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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
3060 Eiwa Street, Room 306
Lihue, Kauai, HI 96766

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'12 MAY 11 P1:17
OFC. OF ENVIRONMENTAL QUALITY CONTROL

Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Director:

Subject: Draft Environmental Assessment for the Mana Plain Wetland Restoration Project, District of Waimea, Island of Kauai.

The Department of Land and Natural Resources/ Division of Forestry and Wildlife has reviewed the Draft Environmental Assessment for the Mana Plain Wetland Restoration Project, and anticipates a Finding of No Significant Impact. Please publish notice in the next available OEQC Environmental Notice.

We have enclosed a completed OEQC Publication Form and one (1) copy of the document in pdf format on a CD; and one (1) hardcopy of the Draft EA. Please call Jason Vercelli at (808) 241-3768 or email Jason.A.Vercelli@hawaii.gov if you have any questions.

Sincerely,

Galen Kawakami
Branch Manager
DOFAW Kauai

Agency Action EA
Chapter 343, HRS
Publication Form

Project Name: Draft Environmental Assessment for the Mana Plain Wetland Restoration Project

Island: Kauai
District: Waimea
TMK: (4) 1-2-2: portion 1

Permits: County of Kauai Grading Permit, County of Kauai Building Permit, US Fish and Wildlife Service Division of Migratory Birds Take Permit, NPDES Permit, Consultation with US Army Corps of Engineers, Consultation with State Historic Preservation Division, Section 7 Consultation with US Fish and Wildlife Service

Proposing/Determination Agency: State of Hawaii, Department of Land and Natural Resources, Division of Forestry and Wildlife, 3060 Eiwa St. Room 306, Lihue Hawaii 96766, Jason Vercelli (808) 241-3768

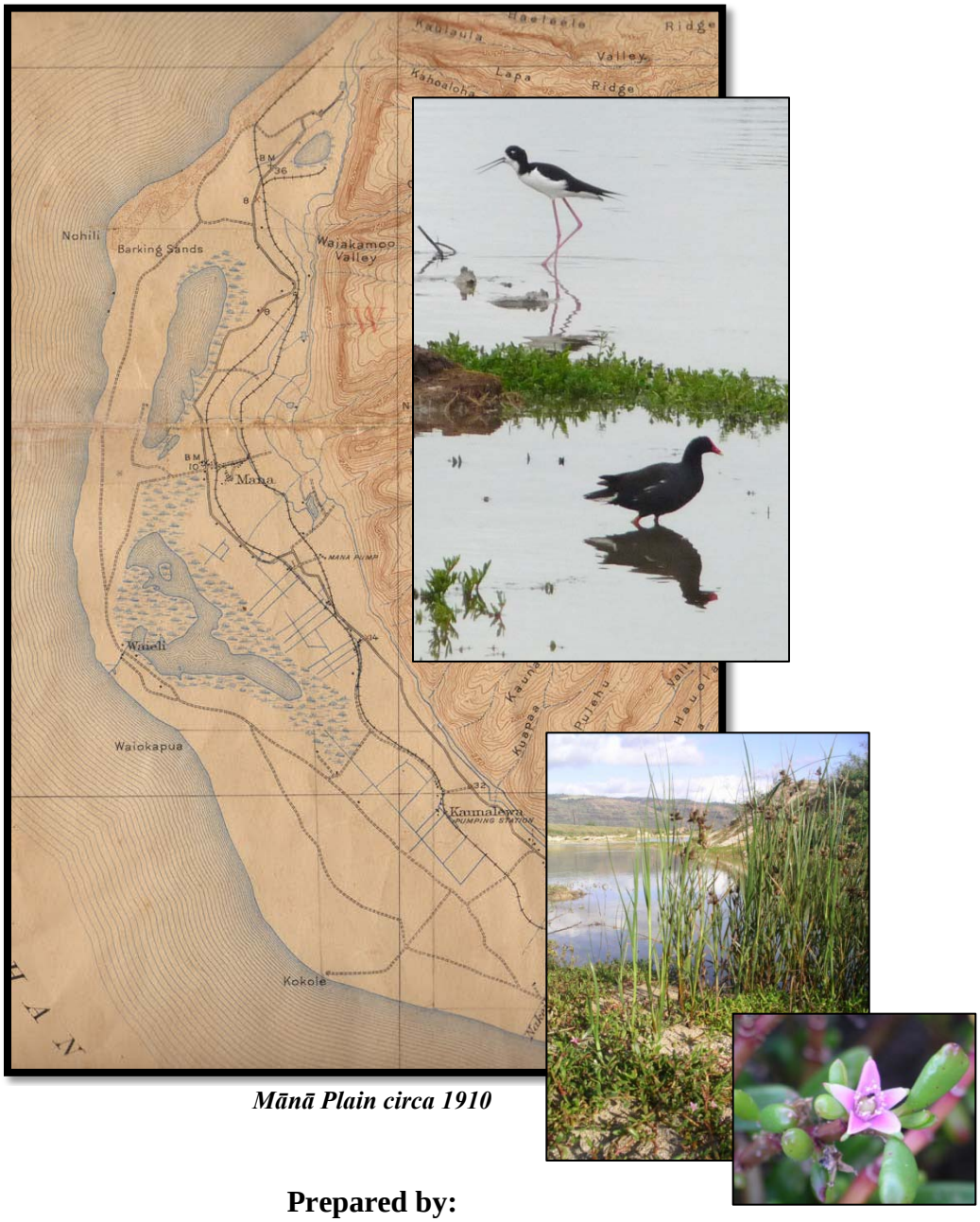
Status: 30-day comment period

Summary : The State of Hawai‘i, Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) is proposing to restore native wetland and associated uplands on 105 acres of the Mānā Plains Forest Reserve. This project will restore managed wetlands on a portion of the historical “Mānā Swamp” and will provide additional habitat to enhance DOFAW’s conservation and recovery efforts for the four endangered endemic Hawaiian waterbirds. Designated as a core wetland area in the Revised Recovery Plan for Hawaiian Waterbirds, this project will play an integral role in the recovery of endangered Hawaiian waterbirds. This project will also increase environmental education opportunities for local residents and visitors. These opportunities will focus on the natural and cultural resources of the Mānā Plain. The proposed action includes removing of non-native, invasive vegetation, contouring of wetland basins, installing a water delivery system, re-vegetating and seeding of native plants, and constructing a visitor center, pedestrian trails, interpretive signs, and a maintenance baseyard. The project is not expected to have negative direct, indirect, secondary or cumulative impacts on environmental resources. Best management practices and other measures will be implemented to reduce potential impacts.

Revised February 2012

DRAFT ENVIRONMENTAL ASSESSMENT

Mānā Plain Wetland Restoration



Mānā Plain circa 1910

Prepared by:

State of Hawai‘i Department of Land and Natural Resources
Division of Forestry and Wildlife

This document prepared pursuant to Chapter 343, HRS

May 2012

COVER SHEET

Project Name: Mānā Plain Wetland Restoration

Agency: State of Hawai‘i, Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW)

Project Location: Mānā Plains Forest Reserve, island of Kaua‘i

TMK: (4) 1-2-2: portion 1

Property Owner: State of Hawai‘i DLNR DOFAW

State Land Use Classification: Agriculture/Open

Anticipated Determination of Environmental Assessment: A Finding of No Significant Impact (FONSI) is expected for the project.

Point of Contant:
Jason Vercelli
Wildlife Biologist
State of Hawai‘i DLNR DOFAW
3060 ‘Eiwa Street, Room 306
Līhu‘e, Hawai‘i 96766-1875
ph. (808) 274-3433

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CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

The State of Hawai‘i Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW) is proposing to restore wetland and associated coastal upland habitat within the Mānā Plains Forest Reserve, on the western side of the island of Kaua‘i. This restoration project is referred to as the Mānā Plain Wetland Restoration Project. Restoration will occur on 105 acres immediately north of the existing Kawai‘ele parcel (also known as the Kawai‘ele Waterbird Sanctuary). The restoration plan identifies actions including 1) wetland and coastal strand restoration; 2) habitat restoration for native Hawaiian plants and native Hawaiian waterbirds; 3) improvements to support DOFAW operational needs; 4) environmental education, outreach, and wildlife-oriented recreation activities. Wetland restoration, as referred to throughout this EA, is defined as the rehabilitation of managed wetland habitats to support endangered Hawaiian waterbirds and native wetland plants in an area that historically contained natural wetland habitats.

The project site is located within the Mānā Plains Forest Reserve on the western leeward coast of the island of Kaua‘i (Figure 1.1 - 1), Tax Map Key (4) 1-2-2: portion 1. The 105 acre project site located at 21˚ 0’ 59.1” N, 159˚ 46’ 34.7”W, lies in close proximity to mile marker 31 on Kaumuali‘i Highway (State Highway 50). The triangular shaped project area’s western border parallels, at a distance of 2,000 feet, the runway of the Pacific Missile Range Facility, operated by the U.S. Navy. Its eastern boundary runs parallel to Kaumuali‘i Highway. The southern boundary is adjacent to a gravel road that is used to access the main Kawai‘ele pump station. The northern point of the proposed project site is located approximately one mile north of its southern border.

The Mānā Plain once contained expansive wetland habitats. Prior to its drainage and conversion to agricultural lands during the early 1900s, approximately 1,700 acres of permanent, semi-permanent, and seasonal wetlands were present on the Mānā Plain. This wetland complex was one of the largest of its kind in the Hawaiian Islands. Approximately 200 acres of aquatic habitats exist on the Mānā Plain currently. These habitats include manmade drainage ditches, reservoirs, and artificial open water and wetland habitats. Most of these aquatic habitats only provide marginal resources for endemic Hawaiian waterbirds due to the presence of invasive vegetation, mammals, and invasive fish species.

Funding for the planning and restoration of the Mānā Plain was provided by the U.S. Fish and Wildlife Service, the State of Hawai‘i, PAHIO Development, Inc., the Pacific Coast Joint Venture, and other partners. Restoration actions and improvements involving the use of State funds and lands are subject to the environmental documentation requirements under Hawai‘i Revised Statutes, Chapter 343, Environmental Impact Statements. This Environmental Assessment (EA) discusses alternatives for the proposed action, including the no-action alternative. These alternatives will be considered to determine which is most responsive to the proposed project’s purpose and need. Subsequent chapters of the EA evaluate the environmental effects and consequences of implementing these alternatives as well as mitigation measures that will be taken to reduce environmental impacts.

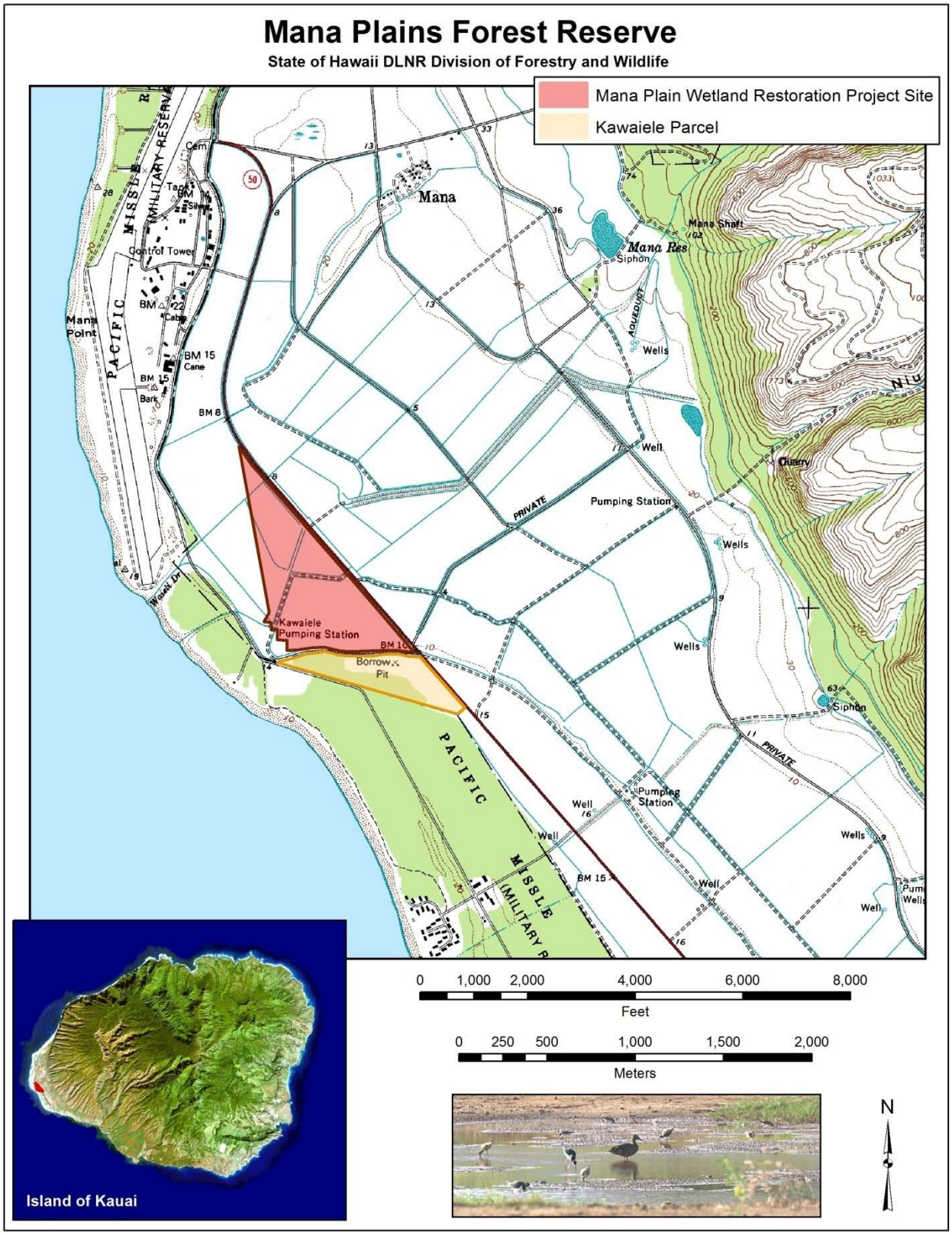


Figure 1.1 - 1. General location of the project site on the west side of the island of Kaua‘i.

1.2 HISTORY OF THE PROJECT

The project site was formerly leased from the State of Hawai‘i by the Kekaha Sugar Company, General Lease No.S-4222, for the cultivation of sugarcane. Sugarcane was last cultivated at the project site during the mid-1990s. The restoration of 313 acres of wetlands on the Mānā Plain was proposed by DOFAW in 2001. Following discussions with the U.S. Navy, the original proposed 313 acres was reduced to 105 acres in 2002 to accommodate the Navy's request to set back the project 2,000 feet from the Pacific Missile Range Facility runway to reduce bird-aircraft strike hazards.

Since 1997 and prior to the transfer of management jurisdiction to DOFAW, the status of the land was vacant and unencumbered. On November 5, 2003 the Board of Land and Natural Resources (BLNR) approved the transfer of 105 acres from the State Land Division to DOFAW as an addition to the Kawai‘ele Waterbird Sanctuary.

Based on the survey map completed by a surveyor for the U.S. Navy, DOFAW submitted a request to the BLNR on May 27, 2005 to designate 142 acres (including the existing Kawai‘ele Waterbird Sanctuary and the proposed 105 acre project site) as the Mānā Plains Forest Reserve. Executive Order 4209, dated November 14, 2007, established Mānā Plains Forest Reserve incorporating lands from previous Executive Orders, known as the Kawai‘ele Waterbird Sanctuary, and the adjacent 105 acres, the proposed project site for this EA.

Restoration planning for the area was initiated during 2004, following the before mentioned transfer of management responsibilities. Information on hydrologic conditions and biological resources has been collected since January 2005 through funding provided by DOFAW, U.S. Fish and Wildlife Service Pacific Islands Fish and Wildlife Office, Ducks Unlimited, Inc., and PAHIO Development Inc. In addition, other cooperating agencies have contributed in-kind services to evaluate cultural resources, soils, and paleo-ecological information.

A conceptual restoration plan was completed by Ducks Unlimited during October 2005 in collaboration with DOFAW and other partners. This plan contains six short and long term goals for the project, the objectives of these goals, as well as the strategies to be implemented in order to obtain these goals. The working draft of the biological plan for the Mānā Plain Wetland Restoration was completed in July of 2008. It addresses wetland ecology of the area, and identifies target species of waterbirds, plants, and invertebrates that will benefit from the proposed project. Additional planning has occurred in regards to public outreach, including environmental education opportunities for Kauai's public schools and outdoor recreation activities for local communities and visitors to the island.

DOFAW has successfully competed in national awards for funding for the implementation of the wetland restoration at Mānā from two U.S. Fish and Wildlife Service grant programs: the National Coastal Wetland Conservation Grant Program (NCWCG); and the North American Wetland Conservation Act Grant Program (NAWCA). Revenue from sand mining activities at the Kawai‘ele parcel will also be used by DOFAW to support restoration and management activities of wetland habitats and associated uplands within the Mānā Plains Forest Reserve.

1.3 PURPOSE

DOFAWs mission is to enhance, protect, conserve, and manage Hawaii's unique and limited natural, cultural, and historic resources held in public trust for current and future generations. For this project, DOFAW will implement habitat restoration actions for the purpose of restoring, within the project site boundaries, habitat suitable for four endemic and endangered Hawaiian waterbirds including the Hawaiian duck, (koloa maoli, *Anas wyvilliana*), Hawaiian stilt (aeʻo, *Himantopus mexicanus knudseni*), Hawaiian moorhen (ʻalae ʻula, *Gallinula galeata sandvicensis*), and Hawaiian coot (ʻalae keʻokeʻo, *Fulica alai*). This restoration plan also includes re-establishing a variety of native aquatic and terrestrial plants, including, but not limited to, ʻohai (*Sesbania tomentosa)*, ʻilima (*Sida fallax*), widgeon grass (*Ruppia maritima*), and makaloa (*Cyperus laevigatus*). These native plants are important cultural resources as well as important resources for nesting and foraging waterbirds.

1.4 NEED FOR ACTION

It is now generally accepted that current rates of species extinction are substantially higher than background extinction rates (Raup 1986). Most current extinctions can be directly attributed to human activity (Diamond et al. 1989), and that for ethical, cultural, aesthetic and economic reasons, these current rates of extinction are cause for considerable concern (Ehrlich 1988, Ledec and Goodland 1988). The worldwide causes of anthropogenic extinctions can be roughly divided into four broad categories: non-sustainable use of resources, pollution, habitat destruction, and the introduction of non-native species.

The 2009 *State of the Birds Report* (North American Bird Conservation Initiative 2009) indicates that "more bird species are vulnerable to extinction in Hawaiʻi than anywhere else in the United States" and defines Hawaiian bird status as a crisis situation. The Hawaiian Islands once supported 113 bird species unique in the world, but now 71 have become extinct and an additional 31 more are federally listed, including all of the endemic waterbirds.

As in other parts of the world, Hawaii's wetlands are threatened by development and agricultural practices. Estimates of wetland loss in Hawaiʻi vary from 12 to 31% (Dahl 1990). Regional losses within an island may be higher depending on the distribution of development and agriculture. For example, wetland loss on the Mānā Plain is likely close to 90% based on examination of historical maps. In addition, many of the remaining wetlands are degraded by non-native invasive species and altered hydrology. Declines in endemic and migratory waterbird populations that depend on wetlands have accompanied the destruction and degradation of these habitats.

1.5 GOALS

DOFAW, with the input of multiple partners, has developed goals, objectives and strategies for the proposed project using the best available information. As new information becomes available, conditions change or additional opportunities arise such strategies may be modified or expanded. The evaluation of new information will continue throughout the restoration and

adaptive management process in order to ensure that the most appropriate strategies are used to meet the goals and objectives set forth. Project goals are as follows:

Goal 1: Ensure long-term protection of the site.

Goal 2: Contribute to the recovery of endangered endemic Hawaiian waterbirds.

Goal 3: Restore and manage diverse and resilient native plant communities.

Goal 4: Promote environmental education opportunities for local schools and communities.

Goal 5: Develop a more complete understanding of Hawaiian waterbird and wetland ecology through applied research.

Goal 6: Promote tourism activities that contribute to the local economy and educate visitors on conservation and sustainable natural resources in Hawai‘i.

The Mānā Plains Forest Reserve restoration project will provide additional habitat to enhance DOFAW's conservation and recovery efforts for the four endangered endemic Hawaiian waterbirds. Designated as a core wetland area in the Revised Recovery Plan for Hawaiian Waterbirds (USFWS 2011), this proposed action will play an integral role in the recovery of endangered Hawaiian waterbirds. The proposed project will restore diverse habitats in the area for these waterbirds and contribute to the State of Hawaii's as well as the USFWS's ultimate recovery goal to restore and maintain self-sustaining populations of Hawaiian waterbirds within their historical ranges. If this recovery goal is achieved these species could eventually be downlisted and eventually removed from the Federal List of Endangered and Threatened Wildlife and Plants.

It also has the potential to serve as an integral component in ongoing community education and interactive efforts by drawing public attention and providing opportunities to display and discover the wetland's natural resource significance as well as past historical and cultural practices.

Hawaiian stilts, Hawaiian duck, and migratory shorebirds at a restored wetland on Kaua‘i. Photo by A. Henry.

1.6 AUTHORITIES FOR IMPLEMENTING ACTION

The proposed action is authorized by the following County, State, and Federal laws, regulations, policy, and guidelines listed below.

1.6.1 COUNTY OF KAUA'I

County of Kaua'i General Plan Chapter 3. This chapter sets policy relating to "land, waters, and culture – which are the heritage of the people of Kaua'i." It defines heritage resources as important natural, scenic, and historic features and specifically lists marshes as one type of heritage resource. Section 3.1.1.1.1 sets policy for heritage resources and states that "projects undertaken with State or County lands or funds shall be designed to conserve heritage resources."

1.6.2 STATE OF HAWAI'I

Hawai'i Revised Statutes Chapter 26-15. This chapter provides general authorities to the Department of Land and Natural Resources to manage and administer public lands, including forest reserves, aquatic life, and wildlife resources and activities in these areas.

Hawai'i Revised Statutes Chapter 124-1. This chapter provides general authorities to the Department of Land and Natural Resources to "conserve, manage, protect, and enhance indigenous wildlife."

Hawai'i Revised Statutes Chapter 183. This chapter provides general authorities to the State of Hawai'i to set aside lands as forest reserves and to adopt, amend, and repeal rules for and concerning the preservation, protection, regulation, extension, and utilization of forest reserves designated by the Department of Land and Natural Resources.

> **§183D Wildlife.** The department shall manage and administer the wildlife and wildlife resources of the State and enforce all laws relating to the protecting, taking, hunting, killing, propagating, or increasing the wildlife within the State and the waters subject to its jurisdiction. This chapter also provides the general authorities to disseminate information on the best methods for protection of wildlife and to gather information concerning the area, location, character, and increase and decrease of wildlife in the State.
>
> Pursuant to §183D-65 of this chapter the DLNR may destroy predators deemed harmful to wildlife on any forest reserve or other lands under jurisdiction of the DLNR.
>
> Pursuant to §183D-9 of this chapter, the State of Hawai'i assents to the provisions of the Pittman-Robertson Federal Aid in Wildlife Restoration Act (50 Stat. 917, 16 U.S.C. §669), as amended. The department shall perform those acts as may be necessary to the conduct and establishment of cooperative wildlife restoration and management projects.

Hawai'i Revised Statutes Chapter 195D. This chapter provides general authorities to the State of Hawai'i to take positive actions to enhance survival of indigenous species of aquatic life, wildlife, and land plants, including endangered species. These species are "integral parts of Hawaii's native ecosystems and comprise the living heritage of Hawai'i, for they represent a natural resource of

scientific, cultural, educational, environmental, and economic value to future generations of Hawaii's people."

> **§195D-5 Conservation programs.** (a) The department shall conduct research on indigenous aquatic life, wildlife, and land plants, and on endangered species and their associated ecosystems, and shall utilize the land acquisition and other authority vested in the department to carry out programs for the conservation, management, and protection of such species and their associated ecosystems. In addition, the department is hereby authorized to acquire by purchase, donation or otherwise, lands or interests therein needed to carry out the programs relating to the intent and purpose of this chapter.

1.6.3 FEDERAL

Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended. This act prohibits take and of threatened and endangered species and provides for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend.

Coastal Wetlands Planning, Protection and Restoration Act (16 U.S.C. 3951-3956). Title III of P.L. 101-646 (16 U.S.C. 3951 et seq.; 104 Stat. 4779; enacted November 29, 1990) engages the Fish and Wildlife Service in interagency wetlands restoration and conservation planning and expands the administration of Federal grants to acquire, restore, and enhance wetlands of coastal States and the Trust Territories.

