle, but such incidents have been documented and are potentially dangerous for project personnel, as well as the general public. The reasons for a turbine collapse or blade throw vary depending on conditions and tower type.

Past occurrences of these incidents have generally been the result of manufacturing defects, poor maintenance, wind gusts that exceed the maximum design load of the engineered turbine structure, extreme seismic events, or lightning strikes (AWEA, n.d.). Most instances of blade throw and turbine collapse were reported during the early years of the wind industry. Technological improvements and mandatory safety standards during turbine design, manufacturing, and installation have largely eliminated such occurrences.

3.15.2.2 Stray Voltage

Stray voltage is a phenomenon that has been studied and debated since at least the 1960s. It is an effect that is primarily a concern of farmers/ranchers, whose livestock can receive electrical shocks. Stray voltage is a low level of neutral-to-earth electrical current that occurs between two points on a grounded electrical system. In a farm setting, stray voltage typically originates from low levels of AC voltage on the grounded conductors of a farm wiring system. These voltages are termed stray when they are large enough to form a circuit when a person or an animal simultaneously touches two objects that are part of an electrical system. The occurrence of stray voltage results from a damaged or poorly connected wiring system, corrosion on either end of the wires, or weak/damaged insulation materials on the hot wire. Livestock may encounter stray voltage when they contact two surfaces with voltage differences, resulting in a small electrical current flowing through the animal and creating a shock.

Stray voltage can occur at electric facilities (such as wind power projects) because of factors such as operating voltage, geometry, shielding, rock/soil electrical resistively, and proximity. Stray voltage from such facilities usually only occurs if the system is poorly grounded and located in proximity to ungrounded or poorly grounded metal objects (such as fences or buildings).

3.15.2.3 Fire

Although the turbines contain relatively few flammable components, the presence of electrical generating equipment and electrical cables, along with various oils (lubricating, cooling, and hydraulic), does create the potential for fire within the tower or the nacelle.

Other project activities create the potential for a fire or medical emergency because of the storage and use of diesel fuels, lubricating oils, and hydraulic fluids. Storage and use of these substances may occur at the collector substation, staging and laydown area, and the O&M building.

3.15.2.4 Lightning Strikes

Because of their height and metal/carbon components, wind turbines and communications facilities are susceptible to lightning strikes. Statistics on lightning strikes to wind turbines are not readily available, but it is reported that lightning causes four to eight faults per 100 turbine-years in northern Europe, and up to 14 faults per 100 turbine-years in southern Germany (Korsgaard and Mortensen, 2006). Most lightning strikes hit the rotor, and their effect is highly variable, ranging from minor surface damage to complete blade failure. All modern wind turbines include lightning protection systems, which generally prevent catastrophic blade failure.

3.15.2.5 Shadow Flicker

Shadow flicker is the term used to refer to the alternating changes in light intensity that can occur at times when the rotating blades of wind turbines cast moving shadows on the ground or on structures. Shadow flicker occurs only when the wind turbines are operating during sunny conditions, and is most likely to occur early and late in the day when the sun is at a low angle in the sky. The intensity of shadow flicker is "…defined as the difference or variation in brightness at a given location in the presence or absence of a shadow."(National Research Council, 2007) The intensity of the shadows cast by the moving blades of wind turbines and thus the perceived intensity of the flickering effect is determined by the distance of the affected area from the turbine, with the most intense, distinct, and focused shadows occurring closest to the turbine. The frequency of shadow flicker is a function of the number of blades making up the wind turbine rotor and rotor speed. Shadow flicker frequency is measured in terms of alternations per second, or hertz (Hz).

There are two kinds of potential concerns that have been raised about severe shadow flicker conditions. One is that shadow flicker could have the potential to trigger epileptic seizures, and the other is that shadow flicker could become a source of annoyance to residents living in close proximity to wind turbines. The Epilepsy Foundation notes that for a small minority (about 3 percent) of the three million people in the U.S. who are affected by epilepsy, there is a potential for epileptic seizures to be triggered by flashing light. These seizures have the potential to be triggered when the light flashes are in the 5 to 30 Hz range. Because the frequency of the shadow flicker created by modern wind turbines is in the range of 0.6 to 1.0 Hz, the shadow flicker effects created by wind turbines do not have the potential to trigger epileptic seizures (Epilepsy Foundation, 2008).

The second issue is of annoyance and is considered more subjective. There could be cases in which shadow flicker cast on dwellings in very close proximity to wind turbines could be significant enough to be considered a nuisance to residents. The National Research Council has observed that shadow flicker is more likely to be a concern in the higher latitude regions of Northern Europe, where the sun is likely to be at a low angle (particularly in winter) than in the continental U.S., where it states that "…shadow flicker has not been identified as causing even a mild annoyance." (National Research Council, 2007)

3.15.3 Potential Impacts and Mitigation Measures

3.15.3.1 Proposed Action

In general, the wind farm facilities are greater than 1 mile away from the nearest residence, and are not publicly accessible. As such, the unlikely event of a tower collapse, blade throw or stray voltage significantly impacting public safety is minimal.

During the construction phase of the project, ignition sources for accidental fires include errant sparks from a variety of vehicles, equipment and tools, and improperly discarded matches and cigarette butts. These are of limited intensity, and under most conditions are unlikely to spark a grass or other fire. Fire-fighting equipment would be maintained in work vehicles and staging areas of the project site and would be available if needed.

During operation of the project, as stated in Section 3.13.1.3, petroleum-fueled mobile equipment (such as trucks and cranes), petroleum-based lubricants, and other flammable materials means would be present at the site. If a fire does occur, there is potential for equipment damage, but it is not expected to be significant. The towers supporting the turbines are of 3/4-inch plate steel, mounted on concrete foundations; the interconnecting electrical systems are below ground; and the operations and maintenance facilities would be constructed of noncombustible construction and exterior finishes. Damage from fire could occur to the onsite substation and would potentially disrupt the facility's provision of electricity to HECO, though it would not jeopardize HECO's ability to provide electricity services to its customers.

Basic onsite fire-fighting resources would include fire extinguishers in the maintenance facility, at the substation, and in all project vehicles, as well as shovels and backpack pumps in the maintenance facility and maintenance vehicles. During construction, firefighting resources would include the provision of fire extinguishers in all construction vehicles and trailers. In addition, during some periods of construction, earthmoving equipment would be present onsite and able to assist in creating fire breaks. Lastly, water that is stored in water tanks during construction can also be used for firefighting.

The results of a shadow flicker analysis for the project indicated that areas of potential shadow flicker effect extend 1,395 meters from each turbine (Figure 41). Because the project is located in an agricultural area, no residences are located within the areas within which detectable shadow flicker would be created. As shown on Figure 41, the closest residences lie in the corridor along the Kamehameha Highway south of Waimea Bay. These and the other residential areas in this part of the island are more than 1,395 meters from the nearest turbine locations, and outside of the areas within which detectable levels of shadow flicker effect would occur.

Mt. Ka`ala Communication Facility Sites

The communication facilities proposed for installation on Mt. Ka`ala are similar in type and function to the existing onsite facilities, and are not expected to affect public safety.

3.15.2.2 Alternative Communication Site Layout

Similar to the discussion of construction and operations of the Mt. Ka`ala communication facilities under the Proposed Action, implementation of this alternative would not be expected to affect public safety.

3.15.2.3 No Action Alternative

Under the No Action alternative, the wind farm facility and Mt. Ka`ala communications facilities would not be constructed, and therefore, there would be no change in the existing levels of public safety.

3.16 Public Infrastructure and Services

This chapter addresses the availability and capacity of public infrastructure and services, including utilities, waste disposal, police and fire protection, health care facilities, education facilities, and recreational facilities.

3.16.1 Existing Conditions

3.16.1.1 Energy

The State of Hawai`i uses a higher percentage of petroleum to generate electricity than any other state in the U.S. In 2005, oil was used to produce 80 percent of electricity sold by the State's utilities (Planning Solutions, Inc., 2009). The remaining electricity generation during that year was supplied by coal (13.9 percent), municipal solid waste (2.6 percent), geothermal (2 percent), hydroelectricity (0.7 percent), bagasse or sugarcane waste (0.6 percent), wind (0.1 percent), and a very small amount from solar photovoltaics. Imported oil costs the state between $2 and $4 billion annually (DBEDT, 2008b). As a result, Hawai`i pays among the highest electricity costs in the country and faces a high level of energy insecurity because of the volatility of oil prices and the potential for disruptions in petroleum supply and shipping.

Fortunately, Hawai`i has abundant renewable resources, including a robust wind resource on several islands. Significant potential for small or distributed wind energy projects exists throughout the Hawaiian Islands (Global Energy Concepts LLC, 2006). It has been estimated that the state has a combined wind energy potential of 1,000,000 kilowatt hours (kWh) (State of Hawai`i and Hawaiian Electric Companies, 2008).