CHAPTER 2: ALTERNATIVES

The Mānā Plains Forest Reserve Wetland Restoration Project will restore approximately 105 acres of seasonally and semi-permanently flooded wetlands and adjacent uplands for endangered Hawaiian waterbirds. Proposed restoration and management actions are designed to mimic natural wetland processes to provide important resources (e.g., emergent vegetation and aquatic invertebrates) for waterbirds within a highly modified landscape.

Proposed strategies within the preferred alternative are based on biological design criteria that incorporate principles of wetland ecology, recent advances in wetland management, and knowledge of waterbird biology and vegetation ecology. Site-specific information on geology, soils, and hydrology was collected to assess the existing physical abiotic conditions within and near the project site. Synthesis of this information incorporated abiotic factors into the restoration design, such as hydrology, that are important drivers in the establishment and succession of habitats in wetland ecosystems (Mitsch and Gosselink 1993).

2.1 NO ACTION ALTERNATIVE

Under this alternative no wetland restoration would be implemented on the 105 acre project site. The land would remain vacant and dominated by non-native, invasive plant species. Wetland and deep water habitats within the Mānā Plains Forest Reserve would be restricted to the existing Kawaiʻele parcel, an area of created habitat. The project site would not contribute to the recovery of endangered Hawaiian waterbirds because no additional suitable habitat would be available.

2.2 PREFERRED ACTION

The preferred action will restore managed native wetland habitats on the 105 acre project site within the Mānā Plains Forest Reserve located within the boundary of the historical Mānā wetland. Based on site topography, soil composition, and maintenance considerations, seven wetland basins will be constructed in the project site as shown in Figure 2.2 - 1. The first letter of the designation (N or S) indicates whether the basin is located north or south of the main central east-west drainage canal. The number in the basin designation indicates the approximate wetland basin acreage. For example, the “N” in wetland basin N13 indicates it is located north of main drainage canal and is approximately 13 acres in size. Wetland basins will have fresh to brackish water salinities, and support emergent, submergent, and mudflat associated native plant species.

During construction of the wetland basins, grading of the current surface soils will be done so as to the contour the basins to specifications that will maximize their productivity as wetland habitats. Abandoned field irrigation ditches that are no longer used will be filled with soils of low permeability from on-site. In order to ensure continued maintenance of surrounding lands and maintain flood control capabilities, the shape and elevation of the two main drainage canals that bisect the project site will not be altered.

Each wetland basin is designed with a low-profile perimeter berm to separate it from adjacent basins and the two main drainage canals that feed the Kawai‘ele pump station. The berms will allow independent water control within each wetland basin. Berms will be set back 40 feet from the main drainage canals currently leased by the U.S. Navy in order to accommodate equipment access for their maintenance. The maximum depth of excavation will be limited to less than approximately 3 feet to avoid intersecting lower permeability subsurface soils and the shallow groundwater table. One of the design objectives is to balance cut and fill on-site, but if off-haul of excess soil is necessary, material will be placed in an approved upland area within the Mānā Plains Forest Reserve. Figure 2.2 - 2 presents a schematic cross-sectional east-west project profile through the southern wetland basins during maximum flooding conditions. The alignment of this cross-section is indicated on Figure 2.2 - 1.

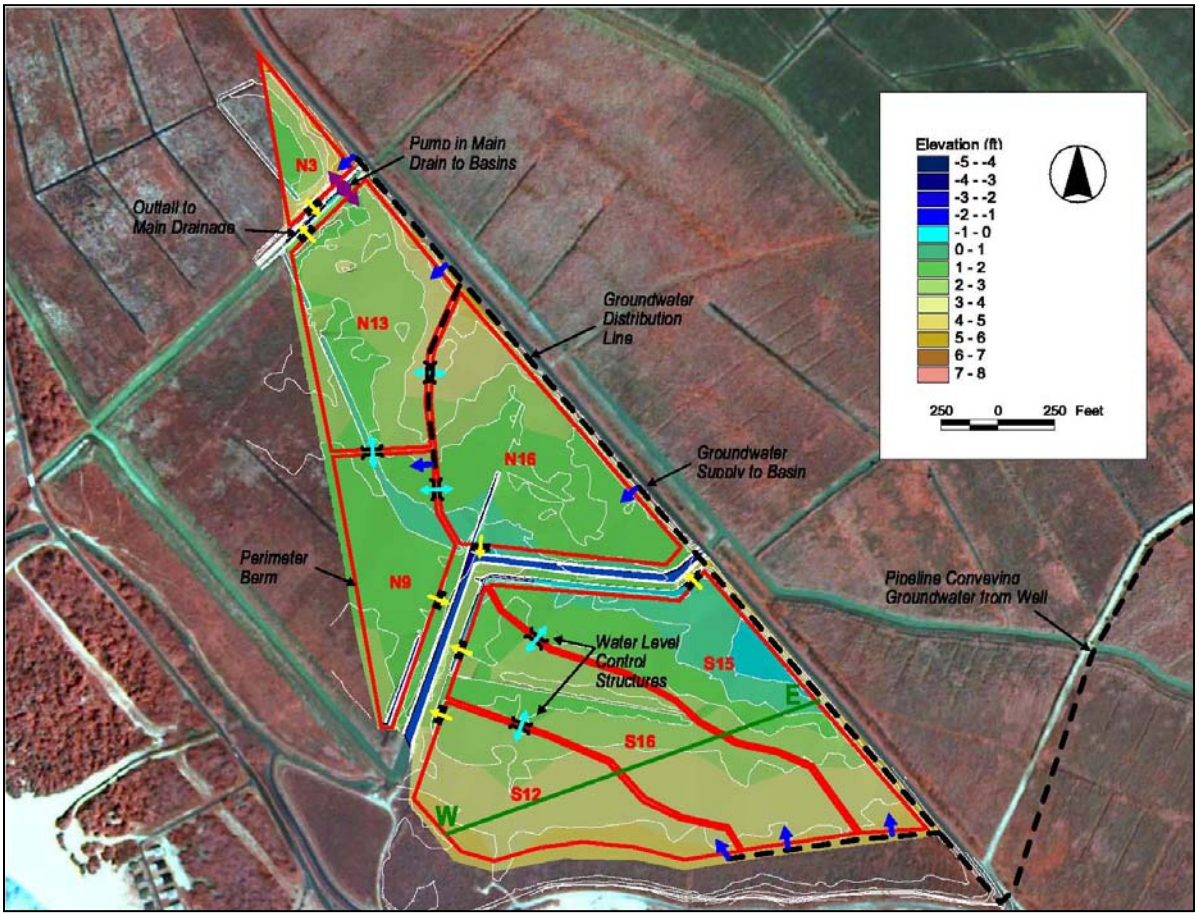


Figure 2.2 - 1. Shaded relief map of the project site existing conditions topographic map from Ducks Unlimited (2008) showing proposed wetland basins, water control structures, and water delivery system.

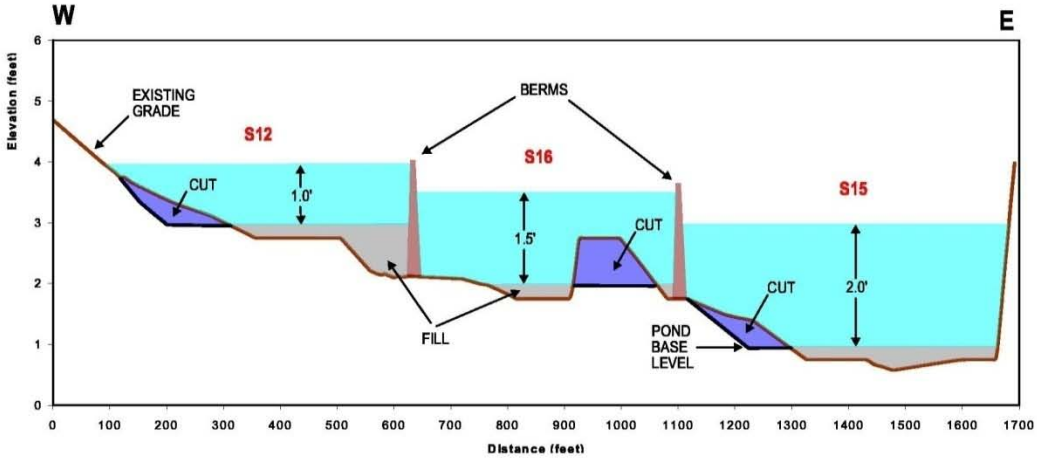


Figure 2.2 - 2. Schematic cross-sectional profile through the southern wetland basins of the proposed project site.

With the exception of basin N3, all basins will be supplied by fresh groundwater originating from an existing but unused artesian well located approximately one mile east of the project site. The use of this well and the power needed to supply the water will be through a Memorandum of Understanding with the Agribusiness Development Corporation (ADC), who owns the well and generates their own power from the upslope irrigation system hydroelectric facilities. This well historically produced around 1,000,000 gallons per day (gpd), or 700 gallons per minute (gpm), of fresh water and was used for irrigation of sugarcane. The currently unused well is flowing under artesian pressure at a rate between 30 and 35 gpm.

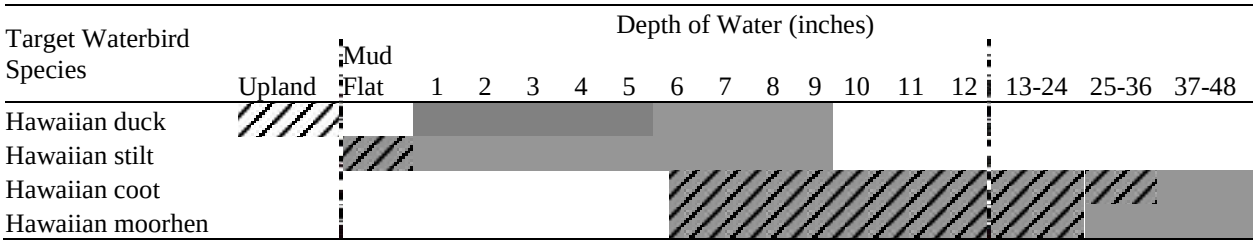
An existing pipeline extends from the well and crosses under Highway 50. Water will be conveyed from the well to the on-site water distribution system, in either the existing, or if needed, a new 12 to 24 inch pipe. The water distribution system at the project site will include a network of piping and valves that supply water to each wetland basin. In order to facilitate control of invasive species, manage for native wetland plant species and aid in the response to a botulism outbreak, the water distribution system will allow for the independent water-level control in every wetland basin. Therefore water levels within each wetland basin can be managed independent of one another. The layout for the on-site water distribution system is provided on Figure 2.2 - 1.

Under the proposed action, all basins except N3 and N13 will be supplied solely by groundwater. Basins N3 and N13 will be designed to receive surface water pumped from the northern drainage canal. Basin N3 will be supplied solely with surface water, while basin N13 will receive a mixture of surface and ground water. Surface water pumped from the northern canal will require installation of an independent water supply system (e.g., pump, piping and controls). Basin N3 will also have piping directed from the groundwater distribution system available in the event that surface water is no longer available or no longer desired as a sole supply to this basin.

In order to create a diversity of desired habitats for target species, wetland basins will be flooded to variable depths and durations each year. Flooding depths are designed to target optimal

foraging conditions for endangered Hawaiian waterbirds (Table 2.2 - 1), promote the growth of native wetland plants, and increase the availability of shallow-water wetland habitats on the Mānā Plain. Figure 2.2 - 3 presents the proposed basin water levels and durations of flooding. Proposed water levels and flooding durations will be rotated annually among basins as physically possible in order to mimic natural variability and prevent stagnant stable conditions. Table 2.2 - 2 shows the water level ranges, depths and estimated flooded areas for each and all wetland basins under the proposed wetland basin configurations. Pass-through flows[1] will be provided to all basins to mimic natural conditions and maintain turnover.

Table 2.2 - 1. Preferred water depths for foraging (solid) and nesting (diagonal lines) by endangered Hawaiian waterbirds.



Hawaiian stilt and Hawaiian moorhen (A. Henry)

Hawaiian duck (J. Denny)

Hawaiian coot (USFWS)

[1] Pass-through flows are defined here as additional water that is pumped into a full basin so that cumulative inflow exceeds cumulative outflow in order to maintain turnover and spillage out of the wetland basins.

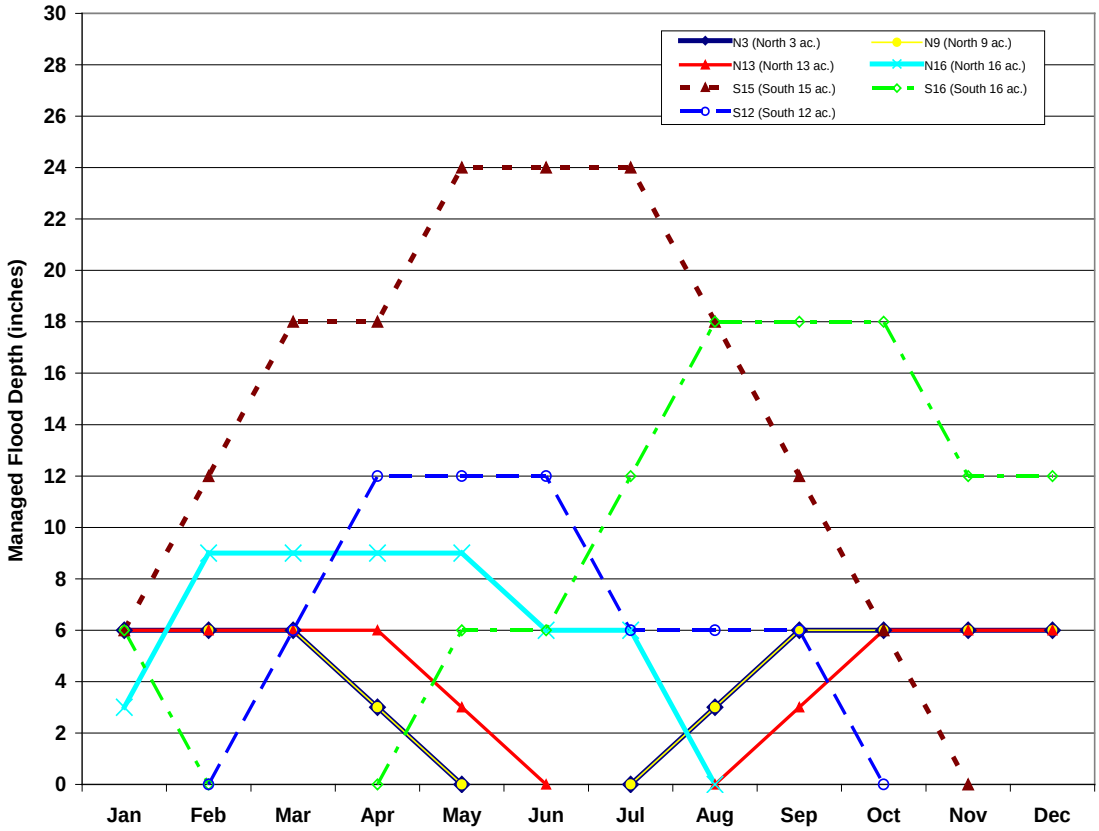


Figure 2.2 - 3. Proposed project water levels and flooding durations for seven wetland basins within the project site.

Table 2.2 - 2. Proposed project wetland basin water levels and estimated maximum flooding areas.

Basin	Water Depth (ft)	Base Elev. (ft)	Flood Elev. (ft)	Flooded Area (acres)
N3	0.50	3.25	3.75	3
N13	0.50	2.00	2.50	13
N9	0.50	1.50	2.00	9
N16	0.75	1.50	2.25	16
S12	1.00	3.00	4.00	12
S16	1.50	2.00	3.50	16
S15	2.00	1.00	3.00	15
TOTALS				**84**

Engineering measures will be implemented to reduce infiltration losses as needed. These include amending the basin bottoms with clay (e.g., bentonite) to reduce vertical infiltration and/or installing shallow slurry walls.[2] Slurry walls will be installed along basin boundaries adjacent to the main drainage canals and in areas where abandoned irrigation field ditches have cut down through a lens sandy loam subsurface soils in order to restrict the horizontal infiltration losses under the wetland basins.

A water budget analysis was completed by Kamman Hydrology & Engineering, Inc. (2012) in order to quantify the necessary water supply required to manage for the target wetland basin water levels presented in Figure 2.2 - 3. Individual wetland basin and total water supply demands calculated using the water budget model are summarized in Table 2.2 - 3 and plotted in Figure 2.2 - 4. Translating the cumulative water demands into standard pumping rates of gallons per day (GPD) and gallons per minute (gpm; continuous pumping, 24-hours per day), the following water yields will be pumped to the wetland basins:

- Minimum pump rate: 86,156 GPD or 60 gpm;
- Maximum pump rate: 491,253 GPD or 341 gpm; and
- Average pump rate: 310,317 GPD or 216 gpm.

The model does not calculate pass-through rates but provides the minimum volume of water to satisfy desired water operations by basin. Pass-through rates will be implemented in an adaptive management strategy, not to exceed 35 gpm (equivalent to the current 30 to 35 gpm artesian losses from the ADC well). Decisions on how to distribute that flow between multiple basins will be identified through an annual adaptive management plan.

A salt budget was also developed in association with the water budget model (Kamman Hydrology & Engineering, Inc. 2012) in order to ensure salinity targets were met. Modeled average maximum monthly salinity concentrations within each basin, not including pass-through flows are plotted on Figure 2.2 - 5. Wetland basins supplied by groundwater will have maximum salinity concentrations ranging from 0.2 to 1.9 ppt. Basin N3, supplied by surface water, will have salinity concentrations ranging from 5.9 to 9.1 ppt. Basin N13, supplied by groundwater and up to 75% surface water, will have salinities ranging from 6.7 to 14.9 ppt. The ratio of source water in basin N13 will depend on the availability of surface water. These maximum estimated salinity concentrations will be reduced in proportion to the relative volume of added fresh water pass-through flow.

[2] Slurry walls in this context refer to trenches filled with low permeability soil or other material to restrict horizontal groundwater flow. Slurry walls woill be installed where needed to a recommended depth around the edges of wetland basins.

Table 2.2 - 3. Predicted monthly and total wetland basin water demands for the proposed project.

	N3 (AF)	N13 (AF)	N9 (AF)	N16 (AF)	S12 (AF)	S16 (AF)	S15 (AF)	Monthly Subtotal (AF)
Jan	0.6	1.2	3.5	5.0	0.0	0.0	5.8	**16.1**
Feb	0.9	2.9	4.6	9.0	0.0	0.0	9.7	**27.2**
Mar	1.1	3.4	5.3	6.3	4.6	0.0	13.0	**33.7**
Apr	0.8	4.9	3.4	8.3	11.4	0.0	9.3	**38.1**
May	0.0	2.4	0.0	9.3	8.7	8.6	17.7	**46.7**
Jun	0.0	0.0	0.0	7.2	9.2	4.6	12.0	**33.0**
Jul	0.0	0.0	0.0	9.7	1.0	13.1	12.7	**36.5**
Aug	3.9	0.0	12.0	0.0	4.4	17.6	5.0	**42.8**
Sep	2.0	6.5	8.4	0.0	3.7	10.9	3.0	**34.6**
Oct	1.2	5.4	5.8	0.0	0.0	8.9	0.4	**21.6**
Nov	1.0	3.1	4.9	0.0	0.0	0.0	0.0	**8.9**
Dec	0.6	1.4	3.5	0.0	0.0	2.8	0.0	**8.2**
Totals	**12.0**	**31.3**	**51.3**	**54.8**	**43.1**	**66.4**	**88.6**	**347.5**

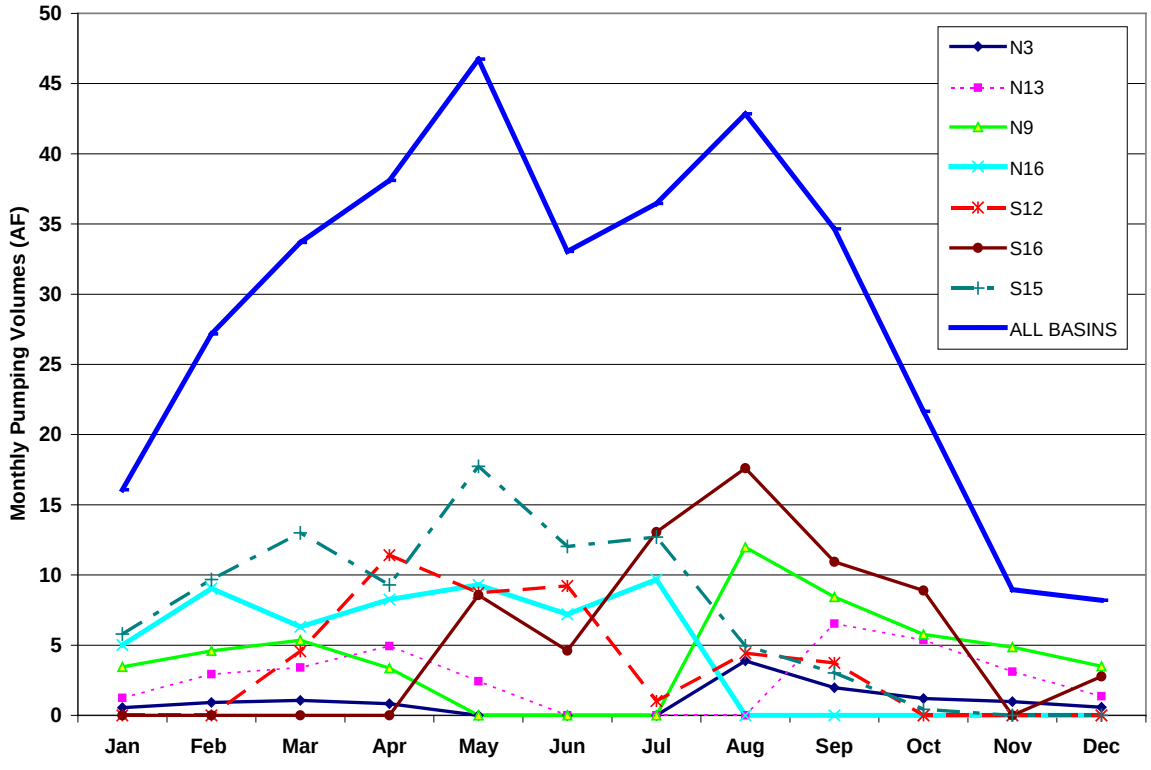


Figure 2.2 - 4. Predicted monthly wetland basin water demands for the proposed project.

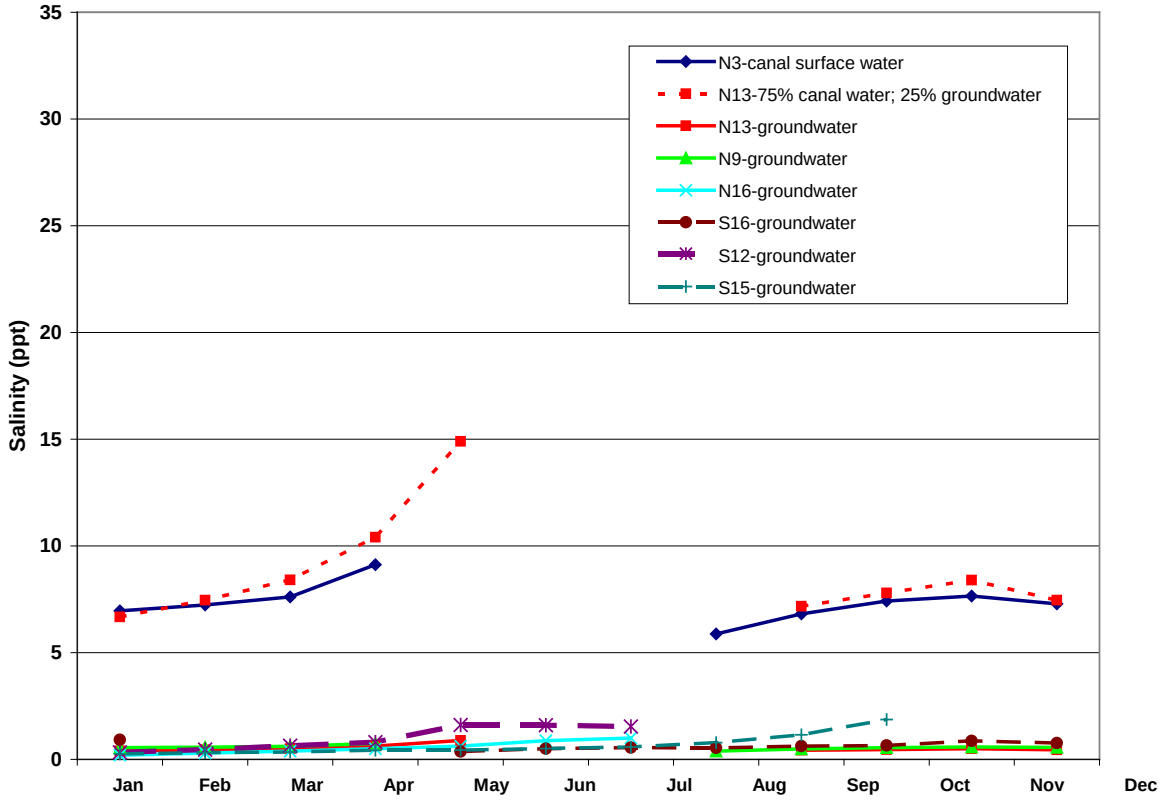


Figure 2.2 - 5. Estimated maximum average monthly wetland basin salinity concentrations for the proposed project.

Anticipated infrastructure maintenance activities will include monitoring and maintenance of the well, water delivery and distribution system, water level control structures, and berms. Maintenance activities of the well and off-site water delivery pipes will be coordinated with ADC. Native vegetation planting will be implemented following construction in order to reduce soil erosion, expedite the establishment of native food sources for Hawaiian waterbirds, and to increase the seed bank available for natural germination. Anticipated habitat management activities will include hand and mechanical control of invasive vegetation and control of aquatic invasive species by water level manipulation. Chemical control of invasive species will only be implemented if other methods are not effective and will be implemented in accordance with the registered labels and appropriate State, Federal, and County regulations. No repeated excavation or reworking of basin topography or configuration is anticipated.

A perimeter fence will be installed to keep large non-native mammalian predators and ungulates out of the restored wetland basins. The fence design will depend on available funding, but at a minimum will be constructed to keep out dogs, pigs, and goats. Control of other non-native mammals, including cats and rats, will be implemented within the project site according to state

and federal regulations. If additional funding is available, the fence will be designed to exclude deer and cats.

As part of long term project operation, a comprehensive adaptive management plan will be prepared that details the organizational structure for the monitoring, maintenance, and adaptive management process to ensure that project goals and objectives are attained. This will also allow for on-going, long-term input from project partners, local property owners and the regulatory community. The adaptive management plan is driven by the project goals and objectives together with the regulatory permit requirements. Using adaptive management techniques, restoration activities conducted under the project will be monitored and analyzed to determine how they are creating properly functioning habitats.

Other design elements that will be incorporated into the proposed project include trails, elevated viewing platforms, interpretive signs, and a visitor center with a classroom, restroom facilities, parking, and a small baseyard facility. The planned visitor/environmental education center will be located on the southeast corner of the project site, and will be accessible from the gravel road to the south. The baseyard maintenance facility will be located west of the visitor center away from the view plane of the Kaumualiʻi Highway and public access areas. Solar panels will be placed on the visitor center roof and other appropriate locations to minimize the facilities environmental footprint and maximize the area available for habitat restoration. All visitor services will be handicap accessible and will be located on approved upland areas along the southern boundary of the project site.

Wildlife-oriented recreation activities, including nature walking and photography, will be allowed in a manner that does not disturb breeding waterbirds. Elevated viewing platforms will be positioned to allow for remote observation of waterbirds using binoculars and spotting scopes from outside the wetland areas, thereby reducing disturbance to endangered waterbirds. Walking trails will be incorporated into the wetland design and along the southern boundary of the project site. To increase environmental education opportunities, DOFAW staff and/or trained volunteers will lead guided tours through the project site to reduce disturbance to nesting waterbirds. Trails along the southern boundary of the project site in upland habitats will be open year-round from dawn to dusk.

2.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

The following alternatives were considered by not analyzed in detail for the project. A brief description for each and the rationale for not analyzing them in detail are provided below. Analyses of four of these seven alternatives are described in more detail in subsequent sub-sections of this chapter.

1. Returning the Mānā Plain to pre-European settlement wetland habitat conditions is not feasible or desirable due to the introduction of non-native species, the extensive land-use modifications that have occurred since the late 1800s, and the current land uses surrounding the project site, including diversified agriculture and U.S. Navy operations,

which are important socioeconomic and military resources. However, restoration of managed wetland habitats has been successfully implemented throughout Hawai‘i and on the U.S. mainland providing important resources for wetland dependent wildlife, including many species of waterbirds.

2. Using water from the excavated sand mining areas at the Kawai‘ele parcel as a supply source for the Mānā wetland restoration project was considered; however, without extensive study and hydrologic testing, the potential adverse ecological impacts associated with dewatering the existing Kawai‘ele habitats was deemed very high. In addition, using the Kawai‘ele parcel as a water source would likely introduce invasive aquatic species currently found at Kawai‘ele into the Mānā wetland restoration project, an impact contrary to project goals.

3. Construction of an on-site reservoir to store rainfall, runoff and/or groundwater for subsequent supply to wetland basins was considered but not analyzed because such a structure would consume a large percentage of the site area at the expense of restored wetland habitats.

4. Reclaimed water from municipal or any other treatment plants is not available in the area. Importing this source from remote areas is not economically or environmentally feasible.

5. Water from the Waimea irrigation system was considered as a potential water source, but was not analyzed in detail due to the presence of aquatic invasive species and the additional infrastructure required to deliver water to the project site (see Section 2.3.1).

6. Design of wetland basins supplied solely or seasonally by surface water from drainage canals would not alleviate any of the invasive species concerns associated with use of the Waimea irrigation system and would likely result in increased salinities within the restored wetland basins (see Section 2.3.2).

7. Although there is a shallow groundwater system underlying the project site, available hydrologic, geologic and water quality information indicate it will not provide the yields necessary to meet project water demands. In addition, the water is of relatively high salinity (see Section 2.3.3).

8. Different numbers and sizes of wetland basins with the same total wetland acres were considered. However, these designs did not optimize habitat, cost-effectiveness, and management capabilities as described below (see Section 2.3.4).

9. Alternative locations proposed by the U.S. Navy were also considered. These areas are outside of the Mānā Plains Forest Reserve and do not optimize habitat and cost-effectiveness as described below (see Section 2.3-5).

2.3.1 WAIMEA IRRIGATION SYSTEM AS PRIMARY WATER SOURCE

The Waimea irrigation system was considered as a potential water source for the project but was considered a significantly lower priority in comparison to other available supplies. The irrigation system contains several species of invasive fish (e.g., *Tilapia* sp.) and an invasive Asian clam (*Corbicula fluminea*), which would become ubiquitous throughout the Mānā wetland system. Tilapia (an inclusive name for the genera *Tilapia*, *Oreochromis*, and *Sarotherodon*) in aquatic habitats at the Kawaiʻele parcel significantly reduced the growth of *Ruppia maritima* (Peyton 2009) and likely negatively affect other species of submerged aquatic vegetation important to Hawaiian waterbirds. Asian clams can cause problems in irrigation canals and pipes (Prokopovich and Hebert 1965, Devick 1991), alter benthic substrates (Sickel 1986), and compete with native species (Devick 1991). The potential adverse impacts that this species would have on wetland ecology was deemed a significant constraint in the use of irrigation water. In order to meet the goals of the proposed project, additional infrastructure would be required to prevent the delivery of these invasive species into the restored wetland basins. In addition, the irrigation water supply would require a longer run of water conveyance piping and there would need to be some sort of forebay reservoir (likely an existing reservoir) to provide operational flexibility in acquiring the necessary volumes of water to operate the wetland system. Existing reservoirs also host a variety of invasive aquatic species that could get introduced into the Mānā wetland. Regardless, the Waimea irrigation system remains a potential alternate water supply if more preferred supplies become problematic.

2.3.2 SURFACE WATER FROM DRAINAGE CANALS AS SOLE SOURCE

Surface water from the two main drainage canals that pass through the project site was evaluated as the primary water supply for the proposed project, but a number of factors have led to uncertainties in its suitability as a sole source without further long-term testing and monitoring. The use of surface water is being restricted to a single small basin (N3) and mixed with groundwater in another single basin (N13) in order to monitor wetland functions over the long-term. It both cases, these basins will be plumbed to receive groundwater in the event canal water is found unsuitable. The reservations in using canal water as a sole source include the following:

1. Records for the Kawaiʻele and Nohili pumps indicate a sharp and constant decrease in the volume of water pumped, indicating a decrease in the total amount of water available for wetland supply (Figure 2.3 - 1). Review of pump records also indicates very low water availability in summer months. The lack of an available and reliable source raises concern about the use of canal water as a sole source.

2. The canals continually fill with sediment and periodic maintenance dredging is required. During January 2012, DOFAW staff observed the northern drainage canal essentially plugged with sediment. Long-term use of the surface water from canals will rely on continued, coordinated and increased frequency of dredging to remove accumulated sediments. Continued coordinated maintenance work could preclude using surface water as a reliable source, and increased frequency of required maintenance could further make canal surface water use impractical.

3. Because of the elevated salinity in the surface water in the drainage canals, basin wetland salinities would be significantly higher than those resulting from groundwater supply and thus be less suitable for all four species of endangered waterbirds. Salt budget modeling was completed assuming surface water as the sole source for the Mānā Wetland project (Kamman Hydrology and Engineering, Inc. 2012). Results of this analysis indicated maximum salinities in most basins approaching 25- to 30-ppt and several basins becoming hypersaline with concentrations of over 55.0-ppt. Project biologists have hypothesized that the salinities resulting from groundwater use would better satisfy project goals and objectives than those resulting from a sole canal water supply.

4. The surface water in the drainage canals contain a variety of invasive aquatic species which would be introduced into the Mānā wetland restoration project through pumping and use of surface water. Installation of pump screens or other devices to exclude invasive aquatic species would require additional infrastructure and increase costs and maintenance requirements. The impacts of non-native invasive fish would be the same as those described in Section 2.3.1.

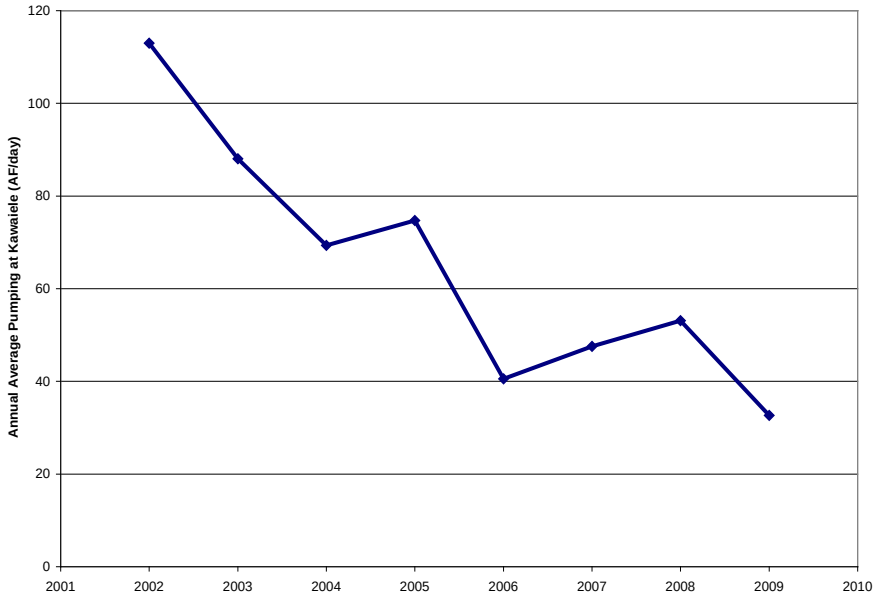


Figure 2.3 - 1. Measured average annual pump rates at the Kawai‘ele Pump Station from 2002 to 2009.

2.3.3 On-site Ground Water as Sole Source

Because of its potential superior quality and lack of introduced species, groundwater is viewed as a favorable water supply for the project. The current location of the groundwater transition zone from fresh to brackish water is not precisely known. However, the further west, or closer to the ocean that a well is located on the Mānā Plain, the greater the chances it will intercept brackish water. Because the proposed ADC well is located just over a mile east of the project site, it has a much higher likelihood of tapping and sustaining fresh water yields versus a well located at the project site. Further discussion of the current and historical groundwater conditions beneath the site are provided in Section 3.2 of this report.

As it currently exists, the ADC well provides excellent water quality and provides yields sufficient to meet project water demands. In addition, the artesian well is currently flowing at the surface at a rate between 30 and 35 gpm. The current artesian yields discharge flows into a ditch connected to a large drainage canal and is ultimately pumped via the Kawaiʻele Pump Station to the ocean. These artesian discharges would arguably be put to better use as pass-through flows to the Mānā wetlands even when the well is not pumping.

If an on-site groundwater well were to be pursued for the project, it would require the initial work of installing and pumping a test well to determine if there are sufficient yields and sufficient water quality to meet project needs. If the test well indicated the underlying aquifer was sufficient in satisfying project needs, a larger final pumping well would need to be installed. In total, the aquifer exploration and development costs would be significant, likely on the order of $150,000. The availability of the existing ADC well, which is known to meet project needs, eliminates these costs. Regardless, an on-site well(s) remains a potential alternate water supply if more preferred supplies become problematic.

2.3.4 Different Size and Number of Wetland Basins

Alternatives were developed with varying numbers and sizes of wetland basin within the 105 acre project site. A greater number of smaller wetland basins would increase management capabilities to provide a diversity of wetland habitat to accommodate the various foraging and life cycle needs of all four targeted endangered species, but would result in less total flooded acreage. As in the preferred alternative, all wetlands would be separated by low, shallowly-sloped berms. However, because of the increased area to edge ratio, the amount of soil required to construct these basins would increase significantly likely requiring soil to be brought from off-site. This alternative is not considered further in this document because of the additional cost and resources needed to construct a larger number of small wetland basins. Although a smaller number of larger basins would increase the flooded wetland acres, it would limit management capabilities to provide a diversity of habitat among the different basins. This option would not maximize habitat quality for endangered waterbirds and is therefore not considered further in this document.

2.3.5 ALTERNATE SITES PROPOSED BY U.S. NAVY

During early December 2011, the U.S. Navy asked DOFAW to consider another location for the Mānā Plain wetland restoration. The proposed alternate site is a borrow pit located outside of the Mānā Plain Forest Reserve near the north end of the Pacific Missile Range Facility (PMRF) (Figure 2.3 - 2). DOFAW staff and wetland restoration partners visited the alternate proposed site on December 14, 2011. This alternate site is smaller than the existing project site, has sandy soils classified as Jaucus sand, and is dominated by non-native upland plant species. This site is not suitable for wetland restoration and does not meet the goals of the proposed project for the following reasons:

1. The alternate site is approximately one third the size of the existing site, and thus would result in significantly less habitat for the recovery of endangered waterbirds.
2. The alternate site is located in Jaucus sand and supports upland habitats. Jaucas sand is not classified as a hydric soil (those formed under conditions of saturation) by NRCS and has a high permeability (e.g., low water holding capability) (Soil Conservation Service 1972) and would be a significant constraint to wetland creation and management.
3. Actions at the alternate site would be wetland creation, not wetland restoration
4. Creating wetlands in upland habitats is not as ecologically productive or economically cost effective as restoring historical wetland sites.

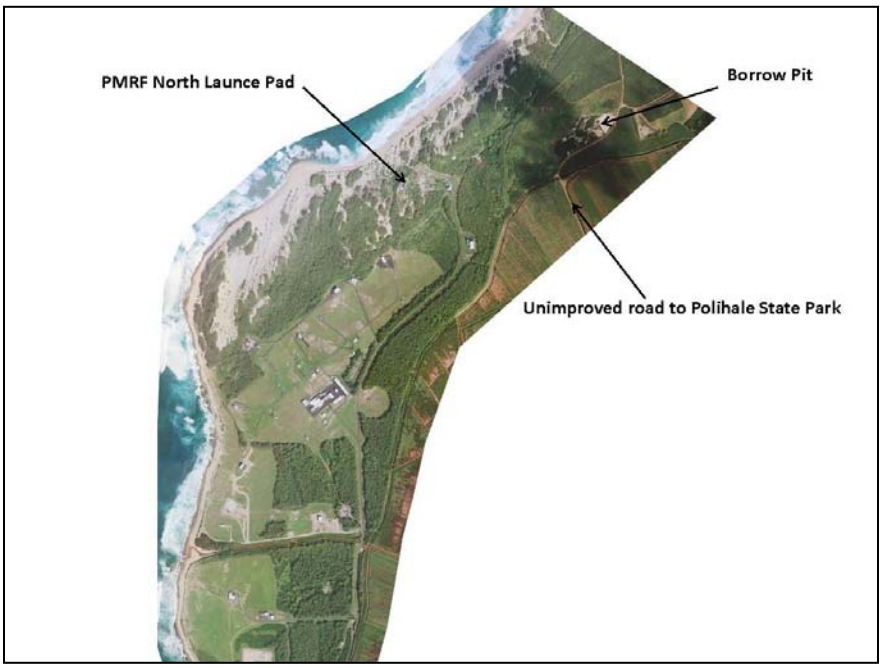


Figure 2.3 - 2. Alternate site (labeled borrow pit) proposed by the U. S. Navy for the Mānā Plain Forest Reserve wetland restoration project during December 2011. Map prepared by the U. S. Navy.

In their scoping comment letter dated January 24, 2012, the U.S. Navy asked DOFAW to consider two alternate sites (see section 6.4) due to concerns about bird-aircraft strike hazards. Alternate Site B is the same borrow pit site identified in early December 2011 and described above and is not suitable for the reasons listed in the previous paragraph. Alternative Site A is located at the north end of the historical wetland labeled Nohili Pond on Figure 3.2 - 7 (see also map submitted with scoping comments in section 6.4) and is outside of the Mānā Plains Forest Reserve.

Alternate Site A may be suitable for wetland restoration, however, no feasibility assessment, planning, or monitoring to assess suitability has been completed at this site. It is located outside of the current Mānā Plains Forest Reserve on lands currently leased to the Agribusiness Development Corporation. The U.S. Navy communicated to DOFAW that they are planning site investigations; however DOFAW has yet to be invited to participate. Alternate Site A is not considered further for the following reasons:

1. DOFAW previously addressed bird-aircraft strike hazard concerns with the U.S. Navy during 2001–2002 and reduced the original proposed wetland restoration area from 313 acres to 105 acres. The acreage was reduced so that the wetland restoration project site would be setback at least 2,000 feet from the PMRF runway as requested by the U.S. Navy.
2. The U.S. Navy agreed that the current size and location of the project site and deemed it adequate to reduce bird aircraft strike hazards. The U.S. Navy contracted a surveyor to have the existing 105 acre site and surrounding area surveyed and submitted to the County of Kaua‘i for subdivision.
3. Planning for the proposed wetland restoration at the existing site has been on-going since 2004, following the land transfer to DOFAW.
4. DOFAW has built an extensive partnership of Federal, State, non-profit, and local corporations to collaboratively develop an ecologically sound and cost-effective restoration design at this location.
5. Bird aircraft strike hazards are evaluated in section 3.10 and are not expected to increase as a result of the proposed project.
6. The concerns regarding the likelihood of increased occurrences of nēnē visiting PMRF as a direct result of the implementation of this restoration project are addressed in section 3.10.
7. Nēnē are attracted to habitats on PMRF and the U.S. Navy has not changed management of these habitats to deter nēnē. Previous hazing efforts have not been effective at preventing nēnē from nesting at PMRF and birds nested on U.S. Navy property as recently as the winter of 2011.

CHAPTER 3: ENVIRONMENTAL ANALYSES

This chapter describes the existing environment of the project site and surrounding lands potentially affected by the proposed restoration project. The environmental consequences that are anticipated as a result of the proposed alternatives are analyzed and described for each section. The discussion focuses on those features needed to understand the issues of the proposed alternatives.

3.1 GEOLOGY AND SOILS

The purpose of this section is to evaluate whether the proposed project would create a physical change in the surface or subsurface soil or rock characteristics, or would expose people or structures to geological hazards.

3.1.1 AFFECTED ENVIRONMENT

PHYSICAL SETTING

The Mānā Plain Wetland Restoration Project site is located on the Mānā Plain on the western end of the Hawaiian Island of Kaua‘i (see Figure 1.1 - 1). The Mānā Plain is a flat, low-lying feature bordering the Pacific Ocean for approximately 9 miles and extending inland an average of approximately 2 miles. Along the coast, elevations range from sea-level up to 15 feet along sand dunes west of the project site and then gradually decrease to 0 to 5 feet within the project site before gradually rising again to an elevation of 30 feet over one mile inland. Immediately east of the Mānā Plain is a prominent wave-cut escarpment into the Nā Pali region volcanic bedrock, with elevations rising quickly to over 800 feet within one-half mile from the eastern edge of the plain. Elevations then gradually rise to the east reaching 3000 to 3500 feet along the Makahoa Ridge, located approximately 5.5-miles east and paralleling the Mānā Plain. Because of this rapid transition in topography, a wedge of coalescing alluvial fan deposits up to 80-feet high form along the east edge of the Mānā Plain at the interface with the Nā Pali Region.

Ground surface elevations at the project site range from 0 to 5 feet above mean sea level, with the channel bed of the two main drainage ditches that bisect the site extending as much as 5 feet below sea level. The elevation of the road surface on Kaumauli‘i Highyway is approximately 8 feet above sea level. Figure 2.2 - 1 includes the project site map with topographic contours surveyed by Ducks Unlimited in 2006.

REGIONAL AND SITE GEOLOGY

The majority of the Mānā Plain is capped by 150 to 250 feet of sediment overlying a relatively flat buried erosional surface of lava deposits associated with the Nā Pali formation of the Waimea Canyon volcanic series (MacDonald et al. 1960). The entire Mānā Plain is underlain by the Nā Pali formation (Burt 1979). The Mānā Plain consists of coralline and marly sedimentary rocks of marine, littoral and terrestrial origin (Burt 1979). Some were deposited in lagoonal and

estuarine environments and some are alluvium washed down from the eastern uplands. From east to west, the surficial deposits on the Plain consist of modern alluvial fans, a thin ribbon of lagoonal deposits, patches of older dune sand, and a coastal berm of modern beach deposits and dunes (Burt 1979). The regional geology and geologic cross-section through the Mānā Plain are shown in Figure 3.1 - 1.

The project site is underlain by lagoonal deposits, which are poorly consolidated sediments deposited in the shallow lagoon that once existed on the Mānā Plain between Kekaha and Barking Sands. These lagoon deposits consist of calcareous sand and gravel, marl, and clay (MacDonald et al. 1960). The thickness of the sedimentary deposits across the plain range from 0 feet on the inland edge of the plain to 400 feet or more along the edge of the ocean (Burt 1979). Well logs indicate that the thickness of deposits is about 160 feet within a half mile of the ocean (Burt 1979).

Mānā Plain looking towards the pali (cliffs). Photo by A. Henry.