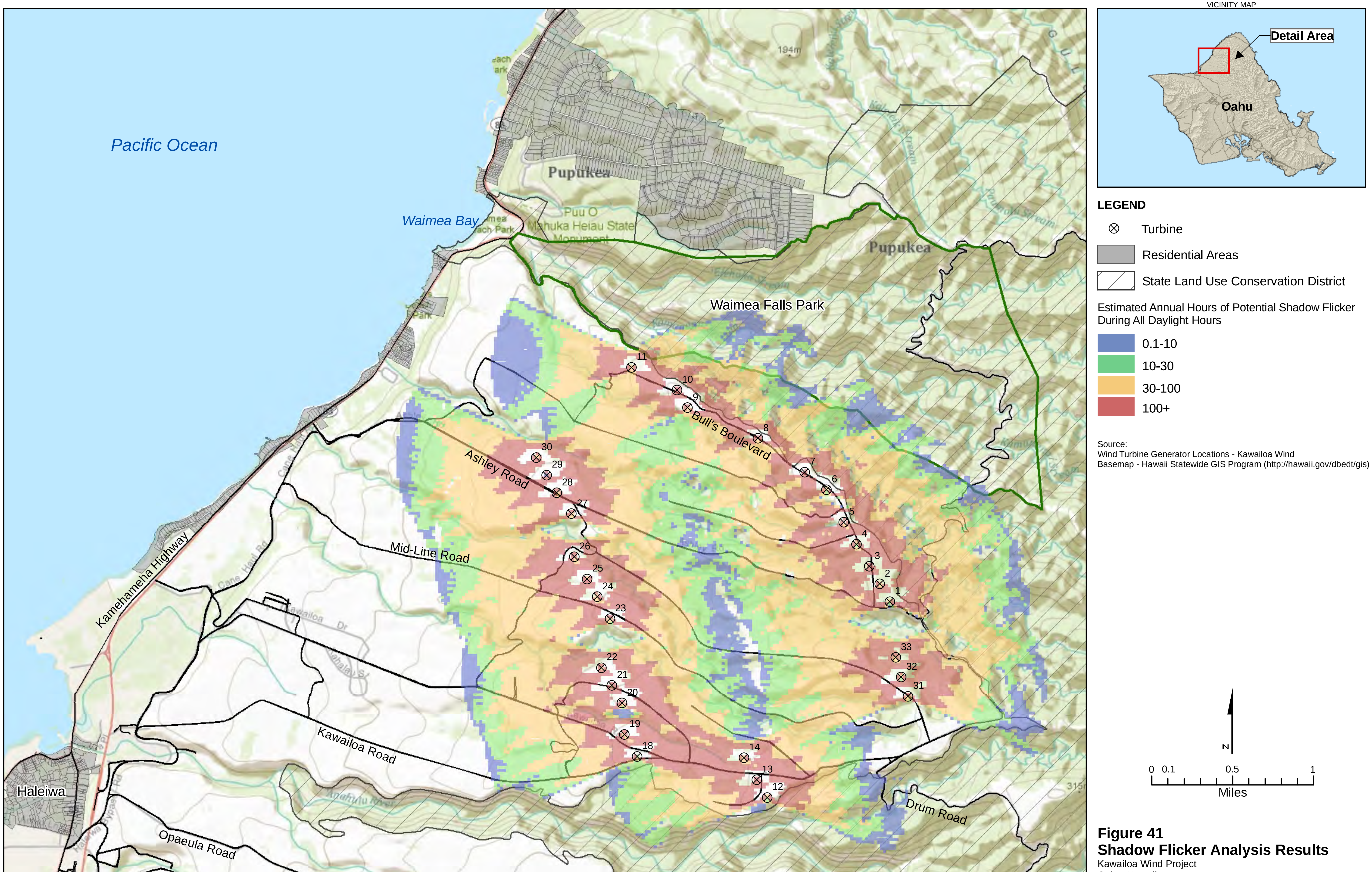


Figure 41
Shadow Flicker Analysis Results
Kawailoa Wind Project
Oahu, Hawaii

Because of increasing fossil fuel costs, energy security issues, and concerns over climate change, the State of Hawai`i is striving to use its own renewable energy (M & E Pacific, Inc., 2008). Hawai`i's RPS (HRS §269-91 to 269-95) present a timeline to increase the amount of electricity generated using renewable resources. According to these standards, each electric utility company that sells electricity for consumption in the state shall establish a renewable portfolio standard of 15 percent of its net electricity sales by December 31, 2015, and 20 percent of its net electricity sales by December 31, 2020. A proposal to increase the standard to 40 percent by 2020 is under consideration by the Hawai`i State Legislature.

In January 2008, the State of Hawai`i and DOE signed an agreement to establish the HCEI. The goal of this agreement is to have 70 percent or more of the state's energy derived from efficiency as well as clean, renewable energy for electricity and transportation by 2030. This goal has the potential of reducing Hawai`i's current crude oil consumption by 72 percent (State of Hawai`i and U.S. DOE, 2008). Hawai`i also passed various House bills (HB2848 CD1, HB 2175 CD1, and SB 988 CD1, HB 2505 CD1, and HB 2863 CD1) to promote energy efficiency and renewable energy sources. In October 2008, the State of Hawai`i signed an Energy Agreement with HECO to help reach the state's energy objectives by facilitating the production of renewable energy sources on the islands, such as wind resources (State of Hawai`i and Hawaiian Electric Companies, 2008). The agreement includes a commitment by HECO to encourage and explore the development of known project proposals.

In order to meet the clean energy goal, local renewable energy alternatives need to be developed in Hawai`i. Several wind energy facilities are already operating in the state and others are being proposed.

Currently, the largest source of renewable energy on O`ahu is burning refuse or municipal solid waste at the H-Power facility in the Campbell Industrial Park (Rocky Mountain Institute, 2008; Beck, 2008). Burning waste meets only 4 percent of the island's electrical load. O`ahu cannot draw on renewable energy generated on neighboring islands until inter-island transmission lines are constructed to connect the different island electrical grids.

HECO provides all electrical service for the Island of O`ahu; utility-scale electricity sold by renewable energy producers is sold directly to HECO. Two 46 kV sub-transmission lines runs through the project area. The Kawailoa wind project would tie into these lines and provide electricity to O`ahu's grid, powering up to approximately 14,500 homes.

3.16.1.2 Solid Waste

Solid waste generated by the residents in Hale`iwa and Pūpūkea is disposed of at the Waimanalo Gulch landfill or burned at the H-Power facility. Solid waste generated by Kawailoa Wind is anticipated to be considered municipal waste and be disposed of as such.

3.16.1.3 Water and Wastewater

Water resources and distribution on O`ahu is managed by the Honolulu Board of Water Supply (BWS). A connection to City and County water facilities is not anticipated to be needed for the proposed project. Kawailoa Wind plans to truck in and store water in onsite holding tanks for its water requirements at the wind farm facility. Given the nature of the proposed project and small number of people working onsite, water usage would be limited to that provided by three water tanks installed onsite; the tanks would be refilled monthly, as needed. There is no expected need for water supply at the Mt. Ka`ala communications facilities.

It is anticipated that an onsite septic tank system would be constructed to deal with project-associated wastewater generated from the few people working onsite. The wastewater discharge from the project area would be within the City and County requirement of less than 1,000 gallons per day. The waste that accumulates in the septic tank system would be collected by a private contractor and transported to an appropriate wastewater treatment facility or other approved location for disposal. The small amount of wastewater that this represents can easily be accommodated in the existing treatment and disposal facilities.

3.16.1.4 Police and Fire Protection Services

The Wahiawā Police Station is located at 330 North Cane Street and is the closest police station to both the wind farm and communications facilities. It is approximately 11 miles from the entrance to the wind farm facility and approximately 17 miles to the communications facilities.

The Waialua Fire Station located at 66-420 Hale`iwa Road is the closest fire department to both the wind farm and communications facilities. It is approximately 2 miles from the entrance to the wind farm facility and approximately 2 miles from the entrance to the Mt. Ka`ala access road.

3.16.1.5 Health Care Facilities and Emergency Medical Services

The nearest hospital to the proposed wind farm and communications facilities is Wahiawā General Hospital, located at 128 Lehua Street, Wahiawā, HI 96786, approximately 9 miles away from the entrance to the wind farm facility and approximately 12 miles away from the from the entrance to the Mt. Ka`ala access road. In case of emergencies, paramedic and ambulance services are available.

3.16.1.6 Education Facilities

Hale`iwa Elementary School, located at 66-505 Hale`iwa Road, is approximately 2.1 miles from the entrance to the Kawailoa wind farm facility and approximately 2 miles from the entrance to the Mt. Ka`ala access road. Sunset Beach Elementary School, located at 59-360 Kamehameha Highway, is approximately 5.4 miles from the entrance to the Kawailoa wind farm facility, and approximately 8 miles from the entrance to the Mt. Ka`ala access road.

3.16.1.7 Recreation Facilities

Multiple parks and recreation facilities are located near the western portion of the wind farm facility and within a two mile radius from the entrance of the Kawailoa wind farm facility. These parks and recreation facilities include Waimea Bay Beach Park, Waimea Valley, Laniakea Beach, Puaena Point Beach Park, Hale`iwa Beach Park, and Hale`iwa Ali`i Beach Park.

3.16.2 Potential Impacts and Mitigation Measures

3.16.2.1 Proposed Action

Wind Farm Site

The proposed project could generate small amounts of solid waste, waste water and hazardous waste, which would be transported by truck to the appropriate local disposal facility for reclamation or landfill. Public services including fire and police, health care, education, and recreation would not be significantly affected, and will not be discussed further.

Energy

With the 70 MW of power potentially generated by the proposed facility, HECO would be able to eliminate the use of approximately 304,200 barrels of oil annually that would otherwise be used to produce conventional power. Reducing the proportion of its energy that comes from fossil fuel would decrease the amount of money that HECO spends on imported fuel and buffer the system from the energy cost fluctuations that accompany volatile oil prices.