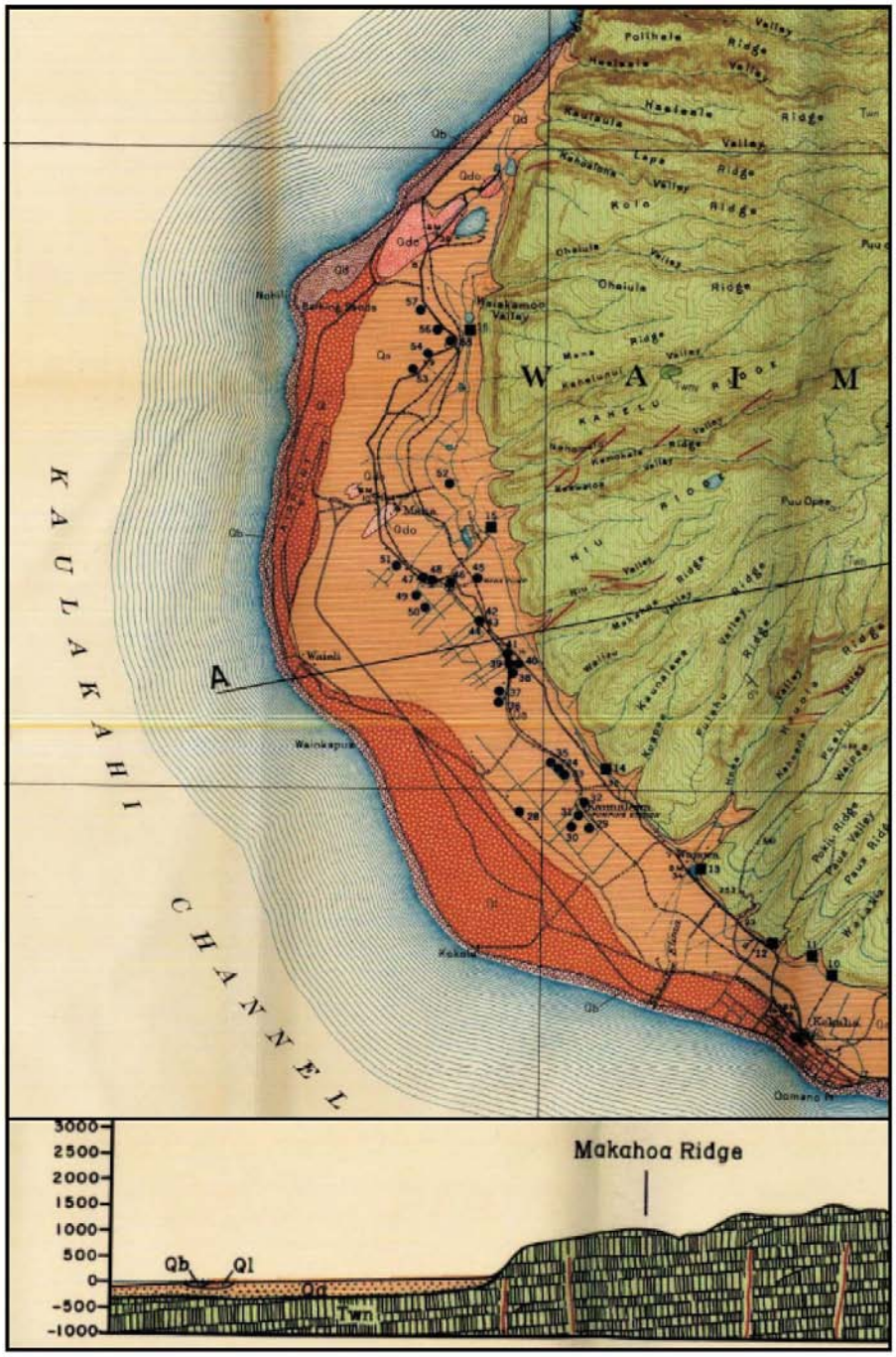


Figure 3.1 - 1. Regional geology of the Mānā Plain, island of Kaua'i. Twn=Na Pali formation lava; Ql=Mānā Plain lagoon deposits; Qa=unconsolidated alluvium; Qdo=calcareous sand dunes; Qb=beach sands; Qd=sand dune (from MacDonald 1960).

PROJECT SITE SOILS

Pursuant to the NRCS Soil Resource Report (USDA NRCS 2010), the project site is underlain by four mapped soil types (Figure 3.1 - 2). The majority of the northern wetland basins and western half of the southern wetland basins are underlain by the Kaloko clay loam (Kf). The southeastern portions of Wetland Basin N16 and eastern portions of all southern wetland basins are underlain by Kaloko clay (Kfa) which is very similar to the Kaloko clay loam. Both the Kaloko clay loam and the Kaloko clay loam are defined as poorly drained with a parent material from basic igneous rock alluvium. Depth to water is 12 to 24 inches and it is occasionally flooded. The Kaloko clay and Kaloko clay loam have similar saturated hydraulic conductivity (Ksat) values, ranging from very low (0.0 in/hr) to moderately high (0.20 in/hr). These soils are characterized as moderately to strongly saline (16.0 to 32.0 mmhos/cm) with a moderate water capacity[3] (about 7.8 inches).

The central area of wetland basin S15 is underlain by Nohili clay (Nh). The Nohili clay is defined as poorly drained with a parent material from alluvium. It has a moderately low (0.06 in/hr) to moderately high (0.57 in/hr) saturated hydraulic conductivity (Ksat)[4]. Depth to water ranges from 18- to 36-inches and it is occasionally flooded. The soil is characterized with a moderate water capacity (about 8.3 inches). A typical profile consists of: 0 to 18 inches clay; 18 to 33 inches of clay; 33 to 43 inches of cemented material/clay; and 43 to 90 inches of clay.

In June 2009 DOFAW, with the help of NRCS soil scientists and several other partners, completed a soil investigation that included sampling and describing soil profiles at 60 locations throughout the project site. Soil data collected during 2009 was summarized by Henry (2010). The surface soil throughout the restoration area was characterized by clay loam averaging 30 inches (range 16–58 inches) below the ground surface. In general, this surface layer was followed by sandy clay loam or silty loam, followed by sandy loam and a basal layer of dense fine clay or silty clay loam. The depth to the shallow groundwater averaged 40 inches below the surface and ranged from 24 to 58 inches.

In September of 2009 DOFAW completed single and dual ring infiltratrometer tests within the different soil types across the project site followed by a series of infiltration tests at selected test (percolation) ponds from June through August 2011. Infiltration test locations are indicated on Figure 3.1 - 2. Test pond infiltration rates were over an order of magnitude lower than infiltrometer test results and are considered more representative of future saturated conditions. Test pond infiltration rates were between 0.07 and 0.11 in/hr in the Kaloko clay loam and just under 0.02-in/hr in the Kaloko clay near the Nohili clay.

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[3] Water capacity of a soil is the amount of water that a soil can store that is available for use by plants.

[4] It's important to note that the higher Ksat values for the Nohili clay versus the Kaloko clay and Kaloko clay loam are inconsistent with soil profile descriptions and field observations and measurements. Clays typically have lower Ksat values than loams and silty clays and one would expect the higher clay content of the Nohili would yield lower Ksat values than the Kaloko series. The project area underlain by Nohili clay is also observed to stay wet/ponded longer than areas underlain by the Kaloko series soil. Results of field infiltration tests also indicate lower infiltration rates occur in the Nohili clay than other site soil.

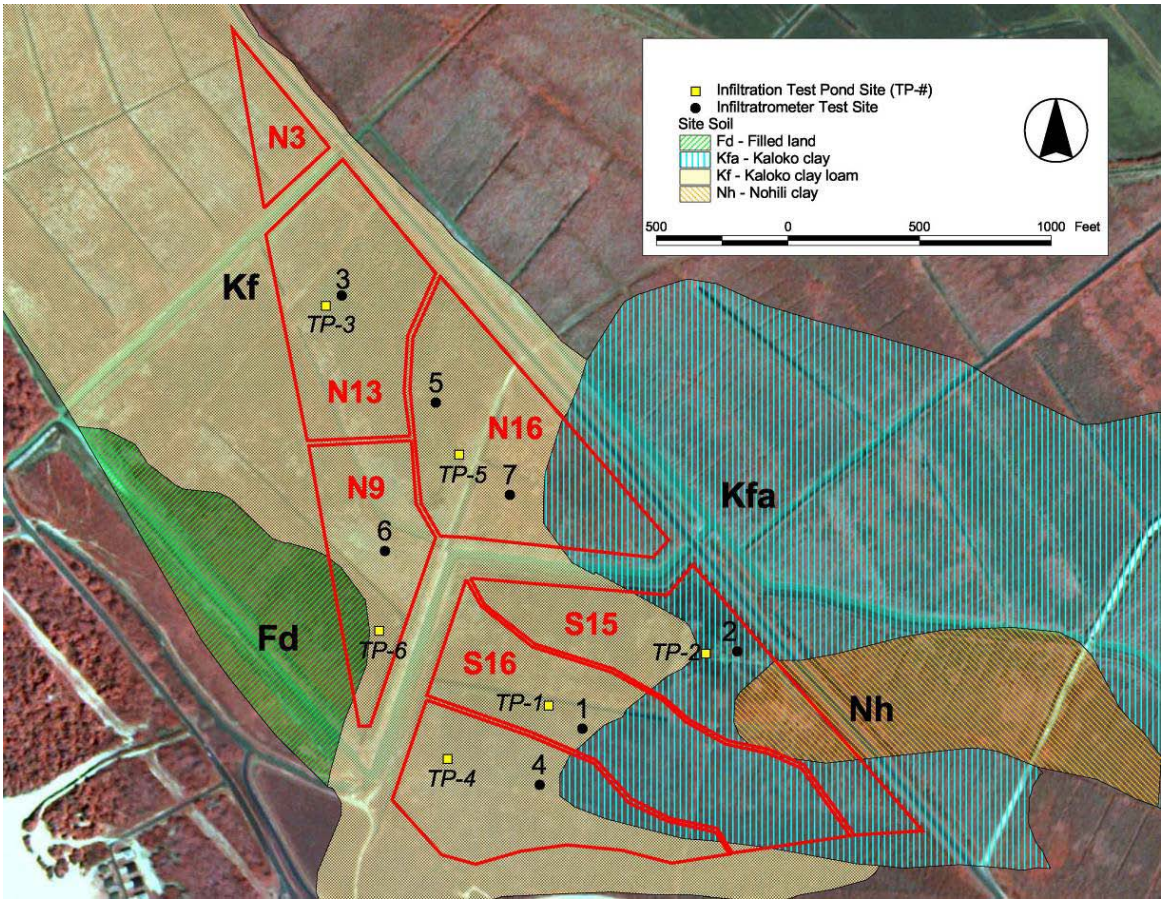

Figure 3.1 - 2. Map of soil types underlying the project site, location of infiltrometer tests, and locations of infiltration test (percolation) ponds.

GEOLOGIC HAZARDS

Two main sources of information were reviewed to assess potential geologic hazards at the project site. They include the Kaua‘i Online Hazard Assessment Tool (County of Kaua‘i 2012) and the Atlas of Natural Hazards in the Hawaiian Coastal Zone (Fletcher et al., 2002). The Kaua‘i Online Hazard Assessment Tool (KOHA) was developed by the County of Kaua‘i in partnership with the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center (CSC) and Pacific Services Center (PSC) to support the County of Kauai's natural hazard related planning, permitting, and outreach activities. KOHA is an intranet based geographic information system (GIS) tool for identifying the hazard risks for any user defined location on Kaua‘i. Although designed to address all hazards, the initial focus of KOHA is coastal and riverine flooding. The Atlas of Natural Hazards in the Hawaiian Coastal Zone was prepared by the USGS in cooperation with the University of Hawai‘i, State of Hawai‘i Office of Planning, and NOAA. The atlas assigns a relative ranking scale to seven natural coastal hazards in map format. The ranking is based on the historical trends and natural factors influencing site vulnerability and hazard intensity in the Hawaiian coastal zone. The main geologic hazards

addressed by these studies include Tsunamis and volcanic/seismic activity. Figure 3.1 - 3 presents the USGS hazard map for the project vicinity.

The USGS volcanic/seismic hazard is ranked low at the project site, meaning there is no recorded recent history of volcanic or seismic activity. However, the USGS tsunami hazard is considered high as there is a history of tsunami flooding with historical damage on the gently sloping coastal plain. The County indicates that the project site lies entirely within the Tsunami Evacuation Zone (Figure 3.1 - 4); all areas makai of the highway within the project vicinity lie within this zone.

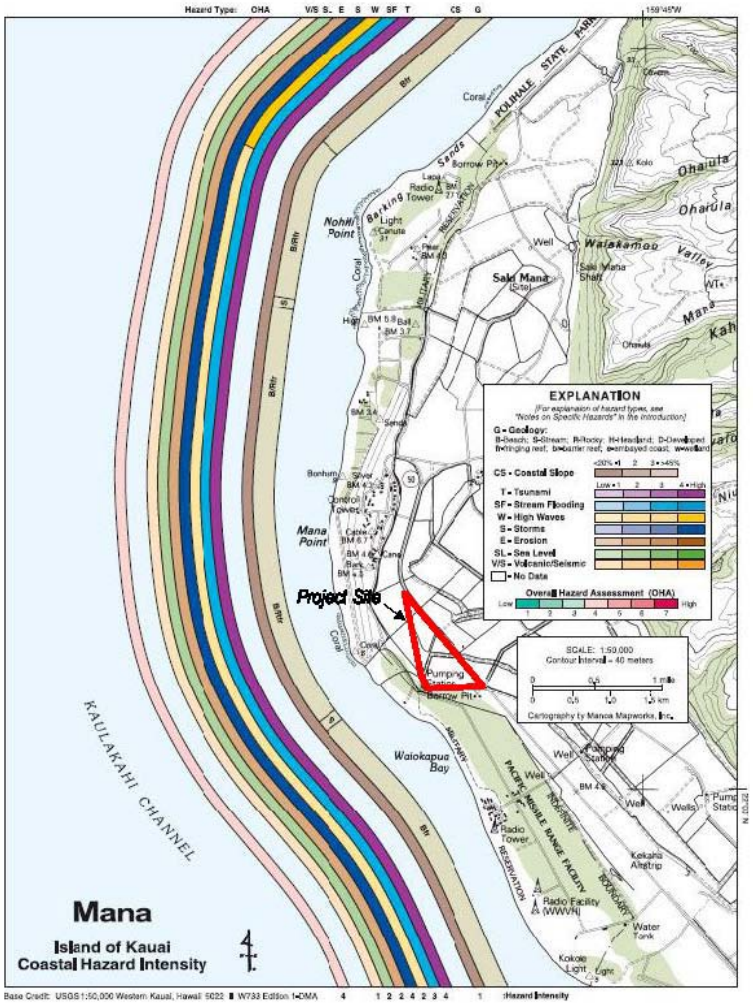

Figure 3.1 - 3. Technical Hazard Map for the vicinity of the Mānā Plain (from Fletcher et al., 2002). Geologic hazards of the volcanic/seismic activity are ranked low. Geologic hazards for tsuanami are ranked high.

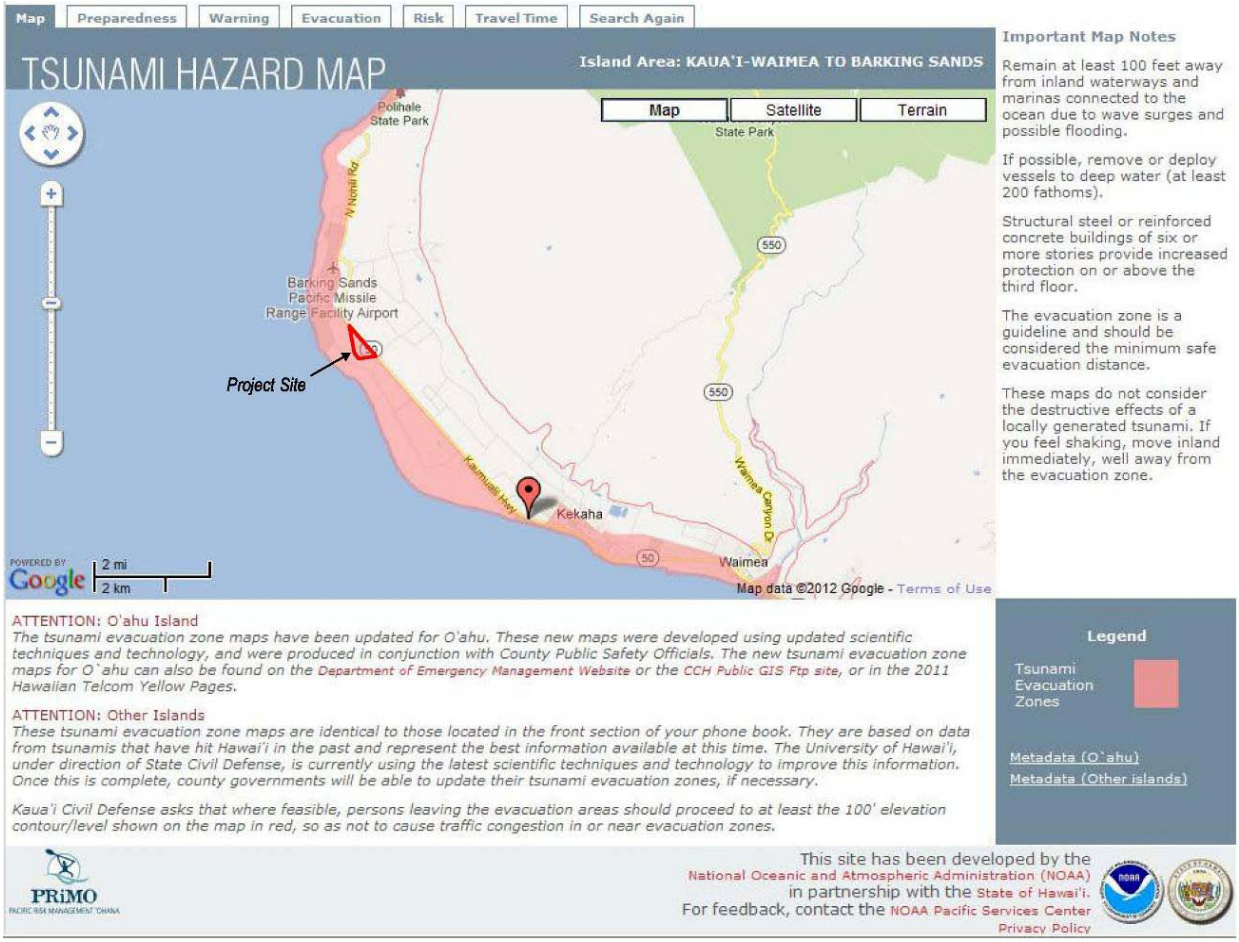

Figure 3.1 - 4. Tsuanmi hazard map of Mānā Plain (source: County of Kaua‘i 2012). Mānā Plain Forest Reserve Wetland Restoration project site is west of State Highway 50 entirely within the County's Tsunami Evacuation Zone.

3.1.2 ENVIRONMENTAL CONSEQUENCES

NO ACTION ALTERNATIVE

There is no slope stability or landslide risks under existing conditions as the site topography is very low relief. Existing canal banks within and adjacent to the project site experience some erosion during high rainfall events. Implementation of the No Action Alternative would keep existing soil static and there would be no further disturbance to the former fields, canals, abandoned irrigation ditches, roads, or any other portion of the project site.

PREFERRED ALTERNATIVE

Under the Proposed Action, the project site will be graded with areas excavated to a maximum of 3 feet in depth. The project would affect soils that have been previously disturbed for sugarcane production. In order to maximize project slope stability, all created wetland basin side slopes will be no greater than 3:1 (horizontal:vertical) and all intervening berms will be constructed with well compacted, vegetation-fee soil with 3:1 side slopes, and then revegetated. Erosion control materials (e.g., erosion control blankets, rolls, weed-free mulch, etc.) will be placed along berm slopes and other sloped soil surfaces to further reduce erosion. The low profile configuration, methods of fill placement (including compaction), and use of erosion control materials will minimize erosion.

All water conveyance and regulating structures directing flow into wetland basins, between basins, and into adjacent drainage canals will also be constructed to minimize, if not eliminate, erosion potential. Best Management Practices (BMPs) will be implemented to ensure immediate and long-term protection from erosion. BMPs include: energy dissipaters at the outlets of pipes, drains, culverts, and spillways; energy dissipaters within the spillway of weirs and flash-board structures; and channel stabilization measures in wetland basin outfalls to drainage canals. Design components, including dense vegetation and rock slope protection, will also be included as needed to ensure long-term stability, further reducing erosion potential.

Geologic Hazards

The site is not in a seismically or volcanically active area; therefore proposed actions will not put people or structures as risk. All construction activities and structures will conform to current County building codes through obtaining the necessary County grading and building permits prior to initiating work.

The entire project site lies within a tsunami hazard and evacuation zone designated by the State. Sirens, radio, television and airplanes provide the public notification of potential tsunamis in Hawaiʻi. Tsunami warning and evacuation is administered through the Hawaiʻi Department of Defense. Highway 50 is a State designated tsunami evacuation route. The project facilities at Mānā, including the visitor center, parking lot and access road will be designed and built in a manner to comply with all State and County codes and provide egress to the evacuation route (Highway 50).

It is possible that the new berms may reduce the mauka expansion of tsunami wave run-up, but the presence of the main drainage ditches would provide avenues for through-flow. Berms will be low profile and will be below the elevation of the road and other existing berms currently on-site. Therefore, little if any change to the extent or level of tsunami run-up would occur as a result of project construction.

3.2 WATER RESOURCES

The purpose of the water resources sections is to evaluate whether the proposed project would affect existing hydrologic and water quality resources. This section describes the climate, hydrologic, and water quality conditions on and in the vicinity of the project site, including surface drainage, flooding, groundwater recharge and flow, erosion, and sedimentation. Processes and other factors affecting water quality conditions and existing water quality data are described to provide a baseline for environmental review. Effects on hydrologic resources and water quality from the proposed action are identified on the basis of numerous analyses conducted for the project area and other reports including those for regional hydro-geologic and hydrologic studies. Analyses of these reports were completed and synthesized in the Hydrologic Feasibility Assessment Report for the proposed project (Kamman Hydrology & Engineering, Inc., 2012).

3.2.1 AFFECTED ENVIRONMENT

CLIMATE

Kaua‘i lies in the belt of northeast trade winds, which dominate island weather from April through September. During this time, the trade winds deliver a mild but moist tropical weather pattern, with rains being introduced to the windward side of the island and dry conditions to the leeward side, including the Mānā Plain. The moist northeast trade winds passing over the mountainous interior of Kaua‘i are the primary source of rainfall for the island. Kaua‘i displays the steep isohyet gradient; as trade winds move over the mountains, the air expands and cools forming clouds, which leads to an increasing rate of rainfall with elevation. Mt. Wai‘ale‘ale, with a mean annual rainfall of 465 inches is considered to be one of the wettest spots in the world and is only 15 miles away from the semi-arid west coast (Chang 1962). The Mānā Plain, on the leeward side of Kaua‘i, is in the rainshadow of Mt. Wai‘ale‘ale and receives much lower amounts of precipitation, averaging just over 20 inches/year. During the winter months (October through March) tropical storms, generally from the south (Kona storms), may bring heavy rains to the entire island.

The annual average temperature within the project area (as measured at Mānā) is 74 degrees Fahrenheit, with a relatively narrow range in average monthly temperature from a low of 70 degrees in January to high of 78.1 in August (MacDonald et. al. 1960). Humidity in the area is generally within the 60 to 80 percent range (R.M. Towill 1990).

Rainfall

Daily rainfall data from climate stations near the project site has been recorded since 1905 (WRCC 2010). Data was obtained and analyzed for the Kekaha, Mānā, Barking Sands, and Waimea climate stations to develop a long-term rainfall record. The long-term annual record for Mānā (1905-2000) was extended to cover the 2001 through 2009 period by correlation to the Waimea record. The long-term average annual rainfall total for the project site is 21.3 inches. The resulting long-term average monthly rainfall totals for Mānā are presented on Figure 3.2 - 1.

Long-term rainfall patterns for the vicinity of the project site are illustrated by a plot of annual precipitation totals for Mānā from 1949 to 2009 (Figure 3.2 - 2). The time series plot indicates that annual precipitation amounts range widely, from 18 to 254 % of the average annual precipitation total of 21.3 inches. The long term minimum and maximum derived annual totals for Mānā are 3.75 and 54.14 inches, respectively.

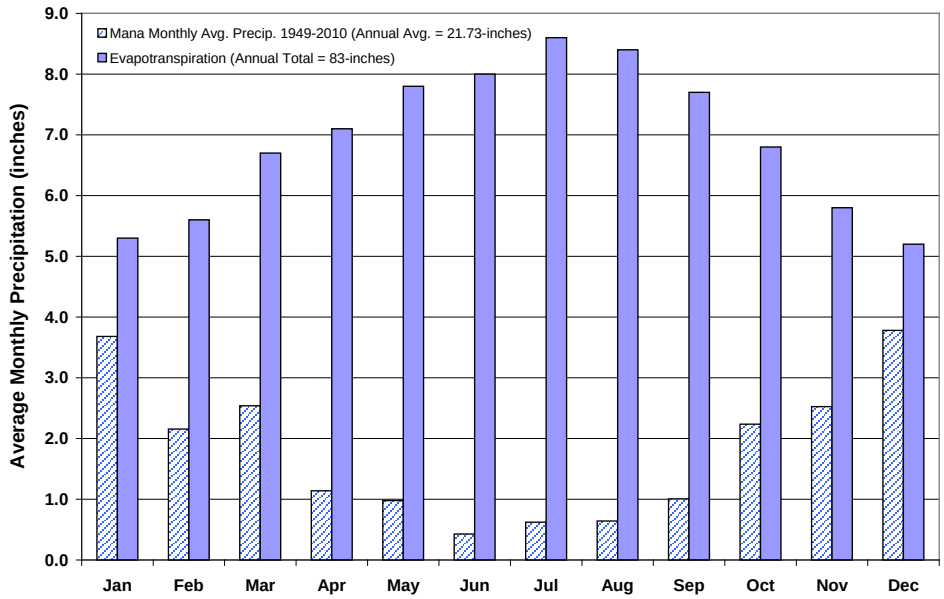

Figure 3.2 - 1. Average monthly precipitation totals (at Mānā) and average monthly pan evaporation rates for the Mānā Plain.