The proposed project would contribute to the goals outlined in the Hawai`i's RPS and the HCEI by increasing the percentage of the state's energy that is derived from clean, renewable sources. The exact percentage is unknown; however, Kawailoa Wind Power is expected to generate enough clean energy to power up to approximately 14,520 of the 337,152 homes on O`ahu (DBEDT, 2008). It also would support recently passed state statutes designed to promote energy efficiency and renewable energy sources.

The proposed project would consume only small amounts of electrical power, which would be either generated by the facility or back-fed through utility's sub-transmission lines.

Solid Waste

Construction and operation of the proposed project is not anticipated to generate a significant amount of solid waste. Although the exact amount is unknown, for other facilities of this kind, waste typically does not exceed one small dumpster per week (Planning Solutions, Inc., 2009). During construction, all waste would be transported to and stored within the temporary use area and periodically carried out and properly disposed of in a permitted landfill. During operation, waste would be collected by a private solid waste management company once a week and disposed of in an approved landfill. Some solid waste may be recycled. These materials would be stored and hauled separately to the appropriate recycling company. An onsite septic tank system would be constructed in the project area to handle sewage, as described in Section 3.15.4.

The vast majority of waste created during construction and operation of wind energy facilities is nonhazardous solid waste, such as shipping crates, boxes, and packing material. No hazardous solid waste is expected to be generated as a result of construction or operation of the proposed project.

Because only a small amount of solid waste is expected to be generated during construction and operation, and appropriate management practices would be implemented, impacts to solid waste disposal or processing are expected to be minor.

Water and Wastewater

Wastewater generated by employees of the proposed facility can easily be accommodated in existing treatment and disposal facilities. Therefore, no significant impact to wastewater treatment facilities is expected from the proposed project.

3.16.2.2 Alternative Communications Site Layout

This alternative would result in construction of new communication towers adjacent to the existing Hawaiian Telcom structures. Implementation of this alternative would still involve construction of the wind farm site, thus resulting in a net benefit relative to greenhouse gas emissions and climatic conditions, similar to that described for the Proposed Action.

3.16.2.3 No Action Alternative

Under the No Action alternative, the project would not be constructed and thus would not affect public infrastructure and services.

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4.0 Other HRS Chapter 343 Topics

4.1 Secondary and Cumulative Impacts

Hawai`i Administrative Rules §11-200-17(I) requires consideration of the direct and indirect effects of all phases of the proposed project as well as its induced and secondary effects.[15] The interrelationships and cumulative environmental impacts of the proposed project and other related projects should be discussed. (The proposed project's direct impact impacts are described in Section 3 of this document.)

While the proposed project's construction and operation expenditures would provide a direct benefit to the local economy, the amounts are relatively too small to cause significant secondary effects in the local economy. The proposed project would not lead to secondary or indirect changes to land use and development on O`ahu in as much as the project's renewable energy is generally a substitute for energy that would otherwise be generated through other means, such as fossil fuels and biofuels.

To assess cumulative impacts, other projects in the vicinity of the project area that occurred in the recent past, present and reasonably forseeable future and involved impacts to resources for which the Proposed Action could contribute incrementally were considered. To date, the only relevant action that has been identified is the Kahuku wind farm project, located approximately 7 miles northeast of the Kawailoa wind farm site. A second wind farm project, Na Pua Makani has also been identified in the vicinity of the Kahuku wind farm site; however, the project is not believed to be proceeding at this time. As part of their master planning effort, Kamehameha Schools identified several potential projects to be implemented on their property, including diversified agriculture and outdoor education programs; these projects are all believed to be in the early stages of development.

Analyses of potential cumulative impacts associated with the Kahuku wind farm project focused on the resource areas most relevant to potential cumulative impacts: climate change, military operations, and wildlife. Because Kahuku is located more than 7 miles away from the Kawailoa wind farm site, and is separated by steep topography, cumulative impacts to sound and visual resources are not anticipated.

4.1.1 Climate Change

The release of anthropogenic greenhouse gases and their potential contribution to global warming are inherently cumulative phenomena. Greenhouse gas emissions resulting from the Proposed Action would be relatively small compared to the 54 billion tons of CO_2-equivalent anthropogenic greenhouse gases emitted globally in 2004 (IPCC, 2007). However, emissions from the Proposed Action in combination with past and future emissions from other sources would contribute incrementally to climate change impacts. At present there is

[15] Hawai`i Administrative Rules §11-200-2 Definitions: "Secondary impact" or "secondary effect" or "indirect impact" or "indirect effect" means effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

no methodology that allows quantification of the specific impacts (if any) this increment of climate change would produce in the vicinity of the facility or elsewhere.

Greenhouse gas emissions caused by construction and operation of the proposed project and the Kahuku wind farm project would be more than offset by the reduction of emissions resulting from the decrease in the amount of fossil fuels currently burned on O`ahu to generate electricity. The energy potentially generated by the Proposed Action would eliminate the use of approximately 304,200 barrels of oil, which in turn would reduce emissions of carbon dioxide (CO_2) by more than 134,400 tons. The 30 MW of power generated by the Kahuku Wind Power facility is expected to eliminate the use of approximately 154,550 barrels of oil annually, and thereby reduce emission of approximately 79,800 million pounds of CO_2. These amounts far exceed those which would be produced by construction and operation of the wind facilities. Given this, the projects are expected to result in beneficial cumulative effects on local and statewide levels of greenhouse gas emissions.

4.1.2 Military Operations

As described in Section 3.11.2, the Kawailoa wind farm site overlaps with an FAA-designated Alert Area of high-density air traffic from the ground surface to 500 feet above ground level, known as the A-311 TFTA. These areas are used by several branches, or services, of the DoD including the U.S. Army, Marine Corps, Navy, and Air Force.

Several potential conflicts have been identified relative to the Kawailoa wind farm project and activities in the TFTA. A local RMCRT has been formed to help avoid, minimize, or mitigate the potential conflicts. These include:

- Effect on day and night aviation training
- Effect on day and night ground training
- Non-directional beacon and use of airspace over the wind farm
- Lighting on the wind turbine towers
- Markings on the towers and blades to alert pilots during the day, night, and during night-vision device training
- Radar interference
- Electromagnetic interference
- Overhead electrical lines

In as much as First Wind is also the developer of the already constructed Kahuku Wind Farm project, cumulative issues related to both wind farm projects on military operations and training will be addressed by the RMCRT.

4.1.3 Wildlife

As discussed in the project's proposed HCP and summarized in Section 3 of this EIS, construction and operation of Kawailoa Wind Power has the potential to result in the incidental take of six Federally listed threatened or endangered species: the Hawaiian stilt, Hawaiian coot, Hawaiian duck, Hawaiian moorhen, Newell's shearwater, and the Hawaiian hoary bat. One state-listed endangered species, the Hawaiian short-eared owl, is also believed to have potential to collide with the proposed turbines or other project infrastructure. These seven Federally or State listed species are known to, or may have potential to, fly in the vicinity of the project area and could be injured or killed if they collide with turbines or other project components. Adjusted take estimates at the Kawailoa wind farm site for all listed species consider both direct and indirect take. Direct take comprises individuals that are killed or injured colliding with turbines, the permanent unguyed met tower, construction vehicles or equipment, or other project components. Indirect take considers that it is possible that listed adults that are killed or injured by project components could have been tending to eggs, nestlings, or dependent young. Thus, the loss of these adults would also lead to the loss of eggs or dependent young, which would be attributable to the proposed project.

The cumulative effects of other existing and proposed wind farms on O`ahu's North Shore were considered in the HCP analysis. First Wind's Kahuku wind farm has been issued a State Incidental Take License for the Covered Species through an HCP (SWCA and First Wind, 2010) that seeks to minimize, mitigate, and monitor the incidental take of threatened and endangered species that may occur during construction and operation of that project. If constructed, the Na Pua Makani wind facility project in Kahuku would also have the potential to result in incidental take of the covered species. Thus, there is a possibility of cumulative impacts to these species. However, it is expected that if approved, the impacts and mitigation for Na Pua Makani would resemble those discussed for the proposed project at Kawailoa; the proposed mitigation for Kawailoa project is expected to more than offset the anticipated take and provide a net benefit to the species.

4.2 Short-Term Uses versus Long-Term Productivity

Hawai`i Administrative Rules §11-200-17(J) requires a description of the relationship between local short-term uses by humans of the environment and the maintenance and enhancement of long-term productivity. This description should include a discussion on the extent to which the proposed project involves tradeoffs among short-term and long-term gains and losses, as well as whether future options are foreclosed, whether the range of beneficial uses of the environment are narrowed, and whether the proposed project poses long-term risks to health and safety.

Construction and operation of the proposed project would provide a source of electrical energy generated from a clean, local, and renewable energy source: the wind. Each MW of wind energy produced further reduces O`ahu's reliance on fossil fuels and the corresponding quantity of air pollutants, such as greenhouse gases, emitted from fossil-fuel generation sources. The use of a local renewable resource, as compared to imported foreign fuels, also provides greater security in maintaining an energy supply and in keeping more of the state's funds within the local economy.

The proposed project is compatible with most agricultural uses and as such does not preclude the present and future agricultural productivity of Kawailoa.

4.3 Irreversible and Irretrievable Commitment of Resources

Hawai`i Administrative Rules §11-200-17(K) requires a description of the extent to which the proposed project makes use of non-renewable resources (including labor, materials, natural, and cultural resources) or irreversibly curtails the range of potential uses of the environment.

Construction of the proposed project would consume some non-renewable resources, such as construction materials and fuel for vehicles. During operation of the project, the primary resource required for operation is wind, a renewable resource, and compatible agricultural uses can occur. In addition, many of the materials (such as steel) can be recycled. After the useful life of the project, the structures can be dismantled and removed from the site. The remaining improved access roads would continue to support the movement of goods and people related to agricultural and other compatible activities on Kamehameha Schools property.

4.4 Unavoidable Impacts and Rationale for Proceeding

Hawai`i Administrative Rules §11-200-17(L) requires a description of probable adverse effects which cannot be avoided and the rationale for proceeding with the proposed project. Unavoidable impacts are those effects remaining after adjusting for mitigation measures that minimize, rectify, or reduce impacts of the proposed project.

Descriptions of mitigation measures as required by HAR §11-200-17(M) are found in Section 3 of this document and in the HCP. Kawailoa Wind is committed to avoiding or mitigating adverse effects to the extent practical. The analysis has not identified significant, unavoidable adverse impacts that would remain after implementation of proposed mitigation measures. Kawailoa Wind believes the Proposed Action is preferable over other alternatives, including the No Action alternative, and that the adverse environmental effects after mitigation are outweighed by the project's benefits, as summarized below.

Production of wind-generated energy would help to meet the State's established regulatory requirements and initiatives, as well as diversify O`ahu's power supply and contribute to the State's energy independence and security, mitigating potential volatility in the fossil fuel supply. By decreasing the consumption of fossil fuels, the proposed project would also help to reduce green-house gas emissions and other forms of pollution, as well as detrimental health effects associated with burning fossil fuels.

The proposed project would also result in economic benefits, as it would contribute to the local economy, generate new jobs, and provide a stable, long-term source of tax revenue for the State and County. Furthermore, power generated by the wind farm is expected to be sold under a long-term, fixed-price contract and, as such, the proposed project would also provide long-term price stability for energy production.

4.5 Unresolved Issues

Hawai`i Administrative Rules §11-200-17(N) requires a summary of unresolved issues and a discussion of how such issues would be resolved before commencement of the project or what overriding reasons there are for proceeding without resolution of the issues.

Permits and approvals must still be obtained from various agencies and it is possible issues may arise during the processing of applications. However, early consultations with agencies and stakeholders as well as the technical evaluations of potential impacts have not identified issues that cannot be resolved.

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5.0 Consistency with Existing Land Use Plans, Policies and Controls

In accordance with the requirements of HAR §11-200-17, this chapter discusses the relationship of the Proposed Action to land use plans, policies, and controls. In addition, a variety of other Federal and State laws would be (or could potentially be) applicable to the project. Following is a discussion of the key Federal and State regulations and land use plans, policies, and controls.[16]

5.1 Federal Regulations

5.1.1 Endangered Species Act

Species that are federally listed as threatened or endangered, and areas that have been designated as "critical habitat" are protected under the ESA (16 U.S.C. §§1531-1544), as amended. Section 10(a)(1)(B) of the ESA allows private applicants to obtain an Incidental Take Permit that permits impacts to protected species that are incidental to otherwise lawful activities. To obtain a permit, the applicant must develop an HCP that analyzes the potential impacts to the listed species and details the measures that would be implemented to mitigate those impacts.

In compliance with Section 10 of the ESA and HRS §195D-4(g), Kawailoa Wind has made a commitment to prepare an HCP and apply for an Incidental Take Permit and Incidental Take License from the USFWS and DOFAW, respectively, for the Kawailoa wind farm facility. The purpose of the HCP is to ensure that a net conservation benefit is provided for any listed species covered under the plan. The HCP would cover the seven species described in Section 3.5.2.3: Newell's shearwater, Hawaiian duck, Hawaiian stilt, Hawaiian coot, Hawaiian moorhen, Hawaiian short-eared owl, and Hawaiian hoary bat. No Federally or State listed plant species are present within the project site.

5.1.2 Clean Air Act

The Clean Air Act authorizes the EPA to establish NAAQS for major air pollutants. Air quality in the State of Hawaii is regulated by the Clean Air Branch of DOH, as authorized under HRS §342B (Air Pollution Control). HAR Title 11, Chapter 59 (Ambient Air Quality Standards) establishes State ambient air quality standards, which in some cases are more stringent than the comparable Federal standards or address pollutants that are not covered by the Federal standards. These standards are monitored and enforced by the Clean Air Branch.

[16] Each of the laws and policies that are specifically called out in HAR 11-200 for which the proposed activities should be evaluated for consistency were reviewed; only those that are relevant to the project are discussed in detail. Specific laws and policies that were considered to not be relevant include HRS 128D (Hawaii Environmental Response Law), HRS 342C (Ozone Layer Protection) , HRS 342E (Nonpoint Source Pollution Management and Control), HRS 342F (Noise Pollution), HRS 342G (Integrated Solid Waste Management), HRS 342H (Solid Waste Pollution), HRS 342I (Special Wastes Recycling), HRS 342J (Hazardous Waste), HRS 342L (Underground Storage Tanks), HRS 342N (Repealed), and HRS 342P (Asbestos and Lead).

Hawai`i Administrative Rules Title 11, Chapter 60.1 (Air Pollution Control) states that "no person, including any public body, shall engage in any activity which causes air pollution or causes or allows the emission of any regulated or hazardous air pollutant without first securing approval in writing from the director." According to Chapter 60.1, an Air Pollution Control Permit is required before constructing, reconstructing, modifying, or operating a stationary air pollution source. Certain air pollution sources are exempt from these requirements including vehicles, trucks, cranes, graders, and loaders (HAR §11-60.1-62d). Stationary sources with potential emissions of less than 1.0 ton per year for each air pollutant are also exempt from Air Pollution Control Permit requirements. Because of the type of equipment anticipated for use during construction and operation of the project, and the low levels of emissions anticipated as described in Section 3.5, the Proposed Action is not expected to require an Air Pollution Control Permit from the Clean Air Branch.

5.1.3 Clean Water Act

The purpose of the CWA is to "restore and maintain the chemical, physical and biological integrity of the nation's waters" [33 U.S.C. §1251(a)]. Section 404 of the CWA prohibits the discharge of dredged or fill material into waters of the United States without a permit from the USACE. Waters of the United States are defined to include rivers, streams, estuaries, the territorial seas, ponds, lakes, and wetlands. Substantial impacts to features that are determined to be waters of the United States may require an individual permit. Projects that only minimally affect jurisdictional features and meet specified conditions may qualify for permitting under the Nationwide Permit Program. Under Section 401 of the CWA, projects that involve discharge or fill to waters of the United States must also obtain certification of compliance with State water quality standards. The State of Hawai`i Department of Health implements the Section 401 water quality certification program, as authorized under HRS §342D. Section 402 of the CWA establishes the NPDES permit program, which regulates point source discharges of pollutants and industrial stormwater discharges into waters of the United States. An NPDES permit sets specific discharge limits for point sources discharging and establishes monitoring and reporting requirements.

As described in Section 3.4, several features occur in the vicinity of the proposed wind farm site that may be considered waters of the United States. If determined to be jurisdictional, these features would be subject to regulation under Sections 404 and 401 of the CWA. The maximum envelope for the project has been defined to exclude these features to the maximum extent possible. The only locations where potentially jurisdictional waters of the United States occur within the project envelope are those areas where the streams intersect with the existing onsite roads. In general, the streams are culverted under the roads, and road improvements will be conducted so as to avoid impacts to these features. The only unculverted road crossing within the project envelope is along Laniakea Stream, an intermittent waterway, where it washes over Cane Haul Road. Road improvements may be required in this location to achieve the specifications for the turbine delivery vehicles; no work would be conducted outside the existing footprint of the road. Potential permitting requirements associated with these activities are currently being evaluated and will be addressed accordingly.

5.1.4 Federal Aviation Regulations

Part 77 (CFR Title 14 Part 77.13) of the FAA Federal Aviation Regulations applies to objects that may obstruct navigable airspace. Proposed projects more than 200 feet above ground level must file FAA Form 7460-1, Notice of Proposed Construction or Alteration with the

FAA before construction. A Notice of Proposed Construction or Alteration-Off Airport was filed with FAA in December 2010. The form provides information (such as structure height, location, lighting, and markings) to the FAA so that an aeronautical study can be conducted by the FAA Air Traffic Organization, Obstruction Evaluation Group (OEG). The information is made available to other FAA offices and military representatives that need to review the proposal. Those offices provide comments to the OEG and after all comments have been received, the OEG will make a determination with respect to air safety and the efficient use of the navigable airspace.

5.2 State of Hawai`i

5.2.1 Hawai`i State Energy Resources (HRS Chapter 196)

In 2008, the State of Hawaii signed an (MOU with the U.S. DOE that established the HCEI. A subsequent agreement (the Energy Agreement) signed in October 2008 between the State and the Hawaiian Electric companies specified that the parties would work together to help Hawaiian Electric companies achieve as much as 40 percent renewable energy by 2030. In April 2010, the HCEI Program was added to State law, as HRS Chapter 196.