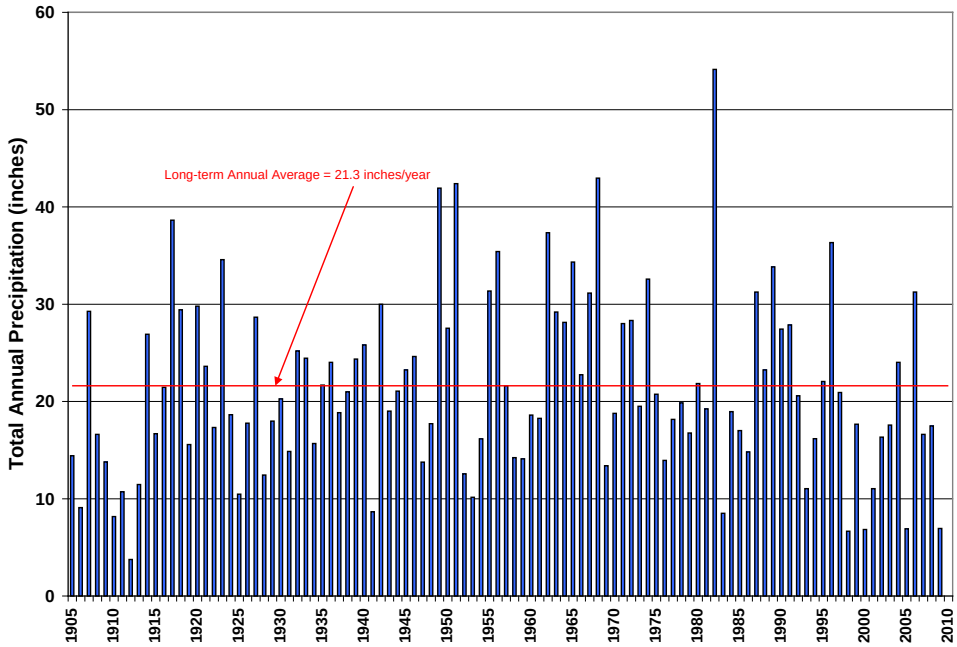

Figure 3.2 - 2. Annual rainfall totals for Mānā (Western US COOP Station, Mānā 1026, station number 516082) from 1905 to 2009.

Evapotranspiration
The quantity of water evaporated from soil and water surfaces and transpired by plants is termed actual evapotranspiration (AE). Estimated values of AE are quantified through pan-evaporation data from class-A evaporating pans. Twenty-five sugarcane production locations in Kaua‘i have documented between ten and thirty years of pan evaporation data (Shade 1995). Using these data, Shade (1995) prepared a map of mean annual pan evaporation contours for Kaua‘i. The mean annual pan-evaporation rate for the project site is 83 inches per year. Calculated average monthly pan evaporation values for the project site range from approximately 5 to 9 inches and are plotted on Figure 3.2 - 1.

GROUND WATER

Underlying the Mānā Plain are two distinct aquifers, consisting of the basaltic lava aquifer and coastal plain sedimentary aquifer (see Figure 3.1 - 1). According to MacDonald et al. (1960), the lagoonal deposits have a low permeability and yield brackish water to wells due to the high salt content in the sediments. In contrast, the underlying Nā Pali formation lavas are highly permeable and yield large quantities of less saline water to wells and shafts. Water contained in the basaltic aquifer is called basal groundwater. The sedimentary complex is called the caprock because it overlies the basalt and confines the basaltic aquifer (Burt 1979).

Burt (1979) and Oki et al. (1992) report that the principal basaltic aquifers have hydraulic conductivities[5] ranging from 400 ft/day to in excess of 1,000 ft/day. Because the Mānā Plain sediments are much less permeable than the underlying lavas, they act as a confining layer (caprock) overlying the high permeability volcanic rocks. Burt (1979) reports caprock hydraulic conductivities at approximately 0.12-ft/day. Hydraulic continuity between the sedimentary and basal aquifers is thus poor. As a result, the caprock retards the seaward and upward discharge of the lava aquifer.

Most wells on the Mānā Plain screened within the underlying lava are or were artesian when installed. MacDonald et al. (1960) report that water levels in these lava wells range from 8 to 12 feet above sea level. However, the beds of sand, gravel, and coral of the caprock can produce zones of relatively high permeability. Leakage from the basal artesian lava aquifer into these sediments likely occurs where they are in contact, albeit at a very slow rate. This upward leakage through the caprock probably maintained the marshy areas that once existed in parts of the Mānā Plain which were later drained and converted for sugarcane production (MacDonald et al. 1960).

On islands such as Kaua‘i, fresh groundwater beneath the island commonly occurs as a lenticular body of water called a freshwater lens that floats on saltwater and is separated from the saltwater by a transition zone of brackish water that is gradational in salinity. Figure 3.2 - 3 presents a schematic illustration of this relationship beneath the Mānā Plain and includes two sections

[5] Hydraulic conductivity (K) of an aquifer is the rate at which water can move through a permeable material.

showing hypothetical potentiometric surfaces[6] and transition zone positions in the confined basaltic aquifer under pre- and post-well development periods. Available data do not provide sufficient information to delineate the actual position of the transition zone in the project area. However, the majority of wells and shafts on the plain that had not been abandoned due to salinity intrusion at the peak of groundwater withdrawal are located within a half-mile zone from the eastern bluffs, suggesting the transition zone was a short distance to the east of these wells (Burt 1979).

Groundwater pumping influences the relative position of the different groundwater zones. When water is withdrawn from a freshwater lens, the freshwater lens shrinks and saltwater or brackish water intrudes upward and/or landward into parts of the aquifer that formerly contained freshwater. The degree of saltwater intrusion depends on several factors, including the hydraulic properties of the rocks, recharge rate, pumping rate, and well location. The effect of intrusion on a particular well depends on the vertical and lateral distance between the well and the transition zone. Wells completed in the freshwater lens near the coast are more likely to induce brackish water or saltwater movement into the well as pumping continues. Figure 3.2 - 3 depicts the landward shift in salt/brackish water transition zone in response to large groundwater withdrawal such as those that occurred during sugarcane production.

[6] A potentiometric surface is the elevation to which water will rise in a well screened within a confined aquifer.

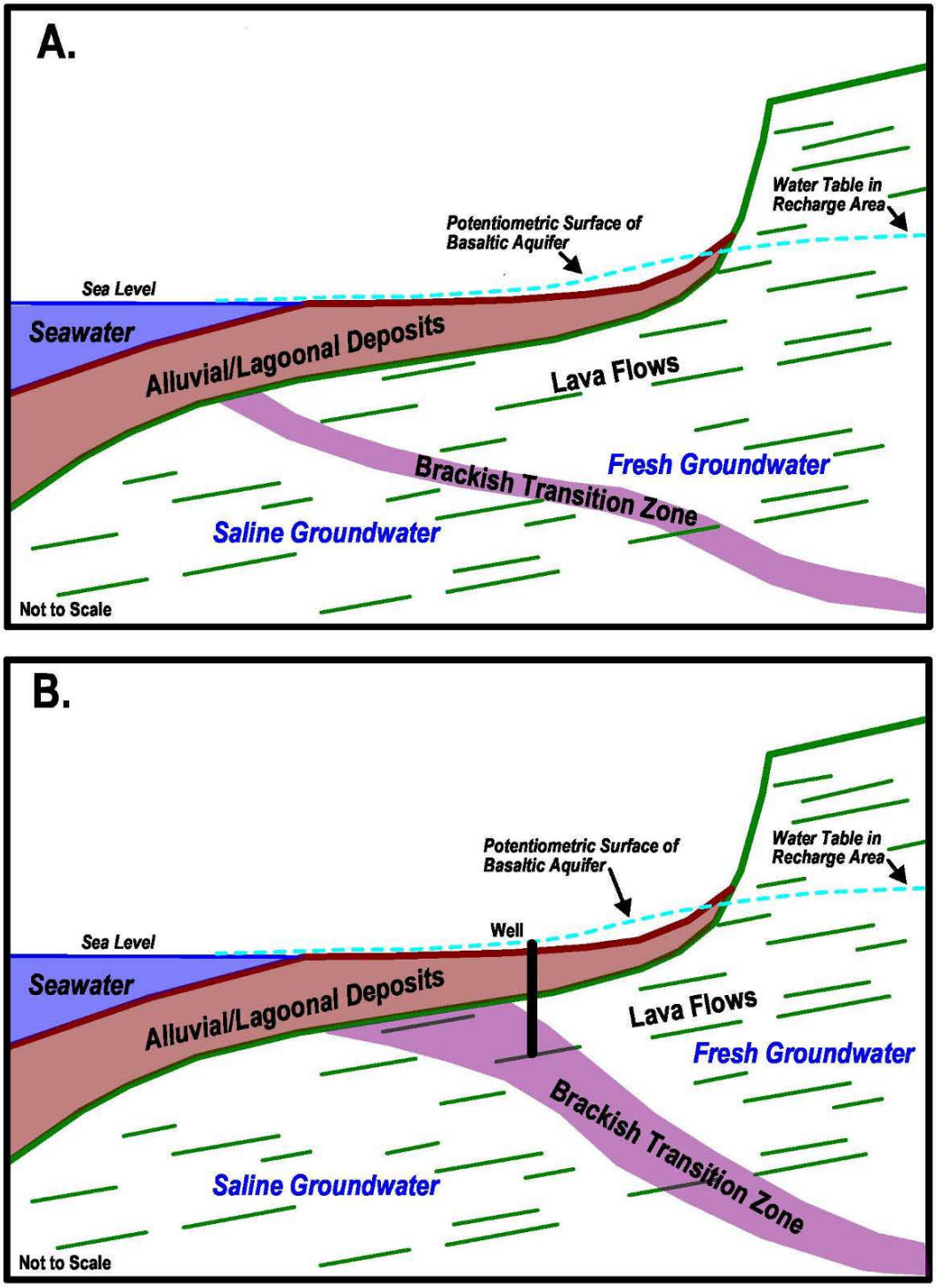

Figure 3.2 - 3. Schematic of groundwater conditions beneath the Mānā Plain under predevelopment equilibrium conditions and after development of wells for irrigation of sugarcane.

Because of the relatively impermeable and low storage capacity of the Mānā Plain sedimentary caprock, recharge to the underlying basal volcanic rock aquifer occurs in the Nā Pali region uplands to the east with groundwater flowing westward through the lavas, under the Mānā Plain towards the Ocean. Recharge to these lavas comes primarily from infiltration of rainfall and irrigation water that is not lost to runoff or evapotranspiration. An average of 21.3 inches of rainfall occurs annually at Mānā, however considerable irrigation of agricultural crops and up to 60.0 inches per year of rain falls along the highly permeable basaltic mountains east of the site. Recharge is reported at about 10 to 50 percent of the rainfall, fog drip, and irrigation water (Gingerich and Whitehead 1999), while mean annual surface water runoff from the eastern highlands onto the Coastal Plain is about 5-percent of the annual rainfall total.

In the early 1990s, there was a need to identify and describe aquifers for each island within the State of Hawai‘i to serve as a framework for the State of Hawaii's Department of Health groundwater protection strategy. In response, a system was initiated to classify and assign codes to the principal aquifers of the state as presented in a report by Mink and Lau (1992). The aquifer codes incorporate location and descriptive indices, while the status codes indicate the developability, utility, quality, uniqueness, and vulnerability to contamination of the groundwater resources.

The project site lies within the Kekaha aquifer system of the Waimea aquifer sector. Pursuant to this classification scheme, the Mānā Plain caprock sediments are considered an independent aquifer from the underlying Nā Pali volcanics aquifer. The caprock sediment aquifer is classified as an unconfined sedimentary aquifer and is a potential source of drinking water (as opposed to being an existing source of drinking water). It is ecologically important containing moderate salinity (1000-5000 mg/l chloride)[7]. This surficial aquifer is classified as having a high vulnerability to contamination[8]. Burt (1979) reports that very few data are available concerning aquifer properties of the caprock but that it has a low potential for production of fresh/brackish water. He also states that wells pumping from the caprock induce recharge mainly from nearby ditches and drains.

The underlying volcanic aquifer is confined (by the overlying sediments) and compartmented by vertical dikes that cut through the lava bed aquifer. The basal volcanic aquifer beneath the Mānā Plain is considered an existing drinking water source as it has low salinity (250-1000 mg/L chloride) and is also classified as having a low vulnerability to contamination.

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[7] Throughout preparation of the Hydrologic Feasibility Report, Kamman Hydrology & Engineering Inc (2012) did not encounter reports of any wells (irrigation or potable water) being constructed in the upper alluvial/lagoonal caprock deposits. The relatively higher hydraulic conductivity and lower salinity of the deeper basal aquifer make it the preferred target for well development on the Mānā Plain. It is unlikely that the caprock deposits will be used for potable or irrigation water in the future.

[8] Mink and Lau (1992) characterize "vulnerability to contamination" in the following manner. In the Hawaiian Islands because of the geographical limits of the resources, interconnection among groundwater sources and the relatively rapid time of groundwater travel, aquifers can be described simply as being either vulnerable or not vulnerable to contamination. Most unconfined aquifers are vulnerable; confined aquifers may or may not be. A refinement in the degree of vulnerability may be instituted by using some modifiers or index. The one used in their classification (high, moderate, low, none) is based on familiarity with environmental conditions.

Development of the basal groundwater by wells in the lava flows under the Mānā Plain began in the early 1880s (MacDonald et al. 1960, Burt 1979). By 1890, there were about a dozen wells near Kekaha and Mānā and more wells were drilled near Waimea and Kaunalewa by 1898 (Burt 1979). A year after these wells were drilled, the water in most became too salty to use (Burt 1979). MacDonald et al. (1960) report that from the time of the first well until about 1906 perhaps 50 or more wells were drilled throughout the plain for the irrigation of rice and sugarcane. Nine wells were installed in 1929 and 1930 alone. Many of the early wells were abandoned and are now lost.

As of 1960, MacDonald et al. (1960) report 52 wells existed in the Mānā Plain while Burt (1979) reports "60-odd" wells. Most of the wells on the plain are between 210- and 280-feet deep, casing off the caprock and are left with open holes within the basaltic rocks (Burt 1979). In addition to the pumped groundwater, an undetermined amount of water discharges to the surface from artesian wells that have been abandoned or are used for irrigation. Most wells were initially artesian, but with groundwater pumping and unregulated discharges from old or abandoned wells, heads in individual wells declined and many wells stopped flowing (Burt 1979). The unchecked flow of water from abandoned artesian wells and extensive groundwater pumping contributed to the historical land-ward migration of the transition zone and salt water in the basal aquifer.

In addition to groundwater wells in the Mānā Plain, shafts and tunnels were drilled into the base of the Nā Pali lava cliffs near Kekaha starting in 1931 (Burt 1979). Between 1931 and 1957, six shafts were installed along the inland edge of the plain to supply irrigation and domestic water. Between 1940 and 1960, the average daily groundwater pumping rate for the Kekaha-Mānā Plain ranged from 6.5 to 14 MGD, with about three-fifths of that water coming from drilled wells, the rest from shafts and tunnels (Burt 1979). Average pumping rates between 1958 and 1968 increase to about 24 MGD (Burt 1979) and up to 42 MGD between 1969 and 1973 (Burt 1979). However, between 1974 and 1978, groundwater pumping rates declined to about 30 MGD (Ibid). Groundwater use estimates from the Kaua‘i Water Use and Development Plan (R.M. Towill Corporation 1990) for the Kekaha hydrologic system for 1990 are down to 19.5 MGD (19.2 MGD to irrigation and 1.3 MGD for municipal use). Ground water pumping on the Mānā Plain has decreased since 1990 to estimated groundwater pumping rate of 4 MGD during 2011. Using this data, a plot of average annual groundwater pumping rates from the Kekaha-Mānā Plain basal groundwater system was prepared and is provided in Figure 3.2 - 4 to demonstrate the historical and existing demands on groundwater supply.

Likely factors that contributed to the rise and fall in groundwater demands and uses in the project area over this time include: a) by 1940, Kekaha Sugar Company had upgraded to a mechanical sugarcane production process, with increased and improved management and processing occurring through World War II and into the 1950s (University of Hawai‘i, 2004); b) by 1970, returns from sugarcane production had diminished and plantation closures began throughout Hawai‘i (Water Resource Associates 2004); and c) by 1990, sugar plantation closures were near complete and the post-plantation period, with sugar cane being replaced by diversified crops that were irrigated more efficiently (drip irrigation) and required nearly half the applied water per acre versus modern sugarcane application rates, began(Shade 1995, Water Resources Associates 2004).

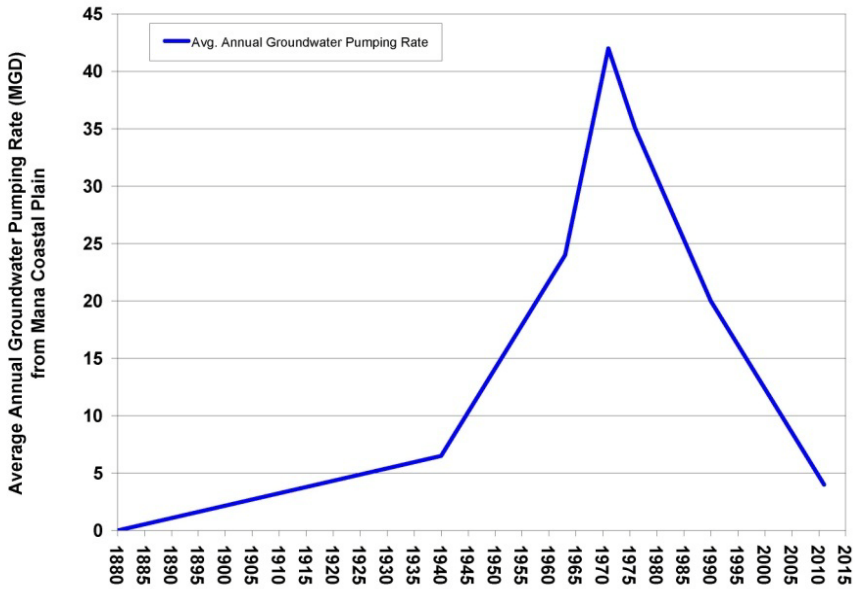

Figure 3.2 - 4. Estimated average groundwater withdrawal rates for Kekaha-Mānā Plain basal aquifer system from 1880 to 2010.

SURFACE WATER

Surface water runoff from the uplands east of the project site is intermittent and appears to occur in direct response to rainfall during the winter months. Records of runoff to/within the Mānā Plain are limited to one USGS flow monitoring gauge in the Nahomalu Valley near Mānā, which was operated for the period July 1, 1963 through September 30, 1971. The gauge (indicated by the blue triangle on Figure 3.2 - 5) is located at an elevation of 236 feet and measured the flow draining from a 3.79 square mile area. Flow from the Nā Pali upland drainages to the east of the project site are not perennial due to the rain-shadowing effects on the west side of Kaua‘i and lack of groundwater/spring contributions to the upland drainages. Flow from the eastern uplands occurs almost exclusively during the winter months in response to Kona storms. The magnitude of runoff per square mile of drainage area is also very low, likely due to the high porosity and rapid infiltration rates of the lavas that make up the eastern uplands. Burt (1979) estimated that the annual runoff from the Nahomalu Valley equals about 4.5% of the equivalent mean annual rainfall. Therefore, from a water resource standpoint, surface water runoff to the project area is not as large a resource as groundwater even during multi-year wet periods.

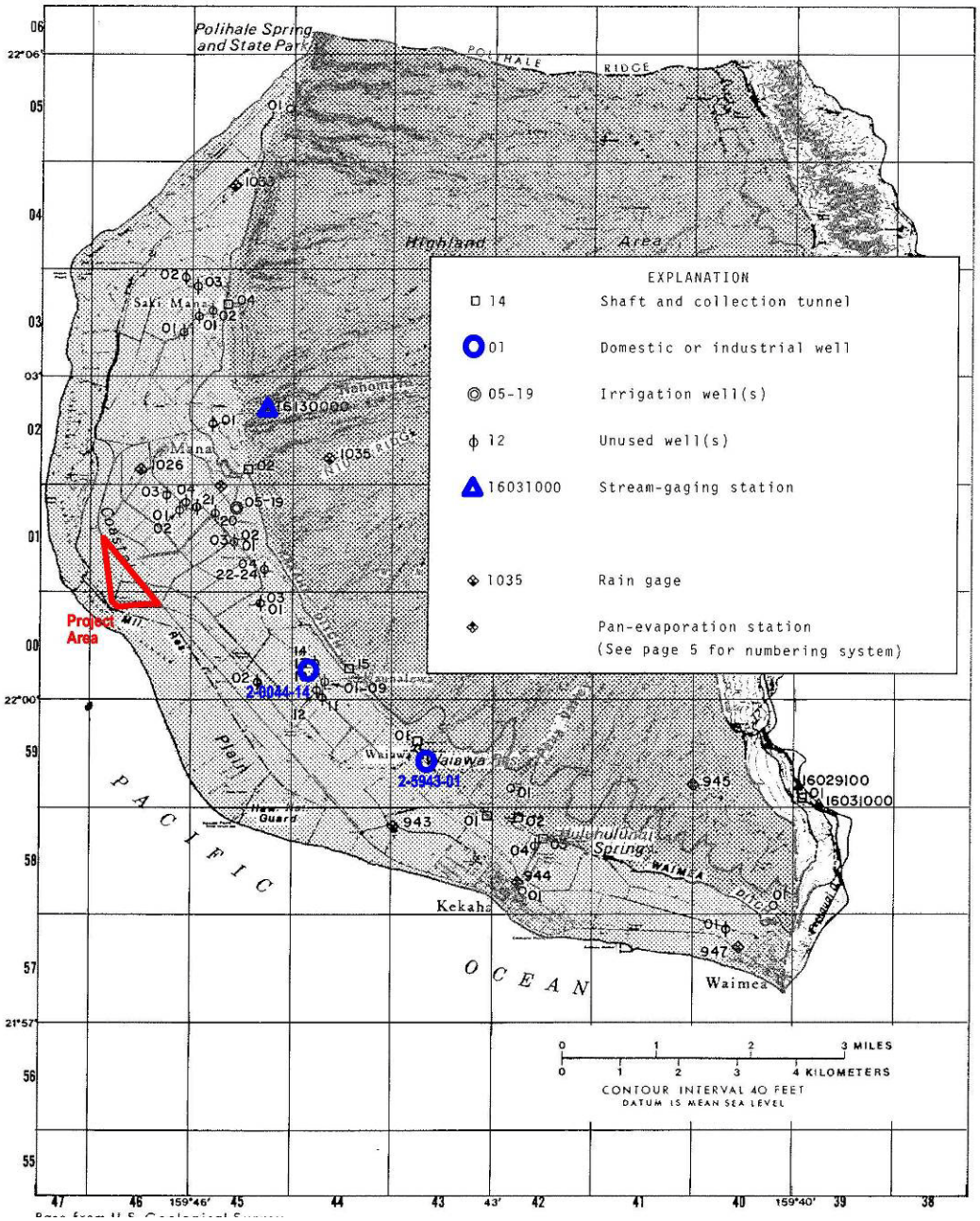

Figure 3.2 - 5. Surface water monitoring and groundwater well locations.

As part of the development of the sugarcane industry around the turn the 20th century (Water Resource Associates), large quantities of surface water from the Waimea River were diverted into miles of transmission ditches and tunnels of the Kekaha Ditch Irrigation System (KEDIS) by the Kekaha Sugar Company (Figure 3.2 - 6). This was done to move water to the abundant dry, fertile lands of the Mānā Plain that required irrigation water to grow sugarcane. The KEDIS, also known as the Waimea and Waimea-Kekaha Ditch, was started in 1906, with 16 miles of

ditches, tunnels, flumes, and siphons in Waimea Canyon and four miles in the Kekaha bluffs. Today, the KEDIS consists of approximately 27 miles of ditches, tunnels, steel siphons, wooden flumes and two hydropower plants. The 2004 system capacities were reported to be an average flow of 56 MGD and transmission capacity of 104 MGD, with 95 MG of storage, an estimated water use of 9.2 MGD and a service area of 3,695 acres (Water Resource Associates 2004).

Historically, the irrigation components of the KEDIS and the former Kekaha Plantation's entire infrastructure operations, including drainage, hydropower and road systems were operated and maintained by an informal agricultural coalition under an interim agreement with the State of Hawai'i DLNR. During 2004, the State (DLNR) transferred management of the KEDIS to the ADC (Water Resource Associates 2004). The ADC has statutory authority to set, enforce, and collect water rates and fees; further it has all the power of the State's executive department in accordance with Hawai'i Revised Statutes (HRS) Chapter 163D (Water Resource Associates 2004). The KEDIS is also critical to the safety of the Pacific Missile Range Facility because it maintains the drainage system that prevents flooding of the low-lying agricultural lands surrounding PMRF.