Hawaiian Revised Statutes Chapter 196 established the clean energy initiative program within DBEDT to manage the State's transition to a clean energy economy. It specifies activities to be implemented as part of the program to include the following:

- Strategic partnerships for the research, development, testing, deployment, and permitting of clean and renewable technologies
- Engineering and economic evaluations of Hawaii's potential for near-term project opportunities for the State's renewable energy resources
- Electric grid reliability and security projects that will enable the integration of a substantial increase of electricity from renewable-energy resources
- A statewide clean energy public education and outreach plan to be developed in coordination with Hawaii's institutions of public education
- Promotion of Hawaii's clean and renewable resources to potential partners and investors
- A plan, to be implemented from 2011 to 2030, to transition the State to a clean energy economy
- A plan, to be implemented from 2011 to 2030, to assist each county in transitioning to a clean energy economy

Implementation of the Kawailoa wind farm project is consistent with the intent of the HCEI, as codified in HRS Chapter 196. Kawailoa Wind is working closely with DBEDT to implement the project, which would generate approximately 70 MW of clean renewable energy.

5.2.2 Hawai`i State Planning Act (HRS Chapter 226)

The Hawai`i State Plan (HRS Chapter 226) is intended to serve as a guide for the future long-range development of the State. The purpose of the plan is to do the following:

- Identify the goals, objectives, policies, and priorities for the State

- Provide a basis for determining priorities and allocating limited resources, such as public funds, services, human resources, land, energy, water, and other resources
- Improve coordination of Federal, State, and County plans, policies, programs, projects, and regulatory activities
- To establish a system for plan formulation and program coordination to provide for an integration of all major State and County activities

The plan presents the objectives and policies for an array of issues, including the economy and environment, facility systems, and socio-cultural advancement. The sections of the plan that are most relevant to the Proposed Action are HRS §226-18(a) and (b), which present the objectives and policies for energy facility systems. These are listed as follows:

§226-18 (a) Planning for the State's facility systems with regard to energy shall be directed toward the achievement of the following objectives, giving due consideration to all:

(1) Dependable, efficient, and economical statewide energy systems capable of supporting the needs of the people;

(2) Increased energy self-sufficiency where the ratio of indigenous to imported energy use is increased;

(3) Greater energy security in the face of threats to Hawai`i's energy supplies and systems; and

(4) Reduction, avoidance, or sequestration of greenhouse gas emissions from energy supply and use.

(b) To achieve the energy objectives, it shall be the policy of this State to ensure the provision of adequate, reasonably priced, and dependable energy services to accommodate demand.

By capturing the wind resources that naturally occur on the proposed Kawailoa wind farm site, the project would produce clean, renewable energy, thus contributing to energy self-sufficiency by increasing the ratio of indigenous to imported energy use. The project would generate up to 70MW of clean, renewable power, contributing to the array of renewable energy projects in Hawai`i and thus increasing energy security for the State. Wind-based energy production generates minimal emissions and, as such, the project would help to reduce greenhouse gas emissions associated with State's energy supply.

5.2.3 Hawai`i Environmental Impact Review Law (HRS Chapter 343)

Hawaii Revised Statutes Chapter 343 is designed to "establish a system of environmental review which will ensure that environmental concerns are given appropriate consideration in decision making along with economic and technical considerations." The regulations identify nine specific activities that trigger the need for compliance. The Proposed Action involves two activities that are triggers for compliance with HRS Chapter 343: (1) use of State or County lands or funds and (2) use of land classified as Conservation District. The Mt. Ka`ala communication sites would be located on land owned by the State of Hawai`i, which is within the State Conservation District. This EIS has been prepared in compliance with HRS Chapter 343. Pursuant to HRS Chapters 343 and 201N, DBEDT is the accepting authority for the EIS.

5.2.4 Hawai`i State Environmental Policy (HRS Chapter 344)

The purpose of HRS Chapter 344 is to "establish a State policy which will encourage productive and enjoyable harmony between people and their environment, promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, and enrich the understanding of the ecological systems and natural resources important to the people of Hawai`i." This policy specifies that the programs, authorities, and resources of the State be used to conserve natural resources and improve the quality of life. Specific guidelines that are relevant to the project relate to (1) land, water, mineral, visual, air and other natural resources; (2) flora and fauna; (3) economic development; and (4) energy. The project is considered to be consistent with these guidelines and the overall policy, as it would serve to provide clean renewable energy, with minimal impact to open space and natural resources.

5.2.5 Hawai`i State Land Use Law (HRS Chapter 205)

The State Land Use Law (HRS Chapter 205) established the State LUC, which has the authority to designate all State lands into one of four districts: Urban, Rural, Agricultural, or Conservation. Permitted uses within each district are listed under HRS Chapter 205 and the State LUC's Administrative Rules (HAR Title 15, Subtitle 3, Chapter 15). The proposed project is located entirely within the State agricultural district, with the exception of the Mt. Ka`ala communication sites, which are located in the conservation district.

HRS Chapter 205-2(d) states that agricultural districts shall include:

> "(4) Wind generated energy production for public, private and commercial use; and… (7) Wind machines and wind farms;"

Permitted uses within the agricultural district are further defined in HRS §205-4.5 and the State LUC's Administrative Rules (HAR Title 15, Subtitle 3, Chapter 15), and take into consideration the LSB land classification system. Pursuant to HRS §205-4.5(a) and HAR §15-15-25, permissible uses on agricultural district lands with an overall LSB productivity rating of A or B include:

> "Wind energy facilities, including the appurtenances associated with the production and transmission of wind generated energy; provided that such facilities and appurtenances are compatible with agriculture uses and cause minimal adverse impact on agricultural land."

HRS §205-4.5(c) and HAR §15-15-25 state that permissible uses on agricultural district lands with an overall LSB productivity rating of C, D, E, or N (unrated) are those uses permitted in A and B lands, and also those uses set forth in HRS §205-2(d), as described above.

5.2.6 Conservation District (HRS Chapter 183C)

Land uses within the State Conservation District are under the sole jurisdiction of the State and are governed by HRS Chapter 183C and HAR §13-5. The Conservation District was created to protect important natural resources essential to the preservation of the state's fragile natural ecosystems and the sustainability of the State's water supply. The Conservation District is divided into five subzones: protective, limited, resource, and general, and a "special" subzone to accommodate unique projects (HRS §183C-1). The Mt. Ka`ala communication sites are located within the protective subzone of the Conservation District.

The DLNR Office of Conservation and Coastal Lands (OCCL) is responsible for regulating land uses within the Conservation District. HAR §13-5-22 identifies those land uses which may be permitted within the protective subzone, which include "*energy generation facilities utilizing the renewable resources of the area (e.g., hydroelectric or wind farms) and communication systems and other such land uses*" (P-6, Public Purpose Uses). This land use is permitted with the issuance of a Conservation District Use Permit. This EIS will be submitted in support of the application for a Conservation District Use Permit.

The criteria that would be used in evaluating the project are provided in HAR §13-5-30(c). These are listed below, with a discussion of how each criterion is addressed by the Proposed Action.

> *(1) The proposed land use is consistent with the purpose of the conservation district;*

The purpose of the Conservation District is to conserve, protect, and preserve the important natural resources of the State through appropriate management and use to promote their long-term sustainability and the public's health, safety, and welfare (HAR §13-5-1). As discussed throughout this EIS, the proposed project would help reduce the State's dependence on imported fossil fuels for electricity, thereby contributing to improved air quality and enhanced energy security and independence. Thus, it is in keeping with the purpose of the Conservation District.

> *(2) The proposed land use is consistent with the objectives of the subzone of the land on which the use will occur;*

The Mt. Ka`ala communication sites are located in the protective subzone of the Conservation District. The objective of this subzone is to protect valuable resources in designated areas such as restricted watershed, marine, plant, and wildlife sanctuaries, significant historic, archaeological, geological, and volcanological features and sites, and other designated unique areas [HAR §13-5-11(a)]. The communication equipment at these sites would be installed on existing structures and is not expected to affect any of the natural resources or otherwise preclude future uses in this area for conservation purposes. As such, it is consistent with the intent of the protective subzone.

> *(3) The proposed land use complies with provisions and guidelines contained in chapter 205A, HRS, entitled "Coastal Zone Management," where applicable;*

The discussion in Section 5.2.5 below confirms the consistency of the project with the Coastal Zone Management Act and the objectives outlined in HRS Chapter 205A.

> *(4) The proposed land use will not cause substantial adverse impact to existing natural resources within the surrounding area, community or region;*

The communication equipment at these sites would be installed on existing structures and, as described in Section 3.5, is not expected to affect any of the natural resources in the area or region.

> *(5) The proposed land use, including buildings, structures and facilities, shall be compatible with the locality and surrounding areas, appropriate to the physical conditions and capabilities of the specific parcel or parcels;*

The communication equipment at these sites would be installed on existing structures and the dish antennae would be similar in size and appearance to those that currently exist onsite. Installation and operation of the equipment is not expected to affect any of the natural resources or otherwise preclude future uses in this area for conservation purposes.

(6) The existing physical and environmental aspects of the land, such as natural beauty and open space characteristics, will be preserved or improved upon, whichever is applicable;

The communication equipment at these sites would be installed on existing structures and the dish antennae would be similar in size and appearance to those that currently exist onsite. No physical disturbance of the ground would occur, and installation and operation of the equipment is not expected to affect the overall scenic values or open space characteristics of the area.

(7) Subdivision of land will not be used to increase the intensity of land uses in the conservation district;

No property subdivision is needed or proposed for the proposed project. Kawailoa Wind is working with DLNR to negotiate a lease for the communication sites.

(8) The proposed land use will not be materially detrimental to the public health, safety and welfare.

The site is located well away from residences and other public areas. The project would not be detrimental to public health, safety, or welfare, and in fact, is expected to improve public health and safety by significantly reducing greenhouse gas emissions in the State.

5.2.7 Coastal Zone Management (HRS Chapter 205A)

Enacted as HRS Chapter 205A, the Hawai`i Coastal Zone Management (CZM) Program was promulgated in 1977 in response to the Federal Coastal Zone Management Act of 1972 (16 U.S.C. §1451-1456). The CZM area encompasses the entire state, including all marine waters seaward to the extent of the state’s police power and management authority, including the 12-mile U.S. territorial sea and all archipelagic waters. The Hawai’i Coastal Zone Management Program integrates decisions made by state and county agencies such as the Land Use Commission, DLNR, Department of Health, Department of Transportation, and Department of Agriculture to provide greater coordination and compliance with existing laws and rules. Specifically, the program focuses on ten policy objectives:

- Recreational Resources. To provide coastal recreational opportunities accessible to the public and protect coastal resources uniquely suited for recreational activities that cannot be provided elsewhere.
- Historic Resources. To protect, preserve, and where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.
- Scenic and Open Space Resources. To protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources.
- Coastal Ecosystems. To protect valuable coastal ecosystems, including reefs, from disruption and to minimize adverse impacts on all coastal ecosystems.
- Economic Uses. To provide public or private facilities and improvements important to the state's economy in suitable locations; and ensure that coastal dependent

development such as harbors and ports, energy facilities, and visitor facilities, are located, designed, and constructed to minimize adverse impacts in the coastal zone area.

- Coastal Hazards. To reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.
- Managing Development. To improve the development review process, communication, and public participation in the management of coastal resources and hazards.
- Public Participation. To stimulate public awareness, education, and participation in coastal management; and maintain a public advisory body to identify coastal management problems and provide policy advice and assistance to the CZM program.
- Beach Protection. To protect beaches for public use and recreation; locate new structures inland from the shoreline setback to conserve open space and to minimize loss of improvements because of erosion.
- Marine Resources. To implement the state's ocean resources management plan.

Key components of the CZM program include (1) regulation of development within the SMA, a designated area extending inland from the shoreline, (2) a Shoreline Setback Area, which serves as a buffer against coastal hazards and erosion, and protects view planes; and (3) a Federal Consistency provision, which requires that Federal activities, permits, and financial assistance be consistent with the Hawai`i CZM program.

The wind farm site is located on the *mauka* side of Kamehameha Highway and would not include any improvements within the SMA. As documented throughout this EIS, the proposed project would not significantly affect coastal resources, and as such, is considered to the consistent with the CZM program. A Federal Consistency determination will be obtained, as needed.

5.2.8 National Historic Preservation Act

The National Historic Preservation Act of 1966 (NHPA) is the primary Federal law protecting cultural, historic, Native American, and Native Hawaiian resources. Section 106 of the NHPA (36 CFR 800) requires Federal agencies to assess and determine the potential effects of their proposed undertakings on prehistoric and historic resources (such as sites, buildings, structures, and objects) and to develop measures to avoid or mitigate any adverse effects. Section 106 consultation is regulated by the DLNR-SHPD. HRS Chapter 6E (Historic Preservation) is also implemented by SHPD, and requires evaluation of any project that is funded or permitted by the State. In addition, HRS Chapter 343 includes a requirement to consider cultural practices as part of an environmental review of the effects of a Proposed Action. A cultural impact assessment is typically prepared to address this requirement. As described in Section 3.6, both a detailed archaeological inventory and a cultural impact assessment are being conducted. Information obtained to date is presented in Section 3.6; complete results will be presented in the Final EIS. SHPD will be provided a copy of this Draft EIS and the detailed archaeological and cultural reports; their comments, if any, will be included in the Final EIS.

5.2.9 State Endangered Species Act (HRS §195D-4)

Any species of aquatic life, wildlife, or land plant that has been determined to be threatened or endangered species pursuant to the ESA is also considered to be threatened or endangered under the State Law, and subject to the conditions of HRS §195D-4. In addition, any indigenous species may be determined by DLNR to be threatened or endangered based on the following factors:

- The present or threatened destruction, modification, or curtailment of its habitat or range
- Overutilization for commercial, sporting, scientific, educational, or other purposes
- Disease or predation
- The inadequacy of existing regulatory mechanisms
- Other natural or artificial factors affecting its continued existence within Hawai`i

As previously described, Kawailoa Wind has made a commitment to prepare an HCP and apply for an Incidental Take Permit and Incidental Take License from the USFWS and DOFAW, respectively, for the Kawailoa wind farm facility. The purpose of the HCP is to ensure that a net conservation benefit is provided for any listed species covered under the plan. The HCP would cover the seven species described in Section 3.5.2.3: Newell's shearwater, Hawaiian duck, Hawaiian stilt, Hawaiian coot, Hawaiian moorhen, Hawaiian short-eared owl, and Hawaiian hoary bat. No Federally or State listed plant species are present within the project site.

5.2.10 Mt. Ka`ala Natural Area Reserve Management Plan

In 1970, the State of Hawai`i established the State Natural Area Reserve System (NARS) in recognition of important and unique natural resources. The NARS is legally mandated to *"preserve in perpetuity specific land and water areas which support communities, as relatively unmodified as possible, of the natural flora and fauna, as well as geological sites, of Hawai`i"* (HRS §195-1). The Mt. Ka`ala Management Plan describes the management programs at the 1,100 acre Mt. Ka`ala NAR and includes the following priorities:

- *Priority #1 – Ungulate Control Program,*
- *Priority #2 – Non-native Plant Control Program,*
- *Priority #3 – Monitoring Program, and*
- *Priority #4 – Public Education and Volunteer Program*

The communication site located at the existing Hawaiian Telcom repeater station is directly adjacent to the Mt. Ka`ala NAR, but is not believed to be subject to the requirements of the management plan as it appears to fall just outside the NAR boundaries. However, if it is determined that this site is subject to management under the plan, activities would require compliance with Priority #2, Non-native Plant Control Program. As described in Section 3.5.3.1, BMPs would be implemented during construction activities to limit the introduction and spread of introduced plant species which are already or may become invasive vegetation in the Mt. Ka`ala NAR.

5.3 County Plans and Policies

5.3.1 City and County of Honolulu General Plan

The City and County of Honolulu's General Plan is the policy document for the long-range development of the Island of O`ahu. The General Plan is a statement of general conditions to be sought in the 20 year planning horizon and policies to help direct attainment of the plan's objectives.

Specific General Plan goals and policies applicable to the Proposed Action are as follows:

Natural Environment

Objective A – To protect and preserve the natural environment

Policy 1 – Protect O`ahu's natural environment, especially the shoreline, valleys, and ridges from incompatible development.

Objective B – To preserve and enhance the natural monuments and scenic views of O`ahu for the benefit of both residents and visitors.

Policy 1 – Protect the Island's well-known resources: its mountains and craters; forests and watershed areas; marshes, rivers, and streams; shoreline, fishponds, and bays; and reefs and offshore islands.

Policy 2 – Protect O`ahu's scenic views, especially those seen from highly developed and heavily traveled areas.

Policy 3 – Locate roads, highways, and other public facilities and utilities in areas where they will least obstruct important views of the mountains and the sea

Environmental due diligence conducted to date includes extensive biological surveys of the site to identify existing habitats, native ecosystems, and threatened and endangered species. The project is being designed to minimize disturbance to ecologically sensitive habitats and species, and also to minimize encroachment into the City and County of Honolulu's Preservation Districts. In addition, natural gulches, streams, and drainages were identified and their avoidance would be taken into consideration in the final design of the Kawailoa wind farm project.

A visual analysis was also conducted to assess the potential effect of the Proposed Action on the North Shore's scenic resources. Consideration was taken with regard to maximizing the distance of associated wind farm components (that is, substation, O&M building, and BESS) from Kamehameha Highway and placement of collector lines underground where feasible.

Energy

Objective A – To maintain an adequate, dependable, and economical supply of energy for O`ahu residents

Policy 1 – Develop and maintain a comprehensive plan to guide and coordinate energy conservation and alternative energy development and utilization programs on O`ahu.

Objective D – To develop and apply new, locally available energy resources.

Policy 1 – Support and participate in research, development, demonstration, and commercialization programs aimed at producing new, economical, and environmentally sound energy supplies from:

a. Solar insolation;

b. Biomass energy conversion;

c. Wind energy conversion;

d. Geothermal energy; and

e. Ocean thermal energy conversion.

The nature of the Proposed Action meets the County General Plan's energy objectives and policies as stated above.

5.3.2 North Shore Sustainable Communities Plan

The City and County of Honolulu is divided into eight regional areas. Each area is guided by Development Plans (DPs) or Sustainable Community Plans (SCPs) required by City Charter and administered by the Department of Planning and Permitting. The plans are intended to help guide public policy, investment, and decision-making through the 2020 planning horizon (DPP, July 2000). The proposed wind farm facility is within the region guided by the North Shore SCP and includes the towns of Hale`iwa and Waialua, and the residential communities of Mokuleia, Kawailoa, and Sunset/Pūpūkea.