The existing network of drainage canals and ditches on the Mānā Plain were also installed as part of the historical land development focused on sugarcane production starting in the late 1800s. These drainage canals, ditches, and pumps control surface water flows/levels and irrigation returns through the Mānā Plain, act as drains for adjacent farm fields, and lower the shallow groundwater table to unnatural levels. Historically, extensive open water ponds and emergent vegetation wetlands existed on the Mānā Plain (Faye 1997). The historical Mānā Swamp encompassed 1,500 to 2,000 acres of seasonally, semi-permanently, and permanently-flooded wetlands. A topographic map from 1910 clearly indicates the extent of the Mānā Plain wetlands and shows ditches already in place that were used to drain wetland habitats (Figure 3.2 - 7). In the 1860s, rice farming began in the Waimea River valley and quickly spread to the wetlands of the Mānā Plain (Faye 1997). By 1878, approximately 50 acres of wetlands were drained and reclaimed for sugarcane production (University of Hawai'i 2004).

In 1922 the Kekaha Sugar Plantation systematically drained (and in some instances filled) low lying "swamp lands" on the Mānā Plain to expand sugarcane production (Faye 1997). Cox et al. (1970) reported that in 1910, at the time of the first topographic survey of Kaua'i, there was a dredged channel from the original coastal-plain to the ocean at "Waieli" [Sic]. Cox et. al. (1970) also state that the only original natural discharge from the "swamps" to the ocean was by ground-water seepage. By 1931, between 2,000 and 3,225 acres were reclaimed using ditches and planting a salt tolerant type of sugarcane (University of Hawai'i 2004)

The primary mechanism for reclaiming the Mānā Plain "swamp land" for agriculture was the construction of ditches that would eliminate ponding by drainage of surface waters as well as dewatering adjacent soils and lowering the shallow water table to a depth below the sugarcane rooting depth. The resulting drainage ditch network within the project vicinity is depicted on Figure 3.2 - 8, which indicates several ditches bisecting the project site. Currently, the drainage ditch network includes excess irrigation water (irrigation returns), waste artesian well water (including artesian flow from the ADC well), natural groundwater seepage, and surface water

storm runoff from the eastern upland creeks(Cox et. al., 1970). Ditch discharges are directed to the Pacific Ocean via the Nohili and Kawaiʻele pump stations.

The pump stations and drainage canal system are operated and maintained by the State of Hawaiʻi Agribusiness Development Corporation (ADC) under National Pollutant Discharge Elimination System (NPDES) Permit No. 000086. The Kawaiʻele and Nohili Pump Stations are operational 24 hours per day, cyclically pumping drainage water from the main canals and releasing this water to adjacent canals draining to the Pacific Ocean. Greater than 5 inches of rain in a 24 hour period or loss of power to the pump stations results in flooding of agricultural areas upstream of the pumping stations.

Average and maximum monthly pump rate data for both pump stations are available from 1999 through 2009. The 2001-2009 average pumping rates at the Kawaiʻele and Nohili stations were 65.5 and 24.8 acre-feet per day (AF/day). These flow rates equate to an average annual pumping volume of 23,900 and 9,040 AF or combined rate of 32,940 AF/year. Cox et. al. (1970) reports that average discharges at Kawaiʻele and Nohili in 1970 were 169 AF/day (55 MGD) and 43 AF/day (14 MGD), respectively. These rates reported by Cox et al. (1970) sum to 212 AF/day or 61,685 AF/year – nearly double the rates presented in the 2001-2009 ADC reports. The decline in pump rates over time is attributed to decreased irrigation needs due to the collapse of the sugarcane market and associated irrigation needs on the Mānā Plain.

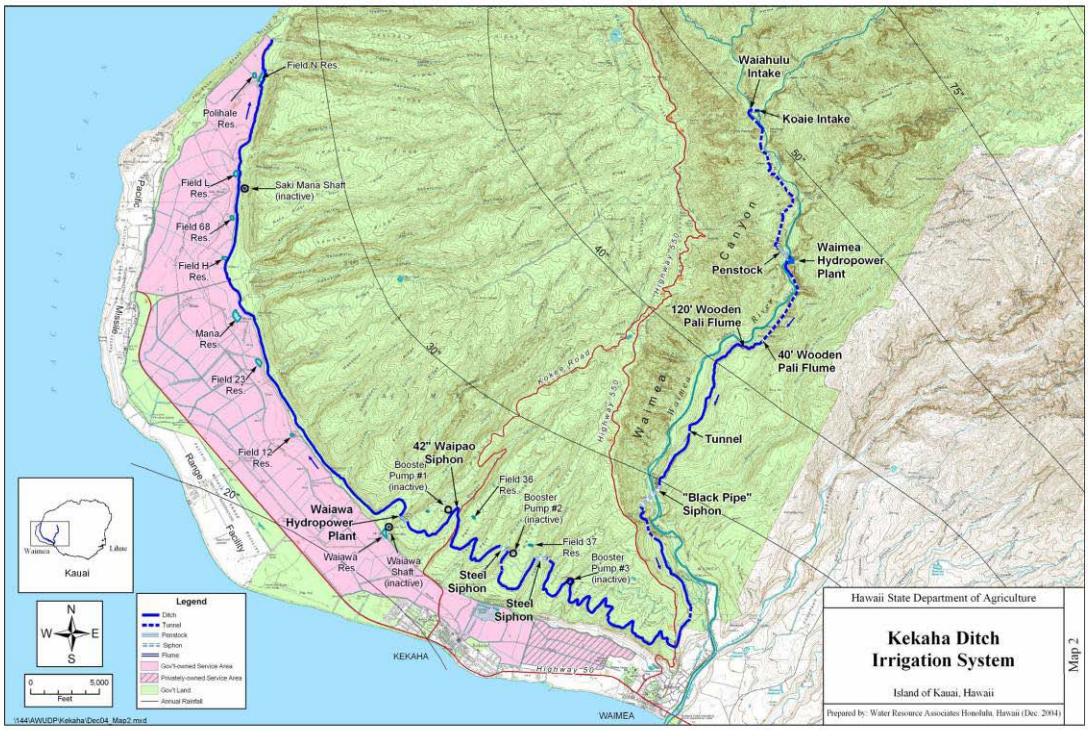

Figure 3.2 - 6. Kekaha Ditch Irrigation System circa 2004.

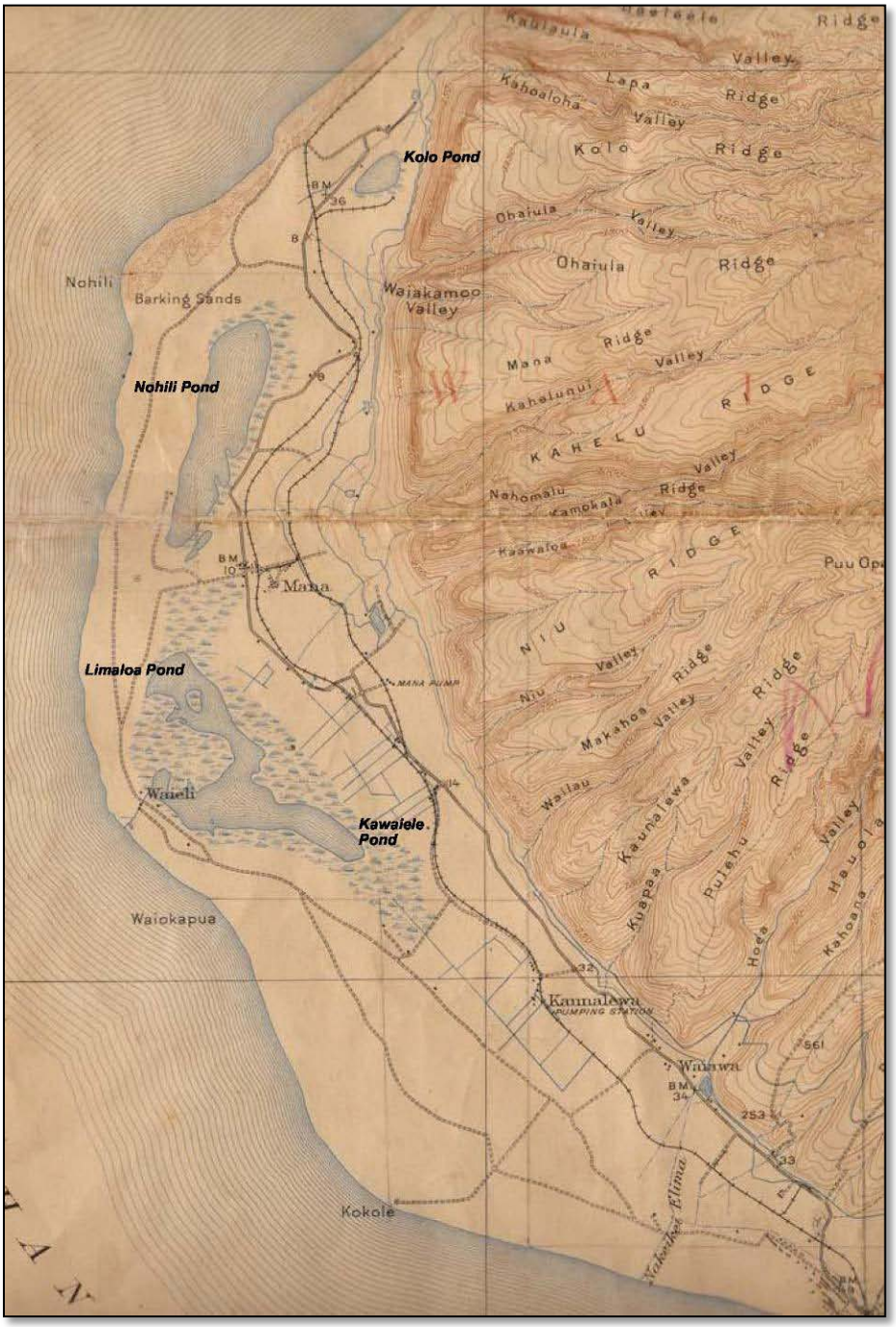

Figure 3.2 - 7. Annotated historical USGS topographic map (circa 1910) of the Mānā Plain.

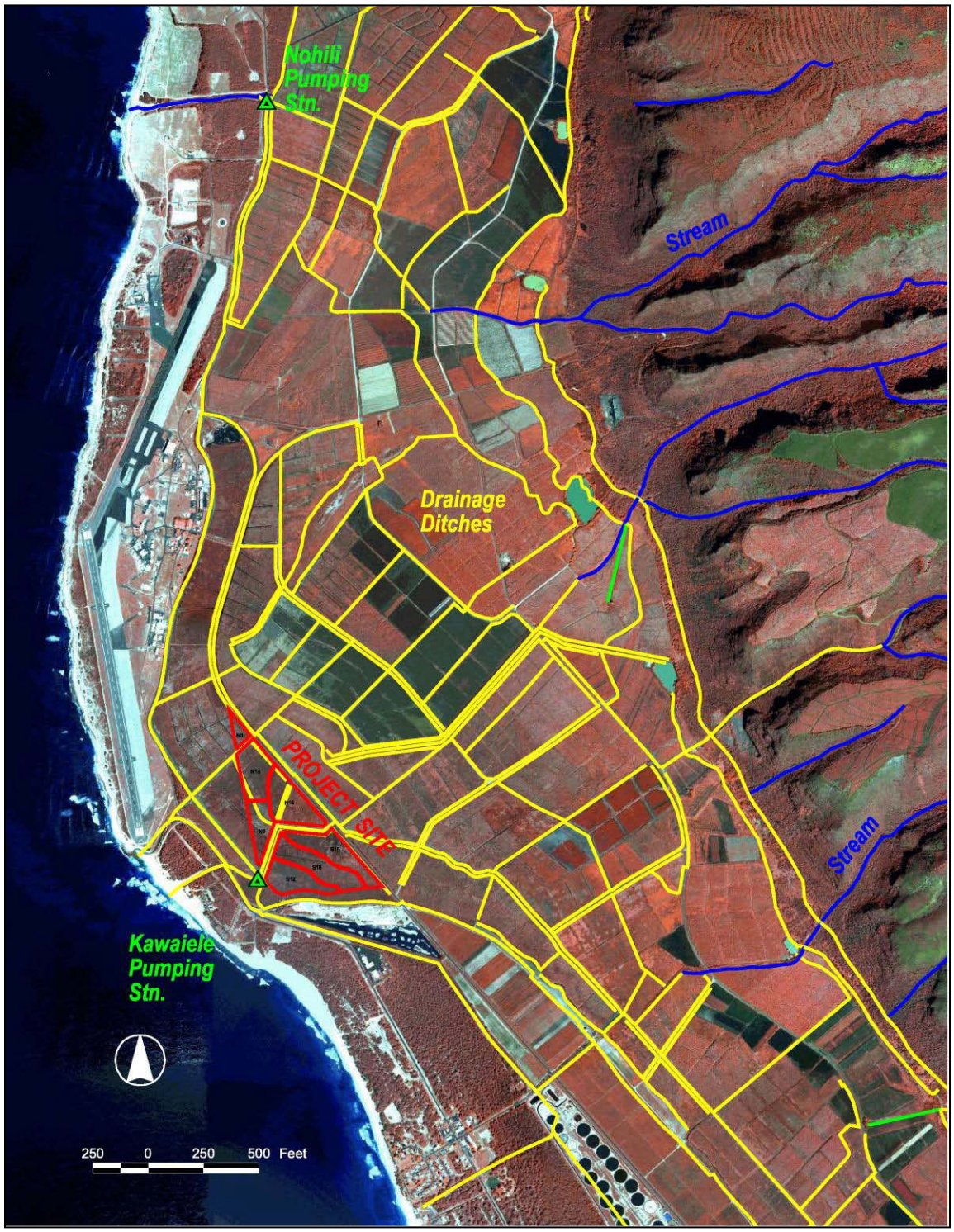

Figure 3.2 - 8. Local area surface water drainage system and pump stations on the Mānā Plain.

WATER QUALITY

Groundwater

The best historical records of groundwater levels and salinity come from three sources: 1) the report by MacDonald et al., (1960), which provide pre-1950 well data; 2) the report by Burt (1979); and 3) the USGS National Water Information System website, which provides post-1970 data. Unfortunately, the lack of consistency in groundwater monitoring locations between the three data sets prevents development of a single, long-term comprehensive record of water level or salinity. Also, early studies of groundwater quality used chloride concentration as an indicator of water salinity. Chloride is a conservative ion which constitutes approximately 55% of the ionic composition of sea water; twice the chloride concentration is a reasonable estimate of water salinity. Therefore, water with a chloride concentration of 500 mg/l is roughly equivalent to a salinity concentration of 1,000 mg/l (equivalent to 1000 ppm or 1 ppt). Sea water has an average salinity of 32 ppt (Hem 1995).

All data reviewed came from wells screened in the basal lava aquifer located between 150 and 200 feet below the surface of the caprock sediments. All water levels[9] displayed artesian conditions, as water levels rose above sea level to near the ground surface. Upon review of available reports and groundwater monitoring records, two basic processes dominate. First, pumping from individual and surrounding wells effectively lowers well water levels; the greater the pumping rate, the more the drawdown in the local groundwater head. Second, increased pumping of the basal groundwater increases the draw and capture of the deeper brackish/transition water zone that occurs beneath the Mānā Plain, leading to increased salinity (chloride concentration) in well samples (see illustrated schematic in Figure 3.2 - 3). Thus, decreases in average groundwater levels over time are likely attributed to increased groundwater pumping, especially if the decrease in well water level is accompanied by an increase in salinity concentration. The magnitudes of change observed in well records from the Mānā Plain were highly variable, but some wells displayed changes in head on the order of 10-feet and salinity concentrations that ranged from 150 mg/l to 4200 mg/l chloride (0.3 ppt to 8.5 ppt salinity). Burt (1979) reports that maximum chloride concentrations from wells drilled in 1929 and 1930 ranged from 80 to 500 mg/l (0.15 ppt to 0.91 ppt salinity). By the 1970s, maximum chloride concentrations were regularly around 2000-mg/l (3.6 ppt salinity) and average chloride concentrations increased several-fold from early levels in response to increased pumpage (Burt, 1979). Chloride levels from the 1990s were lower than those measured during the 1970s (Figure 3.2 - 9), likely as a result of the decreased pumping. No data is available on groundwater salinity or chloride levels since sugarcane production ceased in 1997. Interestingly, the high rate of freshwater recharge from irrigation of the highland sugarcane fields and leakage from the unlined Kekaha Ditch east of Kekaha has helped to maintain lower salinities in down gradient wells around Kekaha.

Figure 3.2 - 9 and Figure 3.2 - 10 are paired plots of groundwater head and chloride for two local area wells that best display the changes and relationships associated with groundwater withdrawals both locally and across the Mānā-Kekaha plain in general. The locations of these wells are provided on Figure 3.2 - 5. Figure 3.2 - 9 compares well head and aquifer chloride content for Kekaha well S13 over the period 1973 through 1995.

[9] Water levels in confined wells are also referred to as hydraulic head or simply head.

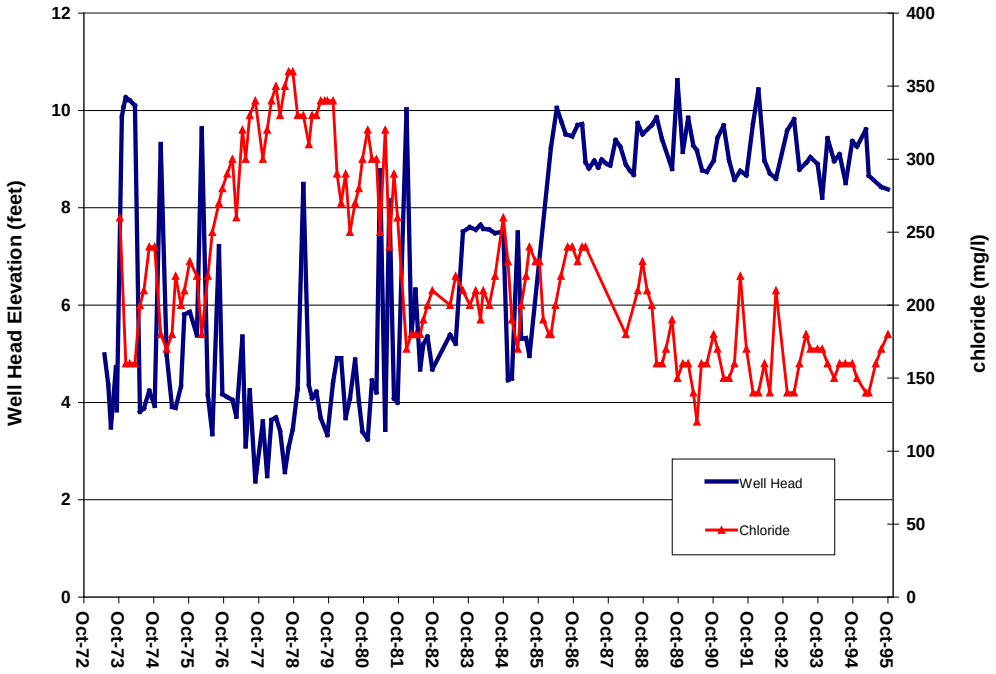

Figure 3.2 - 9. Well levels and groundwater chloride concentrations for well S13 in Kehaka (USGS well no. 215937159434201, Local no. 2-5943-01).

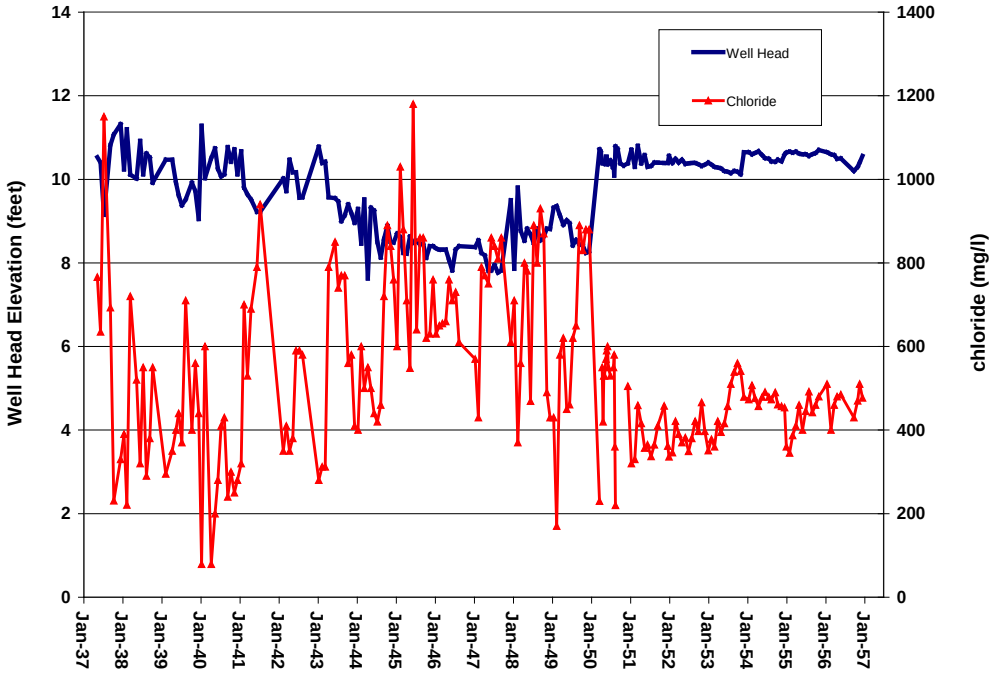

Figure 3.2 - 10. Well levels and groundwater chloride concentrations for well in Kaunalewa (USGS well no. 220019159444801, Local no. 2-0044-14).

Well head levels display sharp annual cycles of fluctuation likely attributed to seasonal changes in winter recharge and summer dry phases. More importantly are the long-term trends in base groundwater levels which display a period of depressed well head elevations around 3 feet between 1977-1978 and rising to a relatively static head level of 9 feet by 1987, a rise of 6 feet over 10 years. The amplitude of yearly seasonal variability in well head levels also decreases after 1987. Mirroring the general long-term trend in base head elevations are chloride concentrations, which peak in 1977-1978 at around 350 mg/l (0.6 ppt salinity) and then fall off and stabilize around 150 mg/l (0.3 ppt salinity) by 1989. These head and salinity level trends agree with the general groundwater withdrawal rates presented in Figure 3.2 - 9 where the peak in pumping around 1977 leads to the lowest well heads and highest salinity concentrations followed by decreasing pumping rates into the late 1980s and early 1990s that led to rising well head and falling salinity concentration.

Although the pumping history is less detailed or unknown for the first half of the 20th century, Figure 3.2 - 10 plots well head and chloride concentration for a well at Kaunalewa for the period 1936 to 1957. Similar to the changes displayed for the Kekaha well, the following changes to the local area well pumping rates can be inferred from these data: a) increased pumping from 1936 to a period of maximum pumping around 1945 is indicated by falling well head levels accompanied by sharply rising aquifer chloride concentration; b) decreased pumping rates from 1945 to 1949 are indicted by rising heads and falling chloride concentration; and c) uniform pumping rates from 1949 to around 1956 are suggested by steady well head levels and aquifer chloride concentrations. Again, these local relationships between groundwater pumping and degrading water quality are ubiquitous across the Mānā -Kekaha plain. There is a good chance that the transition zone in the basal aquifer migrated beneath the wetland restoration project site during the period of high groundwater pumping (see Figure 3.2 - 3). Decreased groundwater pumping after the peak in the 1970s has likely resulted in the transition zone shifting back to the west, similar to where it was under natural conditions.

Surface Water

Surface water quality data within and adjacent to the project site are available from multiple sources. These sources include:

1. Water quality measurements taken quarterly from 1999 through 2009 at the outfall of Kawai‘ele pump station (#002) as reported in the Agribusiness Development Corporation discharge monitoring reports (DMRs) submitted to the State of Hawai‘i Department of Health as a condition of the NPDES Permit No. 000086;
2. Refractometer salinity measurements by DOFAW in drainage canals and abandoned field ditches (see Figure 3.2 - 11); and
3. Water quality measurements taken quarterly at Kawai‘ele by Bruland et al. (2008).

A summary of water quality measurements at the Kawai‘ele pump station (#002) as reported in the DMRs obtained from the State of Hawai‘i Department of Health is provided as it represents water quality in the main drainage canals that bisects the project site (Table 3.2 - 1). Analytical results for eight discrete water samples collected at the Kawai‘ele pump from 2005 through 2008 are also available from the DMRs (Table 3.2 - 2).

On average, pH was 7.7. The maximum recorded pH was 8.1, and the minimum was 7.0. Chlorophyll a concentrations in surface water ranged from 0.5- to 23.5-ug/L and averaged 3.3-ug/L (Table 3.2 - 1). Total suspended solids (TSS) at the Kawai‘ele pump station ranged from 3.3 to 476 mg/L and averaged 53.6 mg/L.

Nitrogen, an essential nutrient for plants and animals, is present in the environment in several chemical forms. Three forms of nitrogen are reported in the DMRs and include total nitrogen (TN), nitrate- and nitrite-nitrogen combined (NO_3^-–NO_2^-) and ammonia nitrogen (NH_4^+). TN, the total amount of nitrogen in a sample, is made up of bioavailable forms of nitrogen including NO_3^-–NO_2^- and NH_4^+ [10]. Total nitrogen averaged 0.795 mg/L; ammonia averaged 0.0952 mg/L; and nitrate+nitrite averaged 0.381 mg/L. Total phosphorous concentrations in discrete samples (Table 3.2 - 2) ranged from 38.44 ug/L to 86.80 ug/L and averaged 58.00 ug/L.

The average salinity of water at Kawai‘ele pump station, was 7.6 ppt and ranged from 0.6 ppt during December 2000 to 26.3 ppt during the summer of 2006. Salts at the Kawai‘ele pump station are the result of seawater drawn inland by the KEIDS pump system (Hawai‘i Pacific Engineers and Tom Nance Water Resource Engineering 1994). Water discharged by the Kawai‘ele pump station is estimated to be 27% seawater and 73% surface water runoff from the uplands (Hawai‘i Pacific Engineers and Tom Nance Water Resource Engineering 1994).

Decreasing salinity measurements in surface waters inland of the pump station are consistent with the conclusions of Hawai‘i Pacific Engineers and Tom Nance Water Resource Engineering (1994). Within the main drainage canals that traverse the project site, six samples at five locations indicated salinities ranging between 0 and 7 ppt; four of the observations were 2 or 3 ppt. Monitoring during January 2012 revealed that salinity decreases in the eastern direction from about 10 ppt in the north-south canal to the west of the project site, to an average concentration of about 4 ppt in the canals at Kaumauli‘i Highway.

Measurements of salinity in abandoned irrigation field ditches exhibit increasing concentrations with distance away from the main drainage canals. Water within the abandoned irrigation field ditches experiences longer residence times, less freshwater mixing, long-term leaching of salts from onsite soils[11], and multiple years of irrigation water evaporation within agricultural fields. Salinity values observed in the central irrigation field ditch at locations 3, 9, 10, 11, 14, and 15 (Figure 3.2 - 11) on February 14, 2010 were 2 ppt at the confluence with the main drainage ditch, then 3, 6, 8, 12, and 28 ppt measured in the upstream direction away from the irrigation ditch. Salinity as high as 67 ppt was measured in a plugged irrigation ditch located parallel to and approximately 80 feet west of the main drain. This higher salinity measurement is the result of the concentration of salts as water evaporates with little to no inputs of fresh water.

Salinity and other water quality parameters were sampled within the Kawai‘ele parcel, immediately south of the Mānā Plain Wetland Restoration project site. Water at Kawai‘ele is supplied by local groundwater and exposed to evaporation, which tends to concentrate salinity

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[10] In contrast to TN, Total Kjeldahl nitrogen (TKN) is nitrogen unavailable for growth or nitrogen bound up in organic form. TKN was not measured as part of the Kawai‘ele pump station monitoring.

[11] The weathered state of igneous basalts naturally contains large quantities of magnesium salts.

and leads to higher salinity levels. Measurements in three locations were taken monthly over a one year period from December 2009 through December 2010. The average salinity for each area was 8 ppt, 11 ppt, 12 ppt.

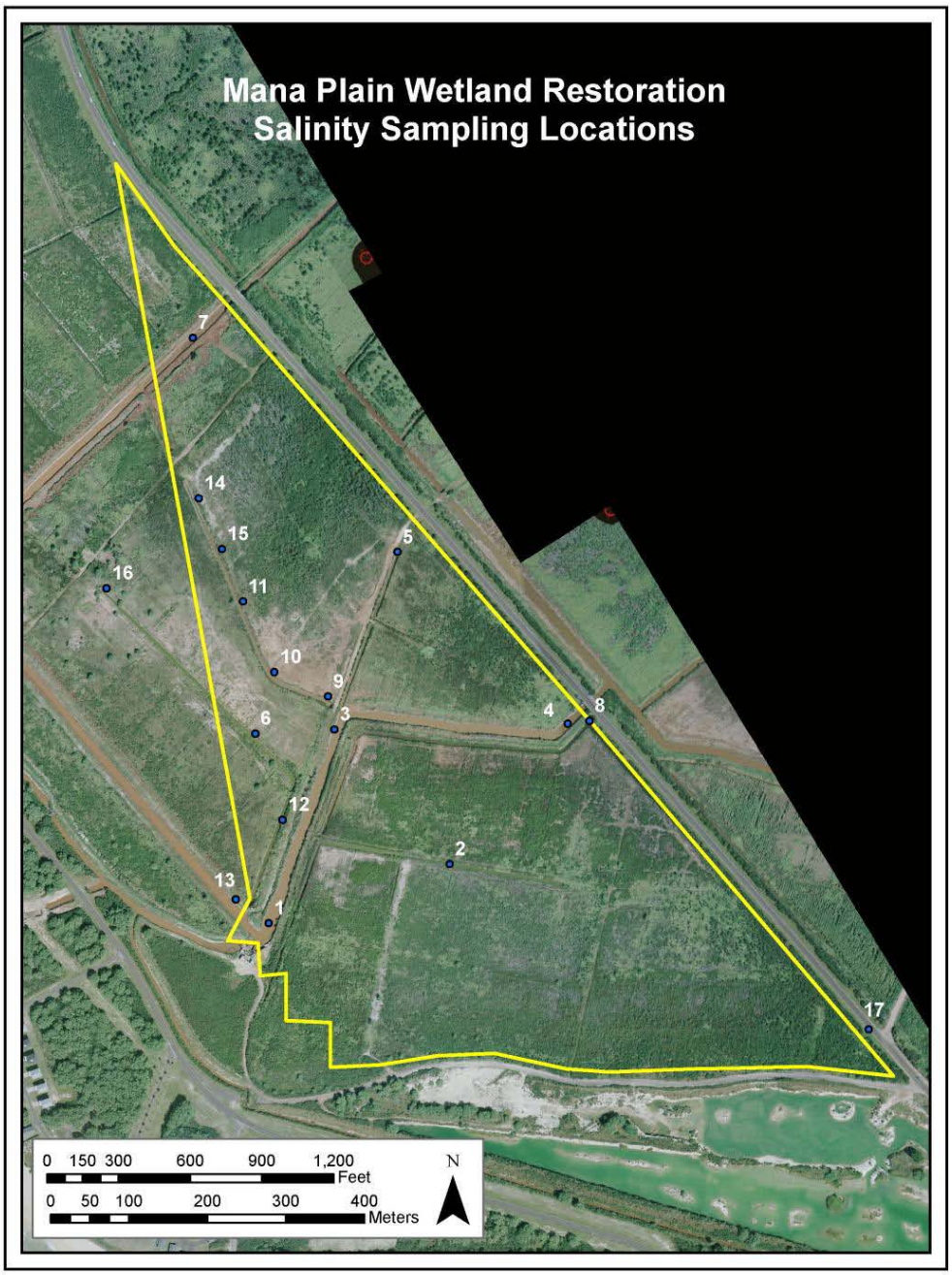

Figure 3.2 - 11. Water quality (salinity) sampling sites at the project site.

Table 3.2 - 1. Average monthly and maximum water quality concentrations at the Kawai‘ele Pump Station as reported in the Agribusiness Development Corporation’s Discharge Monitoring Reports for the period January 1999 through December 2009.

PARAMETER	AVERAGE	MAXIMUM	MINIMUM	COUNT
AVG TSS (kg/day)	4,112.3	26,501.0	57	104
MAX TSS (kg/day)	8,546.2	53,618.5	67	125
AVG TSS (mg/L)	53.6	251.5	3.3	71
MAX TSS (mg/L)	75.8	476.0	4.3	71
TOTAL N_2 (ug/L)	795.3	1,682.1	37.3	24
Ammonia N_2 (ug/L)	95.2	857.4	0.7	23
Nitrate + Nitrite NO_3+NO_2 (ug/L)	380.5	1,234.1	13.4	23
TEMP (^oF)	76.8	80.0	73.0	5
TEMP (^oC)	25.6	28.2	23.2	26
Salinity (ppt)	7.6	26.3	0.6	31
pH (min)	7.6	8	7	69
pH (max)	7.8	8.6	7.1	70
chlorophyll-a (ug/L)	3.3	23.5	0.5	29

Table 3.2 - 2. Summary of ditch water quality from discrete samples feeding the downstream Kawai‘ele outfall pump #002 from 2005 to 2008.

Date	NO3 (ug/L)	NH4 (ug/L)	TP (ug/L)	TN (ug/L)	TURB (ntu)	SALT (o/oo)	Chl-a (ug/L)
6/22/2005	13.44	29.68	39.68	427.28	4.6	9.33	0.535
10/9/2005	807.52	30.24	68.20	1179.92	28.0	9.20	3.650
4/30/2006	623.84	857.36	86.80	1620.08	5.8	12.99	1.206
12/16/2006	953.68	104.72	45.88	1169.28	7.7	5.15	0.703
3/7/2007	418.32	63.28	38.44	814.80	9.1	8.07	0.986
9/29/2007	184.24	99.68	62.00	464.24	23.0	9.69	0.955
3/1/2008	525.56	65.22	78.40	5985.00	84.9	6.75	0.580
12/8/2008	389.76	76.16	42.16	515.76	1.3	4.69	0.535
Average	**490**	**166**	**58**	**1522**	**21**	**8.23**	**1.14**

REGIONAL WATER BUDGET

As part of the Hydrologic Feasibility Assessment completed for the proposed project action (Kamman Hydrology & Engineering, Inc, 2012), a regional water budget analysis originally completed by the Burt (1979) was synthesized and expanded to evaluate the availability of groundwater as a wetland supply. An objective of the water budget assessment was to describe how water moves into, through and beneath the project site in evaluating groundwater and/or ditch water as primary water sources for the proposed project's wetland basins. As such, the assessment considers not only the Mānā Coastal Plain but also the highlands to the east, which serve as the primary recharge area for the underlying Nohili basal aquifer and potential project wells. The study focused on developing and evaluating water budgets for predevelopment, 1958-68 (peak water development), and recent (2011) periods in order to provide a picture of how hydrologic conditions have changed in response to local land use changes and associated water development.

Table 3.2 - 3 presents a summary of the highland area and Mānā Coastal Plain water budgets for the three representative periods. Most groundwater recharge reaching the Mānā Plain occurs in the highland area as infiltration of rain and irrigation water and seepage from creeks and leakage from ditches. Surface runoff from the highland area also flows onto the coastal plain. Therefore, an independent water budget of the highland area is necessary to quantify some of the water budget variables to the coastal plain area. All major inflows and outflows to each area are quantified (Table 3.2 - 3).

Under natural or predevelopment conditions, infiltration of rainfall was the primary source of recharge to the basal basalt aquifer, equating to a total annual inflow to the highland area of 74,000 AF. The total annual amount of recharge that exits the highlands as basal groundwater outflow is 25,000 AF which serves as groundwater inflow the coastal plain area. Other inflows to the Mānā Plain included rainfall and surface water runoff from the highlands. The only predevelopment outflows from the coastal plain are surface water drainage to the ocean. Burt (1979) estimated that there were approximately 1,000 acres of marsh and wetlands on the Kekaha-Mānā Plain during predevelopment times.

With land and water development on the west side of Kaua‘i, came irrigation from surface water diversions from the Waimea River and increased groundwater pumping. Although not a significant change to the large-scale post development water budget, the construction of the drainage ditch network throughout the coastal plain effectively lowered both the shallow caprock water table and basal aquifer potentiometric head. This was accomplished as the ditches drained the unconfined caprock water as well as any upward groundwater seepage from the basal aquifer. Essentially, the drains expedite the drainage of groundwater recharging from the surface or leaking into the caprock from below.

The major changes to the highland area water budget by the 1958-68 peak development period was the added inflow of irrigation water delivered via the Kekaha, Koke‘e and Waimea ditch systems, which led to increased surface water runoff and increased groundwater recharge, even when accounting for increased evapotranspiration. On the lower coastal plain area, the increased groundwater recharge was absorbed by increased groundwater pumping for sugarcane irrigation.

The increased surface water flows were also effectively discharged to the ocean through the well-developed agricultural drainage system.

The recent water budgets reflect important input from the ADC during 2011 regarding irrigation and pumping volumes. As of 2011, the ADC reports that irrigation contributions via the ditches are downs to 33,600 AF/yr as opposed to 61,000 AF/yr for the 1958-68 period. The reduction in irrigation has also lead to a decrease in surface water runoff, and groundwater recharge as well as reduced evapotranspiration loss from irrigated highlands. This translates into less surface water and groundwater inflows to the coastal plain. In addition, reduction in irrigation needs following the decline of sugarcane has resulted in a reduced groundwater pumping rate from the Mānā Plain. ADC staff indicate that the 2011 groundwater pumping rate is approximately 4 MGD or 4500 AF/yr for 2011 as opposed to 27,000 AF/yr during the 1958-68 period. As a result of the decreased groundwater pumping since the 1990s, the groundwater inflows to the coastal plain aquifer exceed outflows by almost 70% as opposed to the peak pumping era when groundwater inflows exceeded outflow by only 28%. The current level of groundwater inflow to the deep Mānā Plain aquifer also exceeds the degree of recharge experienced during the pre-development period when inflow exceeded outflow by 54%.

The recent water budget analysis characterizes recent trends in groundwater use and recharge. Theoretically, both the trend of decreased groundwater pumping from the coastal plain and net increase in groundwater recharge will reverse or ameliorate the adverse impacts of increased basal aquifer salinity associated with historical groundwater pumping. In addition to recharging historically depleted groundwater resources, the net increase in groundwater recharge should push the brackish water transition zone to the west, therefore reducing the potential for salt water intrusion.

Main drainage canal at Kawai‘ele pump station.

Table 3.2 - 3. Estimates of inflow and outflow of water in the Highland Area and Kekaha-Mānā coastal plain area.

HIGHLAND AREA				
		Predevelopment AF/yr	**1958-68 AF/yr**	**Recent AF/yr**
INFLOW				
1. Rainfall	33" on 26,900 acres	74,000	74,000	74,000
2. Irrigation	Kekaha Ditch	0	40,000	
3. Irrigation	Kokee Ditch	0	18,000	
4. Irrigation	Waimea Ditch	0	3,000	33,600
	Total Inflow	**74,000**	**135,000**	**107,600**
OUTFLOW				
5. Runoff	5% of rainfall from highlands	4,000	4,000	4,000
6. Runoff	57% applied irrigation	0	35,000	19,100
7. Evapotranspiration	Non-irrigated highlands	45,000	41,000	41,000
8. Evapotranspiration	Irrigated highlands	0	12,000	8,500
9. GW outflow	Rainfall	25,000	25,000	25,000
10. GW outflow	Ditch/Reservoirs (30% ditch)	0	18,000	10,000
	Total Outflow	**74,000**	**135,000**	**107,600**

COASTAL PLAIN AREA				
		Predevelopment AF/yr	**1958-68 AF/yr**	**Recent AF/yr**
INFLOW				
11. Rainfall	20" on 11,200 acres	19,000	19,000	19,000
12. Runoff	From Highland Area	4,000	4,000	4,000
13. Runoff	Irrigated areas in Highlands	0	35,000	19,100
14. Groundwater	Inflow from basaltic aquifer	25,000	13,000	13,000
15. Groundwater	Pumping	0	27,000	4,500
16. Groundwater	Abandon well leakage	0	3,000	3,000
	Total Inflow	**48,000**	**101,000**	**62,600**
OUTFLOW				
17. Runoff	Surface drainage	25,000	3,000	3,000
18. Runoff	Mill ditch	0	3,000	3,000
19. Runoff	Kawai‘ele drain	0	37,000	18,100
20. Runoff	Nohili drain	0	16,000	7,300
21. Evapotranspiration	Non-irrigated plain	17,000	9,000	9,000
22. Evapotranspiration	Open water	6,000	0	
23. Evapotranspiration	Irrigated plain	0	33,000	22,200
	Total Outflow	**48,000**	**101,000**	**62,600**

HYDROLOGIC AND CLIMATE HAZARDS

Flooding

The entire project site lies within Federal Emergency Management Agency (FEMA) Flood Zone A and is subject to inundation by the one percent chance annual flood event (100 year rainfall event) (Figure 3.2 - 12). FEMA determines Zone A areas using approximate methodologies, and since detailed hydraulic analyses have not been performed, no base flood elevations (BFEs) or flood depths are available (FEMA 2010) for the project site.

Figure 3.2 - 12. Mapped 100-year flood zone.

Historical flooding within the project site is associated with Kona storms during the winter months of the year. Kona storms are preceded by strong and persistent southerly winds, and are generally produced by advance of extra tropical cyclones over the North Pacific (Chun 1952). The direction of the Kona storm is generally from southwest, with greatest precipitation being recorded on the leeward side of the mountain ranges (Chun 1952).

During December 2010, the project site experienced a Kona storm where approximately 5 inches of rain fell over a 12 hour period. Considerable flooding occurred within the project site and surrounding areas due to direct rainfall as well as overtopping from drainage ditches passing across the site. Similar conditions were observed at the site in March of 2006. During both flooding events, standing water persisted for several days, also in part due to complete saturation of site soils in response to shallow groundwater that rose to the ground surface. Under dry

conditions, the high clay content of the alluvial, poorly drained soils suggests slow to moderately high infiltration rates and high groundwater generally 12 to 24 inches below the ground surface. During dry periods, depth to groundwater is generally between 20 and 40 inches below the ground surface. However, during both the March 2006 and early December 2010 Kona events, all site soil was completely saturated until the downstream Kawai‘ele and Nohili pumps could draw down water levels in the main ditch system, allowing shallow surficial site soils to drain.

Hurricanes

Meteorologists classify tropical storms that have sustained wind speeds of 74 to 149 mph for at least one minute as hurricanes (FEMA 2011). Storms with sustained winds of 39 to 73 mph for one minute or more are classified as tropical storms. Between 1970 and 2000, there have been 138 tropical storms in the central Pacific, but the number of these storms that intersected Hawai‘i is relatively rare (Fletcher et al., 2002). Figure 3.2 - 13 illustrates the tracks of the major storms that have affected the Hawaiian Islands in the recent past. It has been hypothesized that Kaua‘i lies in a more vulnerable position than the other islands. However, research at the University of Hawai‘i, Meteorology Department, concludes that every island has been affected, no island is without risk, and all Hawaiian coasts are equally vulnerable to hurricane impact (Fletcher et al., 2002). FEMA also states that there is no meteorological reason why Kaua‘i has sustained more recent direct hits than other islands (Fletcher et al., 2002).

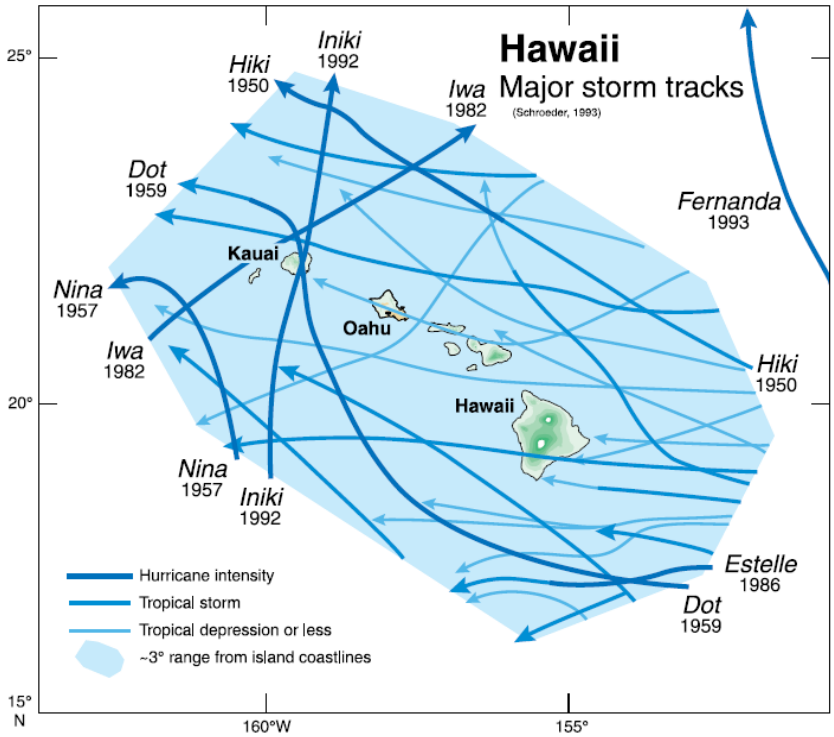

Figure 3.2 - 13. Tracks of recent major tropical storms and hurricanes that have affected Kaua‘i.

3.2.2 Environmental Consequences

This section considers two project alternatives to determine whether any component of the alternatives may result in significant impacts to hydrology, geomorphology, or water quality during or after project construction. If potential impacts are identified, mitigation measures are described that would reduce the impact to less than significant levels.

An important aspect of the Mānā Plain Forest Reserve Wetland Restoration Project is that it has been designed with the specific intent of creating an environmentally beneficial project that will have minimal adverse effects. Therefore best management practices have been incorporated into the project design. This evaluation considers any mitigation that is already a part of the design to be a part of the project being assessed.

No Action Alternative

Under the No Action Alternative, there will be no construction, changes to site topography, or water delivered to the site. Therefore, there will be no impacts to water resources under this alternative. Surface water and ground water will continue to be managed primarily for agricultural resources, and no water would be used for restoration of native wetland habitats. Water quality would likely remain as is under current conditions. This alternative would not improve existing water quality in the northern canal, as delivery of some of that water to a restored wetland basin in order to remove nutrients and suspended sediments before the water is pumped to the Pacific Ocean through the Kawai‘ele pump station would not occur. An area of hypersaline water on the project site would remain as is under current conditions. There is no current existing use at the site related to water quality standards since no wetland habitat is present.

Preferred Action

Climate
The proposed action will not alter the existing climatic conditions. The pump will be run from existing hydro-electric power and renewable solar energy will be incorporated into the design of the visitor center. Therefore the proposed project will not contribute to increased green houses gases into the atmosphere.

Groundwater
The proposed action should have minimal effects on the underlying aquifer because 1) water yields that will be pumped for the proposed project are low and 2) the existing well has no history of salt-water intrusion when previously pumped at a yield higher than that which is needed for the proposed project.

The regional water budget analysis indicates that groundwater conditions have likely improved significantly since the time of peak groundwater withdrawal for sugarcane production. Groundwater pumping on the Mānā Plain has decreased by 91% and groundwater recharge now exceeds pumping. The proposed project will pump groundwater from an existing well at a rate

between 60 and 350 gpm. The highest anticipated rate for the proposed project (350 gpm) is approximately half (50%) of the historical yield from this well and is 1% of the maximum historical groundwater pumping rate on the Mānā Plain.

Current groundwater pumping rates are 9% of the historical peak rate and no salt water intrusion has been detected at this groundwater pumping rate. The proposed project will increase the current groundwater pumping rate on the Mānā Plain by 8%. The combined groundwater pumping rate from existing wells and that from the proposed project is 11% of the historical peak groundwater rate. The pass-through flow for the proposed project will be equal to or less than the current artesian flow that is discharged from the well. Therefore, pumping from the existing well should not negatively impact existing groundwater resources.

Surface Water

The proposed action will not impact the KEDIS or irrigation of the surrounding crop lands. Surface water runoff from eastern upland areas is minimal and therefore will not be affected by the proposed action. The proposed action should have minimal effect on the surface water in the adjacent drainage canals and the day-to-day operations of the Kawai‘ele pump station. As designed and analyzed, basins are intended to drawdown via elimination of water supply delivery and evaporation. Any managed drawdowns of wetland basins to control invasive species, expose mud flats for germination of wetland vegetation, and/or mimic natural wetland cycles will have a relatively slow discharge and will be staggered so that fewer than 3 basins are in a drawdown phase at any given time. Therefore, the volume and rate of water discharged from the wetland basins will be well within the volumes experienced during an average rainfall event and well within the operating range and capacity of the pump station. Use of surface water from the northern canal as a water supply for two of the wetland basins, will likely reduce the amount of water that would otherwise reach the Kawai‘ele pump station, and possibly reduce the amount needed to be pumped.

Water Quality

The proposed wetland restoration actions should have a positive beneficial impact on the water quality of the area by 1)) increasing native wetland plants that uptake nutrients, thereby reducing concentrations of nutrients in the water, 2) removing remnant black plastic irrigation tubing, and 3) reducing areas of elevated salinity in abandoned field ditches. In addition, construction and design criteria of the wetland basins will minimize erosion. The synthesis of information for surface water and groundwater indicates that the water quality of the surface and groundwater is suitable for the targeted wetland-dependent wildlife and plants.