Planning principles and guidelines included in the SCP provide specific guidance to public agencies and private entities in terms of planning, design, and implementation of projects and programs in the various land use categories. These land use categories include open space and the natural environment, agriculture, parks and recreation, historic and cultural resources, residential communities, commercial areas, industrial areas, visitor facilities, institutional uses, and military uses. Specific North Shore SCP land use policies applicable to the Proposed Action are as follows:

3.1.1 Open Space and Natural Environment General Policies

- *Protect significant natural features*
- *Protect ecologically sensitive lands*
- *Protect scenic views*

Environmental due diligence conducted to date includes extensive biological surveys of the site to identify existing habitats, native ecosystems, and threatened and endangered species. The proposed project has been designed to minimize disturbance to ecologically sensitive habitats (including natural gulches, streams and drainages) and species and also to minimize encroachment into the State Conservation District and North Shore SCP preservation districts.

A visual analysis was also conducted to assess the potential effect of the Proposed Action on the North Shore's scenic resources. Consideration would be taken to maximize the distance of associated wind farm components (that is, turbines, substation, O&M building, and BESS) from Kamehameha Highway and place collector lines underground where feasible.

3.2.1 Agriculture General Policies

- *Protect all important agricultural lands, regardless of current crop production capabilities, from uses that would undermine or otherwise irreversibly compromise their agricultural potential and crop production capabilities.*

Road access improvements on Kamehameha School property formerly used for agriculture would be required for the construction and operation of the proposed project. These improvements would once again provide access to agricultural lands formerly used to produce sugarcane but has since become inaccessible. Furthermore, the operation and maintenance of the wind turbines allow the lands on which they are located to be concurrently used for agriculture.

3.4.1 Historic and Cultural Resources General Policies

- *Preserve significant historic features from earlier periods*
- *Respect significant historic resources by applying appropriate management policies and practices. Such practices may range from total preservation to integration with contemporary uses.*
- *Restore or keep intact sites with cultural and/or religious significance out of respect for their inherent cultural and religious values.*

Archaeological and cultural surveys were conducted as part of the environmental due diligence effort to identify plantation-era and historic resources. Such features are to be avoided or managed accordingly as part of the final design and construction of the wind farm facility.

The implementation of the North Shore SCP also includes the integration of general policies and principles for public facilities and infrastructure. As such, the following public facilities and infrastructure policy is applicable to the Kawailoa wind farm project:

4.4.1 Electrical Power Development General Policies

- *Additions to utility systems and other public facilities should be located in areas where they will least obstruct important views. Locate and design system elements such as renewable electrical power facilities, substations, communication sites, and transmission lines to avoid or mitigate any potential adverse impacts on scenic and natural resources. Locating powerlines underground or away from Kamehameha Highway is desired.*

The location of wind farm components such as turbines, substations, BESS, O&M building, collector lines, onsite access roads, were determined based on the location of suitable wind resources and existing facilities (that is, former agriculture roads and existing sub-transmission lines). Consideration was also taken with regard to maximizing the distance of these components from Kamehameha Highway and placement of collector lines underground where feasible.

5.3.2 County Zoning

The City and County of Honolulu's LUO regulates land use and specifies development and design standards for activities within each of the City and County zoning districts. The proposed wind farm site is located within the AG-1 Restricted Agricultural District. A very small area along the northern edge of the site is zoned as P-1, Restricted Preservation; however, pursuant to the LUO, regulatory authority within the P-1 District is delegated to the appropriate State agency. In this case, the area identified as part of the P-1 District is within the State Agricultural District.

Under Section 21-10.1 of the LUO, wind machines are defined as "devices and facilities, including appurtenances, associated with the production and transmission of wind-generated energy." As shown in the LUO Master Use Table, within the AG-1 Restricted Agricultural District, wind machines are considered a Special Accessory Use, subject to the development standards contained in Section 21-5. The development standards for wind machines, as listed in LUO Section 21-5.700, require that "all wind machines shall be setback from all property lines a minimum distance equal to the height of the system. Height shall include the height of the tower and the farthest vertical extension of the wind machine." In addition, wind machines with a rated capacity of more than 100 kilowatts require a Conditional Use Permit (minor).

Within the proposed wind farm site, a Joint Development Agreement will be developed to establish a single legal lot, for the purposes of zoning for the project. All the turbines have been set back a minimum of 500 feet from the boundary of the area that would be covered by that agreement. A Conditional Use Permit would be obtained for both the proposed project, as well as the Joint Development Agreement. As previously described, no improvements are planned within the SMA; therefore, an SMA permit is not expected to be required.

5.4 Kamehameha Schools North Shore Master Plan

In 2008, Kamehameha Schools conducted a master planning effort to develop a framework for sustainable management for all its land holdings on the north shore of O`ahu. The resulting plan identified a range of development concepts, including outdoor education, diversified agriculture, and renewable energy, all of which were developed with community input and reflect the vision and mission of Kamehameha Schools. Seven catalyst projects were described in the Master Plan, one of which was a wind energy project on lands that were historically part of Kawailoa Plantation, a sugar cane plantation operated by Waialua Sugar Company (Kamehameha Schools, 2008). The development concepts included diversified agricultural activities within and adjacent to the wind energy project. The Proposed Action is not expected to affect any of the existing agricultural operations in the area, and Kamehameha Schools is actively pursuing other agricultural activities in the areas surrounding the wind farm facilities. As such, the Proposed Action is consistent with the objectives of the master plan, and project development continues to be closely coordinated with Kamehameha Schools.

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6.0 List of Required Permits

Implementation of the proposed project would require permits from a variety of Federal, State and local agencies. The potential permits or approvals that are expected to be required, or could potentially be required, are presented in Table 29 below.

TABLE 29
Permits and Approvals Required for the Kawailoa Wind Farm Project

Permit/Approval	Project Component Requiring Permit/Approval	Agency/Entity	Status
FEDERAL [a]			
Incidental Take Permit [Endangered Species Act, Section 10(a)(1)(B))]	Wind Farm Facility	USFWS	Ongoing (consultation initiated in June 2009)
Federal Aviation and Administration (FAA) Determination of No Hazard to Air Navigation	Wind Farm Facility	FAA	Application filed on 12/15/2011
Federal Communications Commission (FCC) License	Wind Farm Facility Communications Facility	FCC	To be completed
National Environmental Policy Act (NEPA) Compliance	Wind Farm Facility	USFWS	Environmental assessment to be completed
STATE OF HAWAI`I [b]			
State of Hawai`i Chapter 343 Compliance	Communications Facility Wind Farm Facility	DBEDT	In progress; this DEIS published in February 2011
Endangered Species Incidental Take License and Habitat Conservation Plan	Wind Farm Facility	DLNR DOFAW	Ongoing (consultation initiated in July 2010)
Request for Use of State Lands	Communication Facility	DLNR, Land Management Division	To be completed
Conservation District Use Permit	Communication Facility	DLNR OCCL	To be completed
Forest Reserve System Special Use Permit	Communication Facility	DLNR DOFAW	To be determined if permit is required
Noise Permit	Wind Farm Facility	HDOH	To be determined if permit is required
Coastal Zone Management Act (CZMA) Federal Consistency Determination	Wind Farm Facility	DBEDT, Office of Planning	To be completed
State Historic Preservation Division (SHPD) Notification and Review	Communications Facility Wind Farm Facility	DLNR-SHPD	To be completed
Operate or Transport Oversize and/or Overweight Vehicles and Loads Permit	Wind Farm Facility	HDOT Highways	To be completed
National Pollutant Discharge Elimination System (NPDES) Construction Permit	Communications Facility Wind Farm Facility	HDOH CWB	To be completed

TABLE 29
Permits and Approvals Required for the Kawailoa Wind Farm Project

Power Purchase Agreement (PPA)	Wind Farm Facility	HECO, PUC [c]	Ongoing (HECO granted First Wind the rights to negotiate a PPA in 2009)
CITY AND COUNTY OF HONOLULU [d]			
Conditional Use Permit (minor)	Wind Farm Facility	DPP	To be completed
Conditional Use Permit (minor) for a Joint Development Agreement	Wind Farm Facility	DPP	To be completed
Grading/Grubbing/Stockpiling/Building and Other Construction Permits	Communications Facility Wind Farm Facility	DPP	To be completed

NOTES:

[a] Based on the current site layout, impacts to Waters of the United States (including wetlands) have been avoided to the maximum extent possible. Permit requirements associated with road improvements to Cane Haul Road at the intersection with Laniakea Stream are being evaluated.

[b] Under HRS 205-4.5(14), it is understood that the proposed wind farm is considered a permissible use, and therefore a Special Use permit is not expected to be required.

[c] HECO would be responsible for obtaining approval of the PPA from the PUC.

[d] Based on current design considerations, no improvements are anticipated within the SMA; therefore, an SMA permit is not expected to be required.

7.0 Consultation and Distribution

Over an 18-month period beginning in 2007, Kamehameha Schools conducted a broad community outreach and communication effort as part of their master planning process. This process used a community dialogue structure and provided interested stakeholders and members of the general public with multiple opportunities to learn about the plan. The structure was based on a variety of meeting formats, including small-group stakeholder meetings (that is, 6 to 12 stakeholders), community liaison meetings (that is, with recognized community leaders), large-group public meetings, neighborhood board presentations, and briefings with elected officials. They consulted with more than 30 small and large community groups that included *kūpuna* (elders), local farmers, business owners, community associations, schools and churches. The master plan and the catalyst project described therein were developed based on input and feedback obtained through the community outreach process. The plan received significant community support by virtue of the transparent methodology used in its development and its responsive integration of community values into an overall framework of regional sustainability. As one of the seven catalyst projects identified in the Master Plan, development of a wind project in the Kawailoa region has received broad exposure and was well supported in nearly every one of the more than 30 community meetings convened during the master planning process.

7.1 Agency and Public Consultation

Subsequent to purchasing the rights to the project, Kawailoa Wind began consultations with a variety of agencies, public entities and community members. The purpose of the consultations was to provide information about the status of the project and request input on project development. The list of parties consulted to date is presented below in Table 30.

TABLE 30
Agencies and Other Parties Consulted To Date

Agency/Entity	Contact Name	Date of Consultation
US Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office	Mr. James Kwon	June 2009
State of Hawai`i Department of Land and Natural Resources, Office of Coastal and Conservation Lands	Ms. Tiger Mills, Planner	June 24, 2010
	Mr. Sam Lemmo, Administrator	July 15, 2010
State of Hawai`i, DLNR, Division of Forestry and Wildlife (DOFAW)	Ms. Lauren Goodmiller	July 2010
	Ms. Sandee Hufana	August 12, 2010
State of Hawai`i Department of Business and Economic Development and Tourism	Ms. Malama Minn Mr. Cameron Black	September 9, 2010 January 21, 2010
	Mr. Josh Strickler	September 14, 2010
Outdoor Circle	Mr. Roberts Leinau	September 13, 2010
Endangered Species Recovery Committee (ESRC)	ESRC members	September 23, 2010 December 6, 2010 December 7, 2010

TABLE 30
Agencies and Other Parties Consulted To Date

Agency/Entity	Contact Name	Date of Consultation
North Shore Neighborhood Board	Mr. Mike Lyons, Chair	October 26, 2010
Office of Deputy Assistant Secretary of the Army	Mr. Howard Killian	October 27, 2010
Regional Mission Compatibility Review Team (RMCRT)	Mr. Howard Killian Representatives of affected DoD services (including the Army, Marine Corps, Navy and Air Force)	November 10, 2010 December 15, 2010 January 24, 2011
North Shore Chamber of Commerce	Ms. Antya Miller	November 16, 2010
Waimea Valley	Ms. Gail Ann Chew	January 5, 2011
State of Hawai'i Department of Transportation	Mr. George Abcede Mr. Scott Naleimaile	January 24, 2011
City and County of Honolulu, Department of Planning and Permitting (DPP)	Mr. Jamie Pierson	January 25, 2011
State of Hawaii Land Use Commission	Mr. Dan Davidson Mr. Scott Derrickson	January 31, 2011
State of Hawai`i Department of Health, Office of Environmental Quality Control (OEQC)	Mr. Leslie Segundo Mr. Herman Tuiolosega	January 31, 2011
State of Hawai`i Department of Business, Economic Development, and Tourism (DBEDT) Office of Planning	Ms. Mary Lou Kobayashi Ms. Mary Alice Evans Ms. Ruby Edwards Mr. Shichao Lii	February 7, 2011

7.2 EISPN Distribution

Pursuant to HRS 343, an EIS Preparation Notice (EISPN) was prepared and provided for public review and comment on September 23, 2010. The 30-day comment period was held from September 23 to October 23, 2010. A public meeting was not held in conjunction with the comment period, as Kawailoa Wind chose to hold smaller meetings over a longer period of time, as listed in Table 30.

Hard copies of the EISPN were distributed to a variety of individuals and organizations, requesting their comments on the proposed scope of the analysis. In addition, electronic notification (via email) of the EISPN publication online in the HDOH OEQC register was sent to a variety of individuals and organizations, requesting their comments on the proposed scope of the analysis. Comments on the EISPN were received from the following parties:

- Gregory S. Erdman, OCAS, Inc.
- State of Hawai`i Department of Accounting and General Services
- State of Hawai`i Department of Land and Natural Resources, Office of Conservation and Coastal Lands
- Daniel Akaka, U.S. Senator

- Department of Defense, Regional Environmental Coordinator, Region 9
- United States Marine Corps
- Surfrider Foundation, O`ahu Chapter

In general, these comments addressed the following topics:

- Potential negative impacts of flashing red light lights on wind turbine generators, and use of specialized lighting atop the wind turbine generators
- Coordination of project with existing facilities on Mt. Ka`ala
- Potential for impacts if wind farm facilities are built on the *makai* side of Kamehameha Highway
- Potential for the wind farm project to negatively impact agricultural use of land
- Potential impacts to military training and operations conducted in the vicinity of the planned project, including cumulative impacts of the Kahuku and Kawailoa wind farm projects
- Potential impacts to aircraft operations at Wheeler Army Airfield
- Potential visual impacts of the project on nearby communities

Pursuant to HAR §11-200, responses were provided to each individual or organization that commented on the EISPN. Copies of the comment letters or emails, and the associated response to each are provided in Appendix C.

7.3 Draft EIS Distribution

The distribution list for the Draft EIS is listed in Table 31. In addition, a limited number of documents will be provided as loan copies in libraries.

TABLE 31
Draft EIS Distribution List

Federal Agencies	**Libraries**
U.S. Army Engineer Division	Municipal Library, Honolulu
U.S. Fish and Wildlife Service	Legislative Reference Bureau
U.S. Natural Resources Conservation Service	State Main Library
U.S. Federal Aviation Administration	UH Hamilton
U.S. Federal Highway Administration	Hawaii Documents Center, Hawaii State Library
U.S. EPA – Pacific Islands Office	Kaimuki Regional Library
Office of Deputy Asst. Secretary of the Army	Kaneohe Regional Library
U.S. Department of Energy	Pearl City Regional Library
Federal Communications Commission	Hawaii Kai Regional Library
	Hilo Regional Library
State Agencies	Kahului Public Library
Department of Agriculture	Lihue Regional Library
Department of Accounting and General Services	Waialua Public Library

TABLE 31
Draft EIS Distribution List

DBEDT	Kahuku Public Library
DBEDT – Energy Division	
DBEDT – Office of Planning	**Elected Officials**
Department of Defense	U.S. Senator Daniel Akaka
Department of Education	U.S. Senator Dan Inouye
Department of Hawaiian Home Lands	U.S. Representative Mazie Hirono
Department of Health	State Senator Donovan Dela Cruz
Department of Human Services	State Representative Gil Riviere
Department of Labor and Industrial Relations	Governor Neil Abercrombie
DLNR	Mayor Peter Carlisle
DLNR – Historic Preservation Division	County Councilperson Ernest Martin
Department of Transportation	North Shore Neighborhood Board Chair
State Civil Defense	
State Land Use Commission	**Citizen Groups, Individuals and Consulted Parties**
Hawaii Housing Finance and Development Corp.	Kamehameha Schools
Office of Hawaiian Affairs	Sierra Club
UH Environmental Center	Life of the Land
Public Utilities Commission	Trust for Public Land
	Waimea Valley
City and County of Honolulu	Outdoor Circle
Board of Water Supply	North Shore Chamber of Commerce
Department of Community Services	Regional Mission Compatibility Review Team (RMCRT)
Department of Design and Construction	Endangered Species Recovery Committee (ESRC)
Department of Environmental Services	Landowners of TMKs crossed by existing access roads
Department of Facility Maintenance	
Department of Planning and Permitting	**Utility Companies**
Department of Parks and Recreation	Hawaiian Telcom
Department of Transportation Services	Hawaiian Electric Company
Honolulu Fire Department	
Department Police Department	**News Media**
Oahu Civil Defense	Honolulu Star Advertiser

8.0 List of Preparers

The Draft EIS for the Kawailoa Wind Farm Project was prepared by CH2M HILL, with input by a variety of technical consultants and First Wind staff. The list of individuals and organizations that contributed to the document and their respective topic of responsibility is provided in Table 32.

TABLE 32
List of Preparers

Name	Primary Responsibility
Paul Luersen, AICP; CH2M HILL	Senior planner
Marc Dexter; CH2M HILL	Project manager
Lisa Kettley; CH2M HILL	Environmental planner
John Padre; CH2M HILL	Environmental planner
Curt Bagnall; CH2M HILL	Senior review
Kathleen Chu, P.E.; CH2M HILL	Civil engineering
Rebecca King; CH2M HILL	Air quality
Tom Priestly; CH2M HILL	Visual resources
Michael Stephan; CH2M HILL	Visual resources
Linsey Shariq; Critigen	GIS data management and mapping
Robert Hobdy	Botanical resources
Rechtman Consulting	Archaeological resources
Cultural Surveys Hawaii	Cultural impact assessment
SWCA Environmental Consultants	Habitat conservation plan
Power Engineers	Electrical engineering and interconnection
D.L. Adams Associates, Inc.	Noise impact analysis
Wren Wescoatt; First Wind	Development manager
Dave Cowan; First Wind	Environmental affairs
Steve Jiran; First Wind	Construction project manager
Kekoa Kaluhiwa; First Wind	Government and community relations

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