Small-diameter black plastic tubing that was used for the irrigation of sugarcane is scattered throughout the site and is occasionally observed in the main drainage canals. Under the proposed action, all black plastic tubing will be removed from the site and properly disposed of. This will eliminate the potential for black plastic tubing from the project site to degrade water quality of the adjacent surface waters.

Abandoned field ditches which drain water from adjacent fields and result in increased salinities in these areas will be filled. This will improve water quality by eliminating the ponding of

stagnant surface water that has elevated salinities and likely has low dissolved oxygen, both of which can be detrimental to wetland dependent wildlife.

Under the proposed action and during periods of maximum water levels, pass-through flows will be implemented to improve water quality and maintain and enhance wetland functions within the restored wetland basins. Pass-through flows will ensure that water quality within the wetland basins does not degrade, thereby eliminating stagnant conditions, eutrophication, and concentration of salts due to evaporation. Pass-through flows benefit wetland habitats by maintaining a degree of turnover in the water column and reducing the probability of disease outbreaks. Furthermore, pass-through flows reduce the accumulation of salts, an important aspect of managing wetland systems in arid and semi-arid environments (Fredrickson 1991).

The availability of nitrogen and phosphorus is positively related to the biomass and productivity of many wetland plants; however excess nutrients can lead to eutrophication in wetland habitats (Keddy 2010). Freshwater and salt water marshes with seasonal and semi-permanent flooding regimes have a high availability of nutrients compared to other wetland types (Keddy 2010). Phosphorus and nitrogen play important roles in wetland biogeochemistry and are often limiting in wetland ecosystems (Mitsch and Gosselink 2000).

The use of surface water is likely to benefit wetland plants by providing essential nutrients that are often limited in wetlands. Aquatic and emergent plants within the restored wetland basins will use these nutrients and therefore improve water quality by reducing the amount of nutrients in water that is discharged to the Pacific Ocean through the Kawai‘ele pump station. In addition, the increased phosphorus (P) sorption capacity of the proposed actions will bind P, therefore reducing the amount of P in surface water that is currently pumped through the Kawai‘ele pump station.

Coastal wetlands, due to their relatively lower topographical position in the landscape, generally receive nutrients from upland sources. Historical natural hydrologic processes which transported nutrients from the uplands to wetlands on the Mānā Plain are now lost due to hydrological alterations. The use of surface water from the drainage canals will provide two of the restored wetland basins with nutrients essential for plant growth. Nutrient levels in the surface water, as measured at the Kawai‘ele pump station, are similar to average values reported from lowland coastal wetlands on Kaua‘i and throughout the main Hawaiian Islands that support endangered Hawaiian waterbirds and native wetland plants (Bruland and MacKenzie 2010, Bruland et al. 2010) and no adverse effects are expected.

Phosporus sorption capacity of Hawaiian lowland wetlands is variable, however wetlands with longer flooding regimes have higher sorption capacities than drier sites (DeMent 2008). Restoration of managed seasonal and semi-permanently flooded habitats is likely to increase the P sorption compared to existing drier conditions (no action alternative). Therefore, the use of surface water is not expected to have a negative impact on wetland function, flora or fauna, and will likely have a positive effect by increasing productivity of wetland plants and decreasing nutrient concentrations in surface water that is currently pumped to the ocean through the Kawai‘ele pump station. If unanticipated adverse impacts to water quality result from the use

of surface water, operational changes to increase the amount of groundwater supply to the selected wetland basins will be initiated.

Activities associated with the construction of wetland basins and environmental education and recreation opportunities should have minimal short-term impacts on water quality. DOFAW will obtain and follow all necessary permit requirements for construction activities and best management practices will be incorporated into the design to minimize potential water quality impacts. Existing stabilized two-track roads will be used for construction access. Construction of wetland basins and berms will be set back from the drainage canals to allow future canal maintenance. Additionally, a filter strip will be left between construction activities and existing drainage canals. Berms and wetland basin contours have been designed with shallow slopes to reduce erosion potential. In addition, biodegradable erosion control matting (e.g., mats, rolls, and/or netting), or other equivalent erosion control material, will be placed on berms and other sloped areas to stabilize soils. Vegetation will be seeded or planted to ensure long-term stability.

Vegetation and soil removed as part of the grubbing and grading of the project site will be placed in an approved upland area within the project site that minimizes the potential for wind and rain erosion. The design criteria to balance cut and fill will minimize, if not eliminate, the stockpiling of material. Excavation of wetland basins will be above the shallow groundwater. Shallow groundwater may be encountered during construction of slurry walls. All construction dewatering activities will follow county, state, and federal regulations and best management practices.

The size of wetland basins and shallow slopes of the berms within the proposed alternative will reduce wind-wave generated erosion within the project site. Under the proposed action, the orientation, basin size, and shallow perimeter berms of the wetland basins will restrict the necessary surface area for the set-up of significant wind-waves that cause erosion along shorelines. As part of proposed project design, all inflow and outflow structures and water flow constriction points will include outlet stabilization structures designed to absorb the impact of the flow of water and reduce the velocity to non-erosive levels. These measures, combined with gently sloping shorelines and vegetated surfaces, will further minimize erosion.

Hydrologic and Climate Hazards

In order to evaluate potential project-induced benefits or impacts to flood hazards, a numerical modeling flood study was completed by Kamman Hydrology & Engineering, Inc. (2012). The study focused on characterizing the differences between existing conditions and proposed action potential on water surface elevations simulated at the Mānā Plain wetland restoration site and the surrounding area over a series of different magnitude flood events and during post-storm conditions. The work was accomplished through development of the computer-based hydraulic model HEC-RAS (USACOE 2010), which simulates existing and proposed project alternatives, including current operating conditions employed at the Kawaiʻele pump station. The hydraulic model predicts water surface elevations and channel velocities for a full suite of 24-hour storms between and including floods having a 2- through 100-year recurrence interval.

Based on the flood assessment completed as part of project design, and the feasibility assessment there will not be any notable change in the existing height, extent, or flow velocities of floodwaters under project conditions. Results of the flood study indicate that simulated proposed action conditions do not appreciably differ from pre-project (existing) conditions within the project area. Under the proposed action, water may recede slightly slower than during existing conditions, causing the lead Kawaiʻele pump cycle to be delayed by about an hour for larger events. Peak velocities are not affected by the proposed action. Velocities remain below 2 feet per second within the project area, regardless of the size of the storm event. Non-suspended sediment, and only a portion of suspended sediment, accumulate in the project reach from upstream and have no way to exit the system except by mechanical means.

Damage and injury associated with tropical storms is the result of high winds, storm surge, heavy rains, tornadoes and high waves. The greatest threat related to hurricane over-wash in the Hawaiian Islands is due to water-level rise from wave forces rather than wind forces, which is the driving process over the mainland.

The project is located in relatively close proximity to the coast and could experience flooding and high winds associated with tropical storms. Within the wetland basins, the effects of a tropical storm or hurricane would be similar to the no action or existing condition.

Structures associated with the visitor center could be damaged by strong winds and flooding. Although mitigation against tropical storms and hurricanes is difficult, a number of relatively simple construction and retrofit techniques can significantly increase the ability of a structure to withstand damage (FEMA 2011). Structures would be built in conformance with applicable building codes. Also, damage to these structures pose no significant hazard to the wetlands or surrounding properties and structures. Damages to project structures are no more likely than the risk associated to structures within the surrounding area

3.3 BIOLOGICAL RESOURCES

3.3.1 AFFECTED ENVIRONMENT

PRE-EUROPEAN SETTLEMENT HABITAT AND HISTORICAL CHANGES

The historical "Mānā Swamp" extended from Waimea to Polihale, and was one of the largest wetland complexes in the Hawaiian Islands. During the rainy months, one could canoe from Waimea to Mānā. Historically the Mānā Swamp included four large open water areas behind the coastal sand dunes supported by springs, artesian ground water, and surface water during the rainy months (see Figure 3.2 - 7). These open areas were surrounded by neke (bulrushes), and likely included areas of semi-permanently, seasonally, and temporarily flooded habitats and their associated plant species. The area supported thousands of native and migratory waterbirds as described below:

> *Far to the west he came upon the flats of Mana' [sic] stretching sleepily for miles along the ocean …Extending toward Waimea was a wide lagoon, teeming with gold fish and*

> *strand new birds and ducks, the moha, the manu Koloa, the alae or mudhens with white and red heads, and the aio, a wading bird or stilt. There were thousands of them…* (from Knudsen and Noble 1944).

Valdemar Knudsen started the Kekaha Sugar Company in 1878 with the first planting of sugar at Kekaha. The wet areas described were drained by pumps and drainage canals, and low areas were filled with sand from the coast and topsoil from the upland or mauka areas (Yent 2005). A USGS topographic map from 1910 (see Figure 3.2-7) shows the open water areas surrounded by wetlands still in existence and ditches already dug in what was likely seasonally and temporally flooded habitats. The last open water area was drained and planted to sugarcane in 1959 (Yent 2005).

Sugarcane was cultivated at the project site until the late 1990s when Kekaha Sugar Company closed. A system of drainage canals, ditches, and pumping stations is maintained for diversified agricultural crops. These crops include corn and sunflowers, which are grown on fertile uplands to the east of the project site.

EXISTING HABITATS AND BIOLOGICAL RESOURCES

The project site is predominately classified as grassland/herbaceous and scrub/shrub by 2001 land cover maps based on Landsat Enhanced Thematic Mapper scenes analyzed according to the Coastal Change Analysis Program (C-CAP). The terrestrial habitats are dissected by two main drainage canals, service roads (2-track), and several abandoned field ditches.

A botanical survey of the project site was conducted during January 2005. An additional vegetation survey was completed during 2009 as part of the wetland delineation conducted by Natural Resources Conservation Service (NRCS). Any additional species observed during subsequent field work up through 2011 have also been recorded. The current vegetation is dominated by non-native, introduced plant species. Approximately 65 species of non-native plants are found in the area (see Appendix A). Dominant vegetation within the proposed project site includes two species of shrubs, haole koa (*Leucaena leucocephala*) and fleabanes (*Pluchea* sp.). The understory is dominated by non-native grasses, sedges, and forbs. Eight species of native coastal strand plants occur within or near the project site, but they occur in very limited numbers and distribution. At least five species of native wetland obligate plants occur at Kawai‘ele.

Surveys of native birds at the project site and at the adjacent Kawai‘ele parcel were conducted from 2005 to 2007. In addition, Kawai‘ele and other open water and wetland sites on the Mānā Plain are surveyed as part of the Statewide Biannual Waterbird Survey. Avian species that are known to occur at or near the site include 21 species of non-native, introduced birds and 27 species of native resident or migratory birds (Appendix B). Non-native, introduced birds include songbirds, game birds, barn owls, and cattle egrets. Of these 21 non-native species, 14 species are known to nest in the area. The other 7 species use the area to forage. Native species at and near the project site include 5 species of indigenous waterbirds (4 of which are listed as endangered), 5 species of migratory shorebirds, 5 species of migratory waterfowl, 2 species of

migratory gulls, 7 species of seabirds (overflight only), the Hawaiian goose, and the Hawaiian owl.

Four species of endangered Hawaiian waterbirds (Hawaiian stilt, Hawaiian moorhen, Hawaiian coot, and Hawaiian duck) have nested at the adjacent Kawai‘ele parcel and occasionally are observed loafing or feeding in the main drainage canals within the project site. No nests of endangered Hawaiian waterbirds have been documented within the boundaries of the project site.

The endangered Hawaiian goose has been observed loafing and feeding at the adjacent Kawai‘ele parcel. No nests of endangered Hawaiian geese have been documented in the project site. Hawaiian geese have nested at the Pacific Missile Firing Range (PMRF) from 2009 to 2011. One nest was observed at the Kawai‘ele parcel during 2011.

The Hawaiian hoary bat has been recorded from the north end of the Mānā Plain and near Kekaha and may forage at the project site, but no suitable roosting habitat is currently available.

Introduced, non-native mammals observed at and adjacent to the project site include feral cats (*Felis catus*), feral dogs (*Canis familiaris*), feral pigs (*Sus scrofa*), mule deer (*Odocoileus hemionus cloumbianus*, rats (*Rattus* sp.), and mice (*Mus* sp.). Recent reports of mongoose (*Herpestes javanicus*) on the Mānā Plain and elsewhere on the island of Kaua‘i have not been confirmed.

Several species of non-native fish (see Appendix B) occur within the drainage canals and ditches on the Mānā Plain as well as at the adjacent Kawai‘ele parcel. Non-native fish observed include mollies and mosquito fish (*Poecillia* sp.), and tilapia (*Tilapia* sp.) (Shimoda and Sakihara 2006). No native species of fish have been observed with the project site. Nine species of non-native reptiles and amphibians occur or potentially occur within the project site.

Two species of adult Odonates, *Ischnura ramburii* (an introduced blue and black damselfly) and *Pantala flavescens* (an indigenous species of globe skimmer) have been observed near the project area. Capable of wide dispersal, these species likely breed (i.e., occur as aquatic stages) outside of the Mānā Plains Forest Reserve (Polhemus 2006). The native damselfly *Megalagrion xanthomelas* was not observed at the project site and reinforces the conclusion that this native species has been extirpated on Kaua‘i for over 100 years (Polhemus 2006). One species of non-native Thiarid snail (*Melanoides tuberculata*) occurs at Kawai‘ele and Asian clams (*Corbicula fluminea*) occur in the reservoirs and canals upstream of the project site. Neither species has been observed within the project site, but may occur there, especially during periods of flooding.

SPECIAL STATUS PLANT AND WILDLIFE SPECIES

For the purpose of this section, special status species are defined as:

- Species listed or proposed for listing as threatened or endangered under the federal Endangered Species Act;
- Species that are candidates for future listing as threatened or endangered under the federal Endangered Species Act;
- Species that are federal species of concern;

- Species that are listed or proposed for listing as threatened or endangered by the State of Hawai‘i under the Hawai‘i Administrative Rules Chapter 13;
- Species of greatest conservation need as identified by Hawaii’s Comprehensive Wildlife Conservation Strategy;
- Rare plants listed by the Plant Extinction Prevention Program of Hawai‘i as having fewer than 50 individuals in the wild; and
- Species protected by the Migratory Bird Treaty Act.

Thirty six special status species are known to occur at or near the project site as described below. Species descriptions were compiled from factsheets in Hawaii’s Comprehensive Wildlife Conservation Strategy (Mitchell et al. 2005) and other sources as noted.

<u>Plants</u>

‘Ohai (*Sesbania tomentosa*)

‘Ohai is federally and state listed as endangered and is a species of greatest conservation need. It occurs on dry coastal shrublands on a variety of soil types. It has been planted at the adjacent Kawai‘ele site in sandy upland areas, but does not occur within the project site. Critical habitat for this species has been designated to the north of the project site at Polihale State Park (USFWS 2003).

Lau‘ehu (*Panicum niihauense*)

Lau‘ehu is federally and state listed as endangered and is a species of greatest conservation need. It is also listed as a rare plant by the Plant Extinction Prevention Program. Lau‘ehu is a rare bunchgrass found in dry coastal habitats that is endemic to the islands of Kaua‘i and Ni‘ihau. The last know population is found in Polihale State Park and critical habitat has been designated to the north and south of the project site (USFWS 2003). Lau‘ehu is not found within the project site. It is threatened by non-native invasive species and off-road vehicles.

‘Ilima (*Sida fallax*), pa‘uohi‘iaka (*Jacquemontia ovalifolia*), pōhuehue (*Ipomoea pes-caprae*), hala (*Pandanus tectorius*), a‘a‘li‘i (*Dodonaea viscosa*), and nehe (*Lipochaeta* sp.)

These species are listed as species of greatest conservation need and are considered important habitat or dominant plants of coastal areas in the Hawaiian Islands and may occasionally be found in or adjacent to coastal wetlands. Some of these occur at the adjacent Kawai‘ele site, but none are found within the project site. Species description and uses by native Hawaiians are compiled from University of Hawai‘i (2009), Erickson and Puttock (2006), Mitchell et al. (2005), and University of Hawai‘i (2001).

Coastal forms of ‘ilima tend to be low-growing and found on sandy or rocky substrates. ‘Ilima is important to native Hawaiian culture. ‘Ilima flowers were used in leis for Hawaiian royalty and were also used medicinally as a mild laxative and to treat asthma.

Paʻuohiʻiaka is a sprawling non-woody vine found on dry sandy and rocky coastal substrates that are well drained. Paʻuohiʻiaka was dried to make a tea or mixed with coconut and eaten by early Hawaiians. It was also used medicinally to treat constipation and cuts.

Pōhuehue is a sprawling woody vine commonly found on coastal strand and sand dune habitats and sometimes in lowland saltwater marshes. Pōhuehue was used for medicinal purposes as a cathartic. Its vines were used to bind sprains as well as for cordage to weave fishnets and baskets.

Hala was once extensive throughout the coastal regions of Hawaiʻi. It occurs in remnant groves in mesic coastal sites, on slopes of coastal valleys, and occasionally in wetland habitats. Hala leaves were woven into mats, pillows, and thatch. The fruits and seeds are edible and the male inflorescence was used to scent oil.

Aʻaʻliʻi is a medium sized shrub or small tree in the Sapindaceae family that is extremely variable throughout its range, which extends from sea level to 7,500 feet. It is an early colonizer of open areas, including coastal strand habitats, lava fields, and pastures. The seed pods of Aʻaʻliʻi are often used in haku leis.

Nehe is a perennial subshrub in the asteraceae family. It is endemic to the Hawaiian Islands and found in relatively undisturbed mesic coastal habitats, including coastal strand, wetland, and riparian areas.

Wildlife

Koloa maoli (Hawaiian Duck, *Anas wyvilliana*)

Koloa maoli are state and federally listed as an endangered species and listed as a species of greatest conservation need by the State of Hawaiʻi. They can be found from sea level to 9,900 feet elevation in a variety of habitats, including coastal wetlands and montane streams. Koloa maoli are found on all the main Hawaiian Islands except Lānaʻi and Kahoʻolawe, however most birds found outside of Kauaʻi are likely hybrids. Hawaiʻi State Waterbird Survey counts of koloa maoli on the Mānā Plain ranged from 0 to 36 birds during 1986-2004. The nesting biology of koloa maoli is poorly known, but they generally nest on the ground near water and lay 8-10 eggs. Nesting occurs year round, but peaks from January through May. Koloa maoli are opportunistic feeders that eat small fish, insects, snails, worms, algae, seeds, and leaves. Threats to the species include hybridization with feral mallards, habitat degradation by introduced mammals, and those threats listed for aʻeo (Mitchell et al. 2005).

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A‘eo (Hawaiian Stilt, *Himantopus mexicanus knudseni*)

A‘eo are state and federally listed as an endangered species and listed as a species of greatest conservation need by the State of Hawai‘i. They occur in coastal and low wetlands generally below 660 feet elevation on all the main Hawaiian Islands except Kaho‘olawe. A‘eo nest on sparsely vegetated exposed mudflats and typically lay 3-4 eggs. They nest from March through August, with peaks in May and June. A‘eo forage in less than 9 inches of water and eat aquatic invertebrates and small fish. Threats to the a‘eo population include habitat loss, introduced predators, altered wetland hydrology, non-native invasive plants, avian diseases, and environmental contaminants (Mitchell et al. 2005).

‘Alae ‘ula (Hawaiian Moorhen, *Gallinula galeata sandvicensis*)

‘Alae ‘ula are state and federally listed as an endangered species and listed as a species of greatest conservation need by the State of Hawai‘i. Currently found on the islands of Kaua‘i and O‘ahu in wetlands below 410 feet elevation, ‘alae ‘ula historically inhabited all the main Hawaiian Islands except Lāna‘i and Kaho‘olawe. Life history and breeding biology of the ‘alae ‘ula are poorly known, in part due to the secretive nature of the species. ‘Alae ‘ula nest in water less than 24 inches deep with dense emergent vegetation used to support and line nests. They typically lay 5-6 eggs. ‘Alae ‘ula forage in a variety of fresh and brackish water wetland habitats and are opportunistic feeders, consuming algae, seeds, plant material, snails, small fish, and insects. Threats to the species are the same as those listed for a‘eo (Mitchell et al. 2005).

‘Alae ke‘oke‘o (Hawaiian Coot, *Fulica alai*)

‘Alae ke‘oke‘o are state and federally listed as an endangered species species and listed as a species of greatest conservation need by the State of Hawai‘i. They occur below 1,320 feet elevation on all the main Hawaiian Islands except Kaho‘olawe. Hawai‘i State Watebird Survey counts of ‘alae ke‘oke‘o on the Mānā Plain ranged from 0 to 87 birds during 1986-2004. ‘Alae ke‘oke‘o construct nests from aquatic vegetation in open or vegetated habitats over water. Nesting primarily from March through September, they lay 3-10 eggs, but nesting can occur year round. ‘Alae ke‘oke‘o forage in a variety of habitats, including wetland and adjacent uplands, and consume seeds, leaves, insects and other aquatic invertebrates, and small fish. Threats to the species are the same as those listed for a‘eo (Mitchell et al. 2005).

‘Auku‘u (Black-crowned Night Heron, *Nycticorax nycticorax hoactli*)

‘Auku‘u are indigenous to Hawai‘i and recognized as a species of greatest conservation need by the State of Hawai‘i. They are widely distributed throughout the main Hawaiian

Islands. Information on breeding biology in Hawai‘i is limited, but ‘auku‘u are colonial nesters, laying eggs in a bulky stick nest placed low in vegetation. ‘Auku‘u use a variety of wetlands to forage on fish, frogs, insects, mice, and young of other waterbirds. Threats to the ‘auku‘u include habitat loss, introduced predators, non-native invasive plants, avian diseases, and environmental contaminants (Mitchell et al. 2005).

Nēnē (Hawaiian Goose, *Branta sandvicensis*)

Nēnē are state and federally listed as an endangered species and listed as a species of greatest conservation need by the State of Hawai‘i. They can be found from sea level to 7,800 feet elevation on the islands of Hawai‘i, Maui, Moloka‘i, and Kaua‘i. Nēnē use a wide variety of habitats including grasslands, shrublands, coastal dune vegetation, lava flows, wetlands, and reservoirs. Nēnē nest on the ground in dense vegetation, usually under shrubs and lay 2-5 eggs. Compared to other geese, nēnē are more terrestrial and have longer legs and less webbing between their toes which may facilitate walking on lava (Mitchell et al 2005). Threats to nēnē include introduced predators, exposure in high elevation habitats, nutritional deficiencies due to habitat degradation, habitat loss particularly in the lowlands, human caused disturbance and mortality, behavioral problems related to captive propagation, and inbreeding depression (Mitchell et al. 2005).

Pueo (Hawaiian Short-eared Owl, *Asio flammeus sandwichensis*)

Pueo are a subspecies of the Short-eared Owl that are endemic to the Hawaiian Islands. They are recognized as a species of greatest conservation need by the State of Hawai‘i and are State listed as endangered on the island of O‘ahu. Pueo occur on all the main Hawaiian Islands from sea level up to 8,000 feet elevation and are mostly commonly found in open habitats including grasslands, shrublands, and montane parklands. Information on the breeding biology of pueo is limited, but nests are simple scrapes on the ground lined with leaves and down. Nests have been found throughout the year. Pueo prey on small mammals, birds, and insects. Threats to pueo include habitat loss, disease, predation, contaminants, and human interaction (Mitchell et al. 2005).

‘A‘o (Newell’s Shearwater, *Puffinus auricularis newelli*)

‘A‘o are state and federally listed as a threatened species and are a subspecies endemic to Hawai‘i. They nest in colonies on steep mountain slopes, including the Nā Pali coast on the island of Kaua‘i. They forage mainly by pursuit plunging for fish and squid. Adult ‘a‘o forage hundreds of miles offshore and return to breeding colonies at night to feed their young. ‘A‘o may fly over the project site between nesting and foraging habitats, but do not directly use habitats at the project site.

‘Ua‘u (Hawaiian Petrel, *Pterodroma sandwichensis*),

‘Ua‘u are state and federally listed as an endangered species and are endemic to Hawai‘i. They nest in colonies in high elevation forests including those on the Nā Pali coast on the island of Kaua‘i and feed primarily on fish. Adult ‘ua‘u forage thousands of miles at sea to collect food for their young. ‘Ua‘u may fly over the project site between nesting and foraging habitats, but do not use habitats at the project site.

‘Akē‘akē (Band-rumped Storm Petrel, *Oceanodroma leucorhoa*)

‘Akē‘akē are candidate species for listing under the federal ESA and state listed as endangered. This species has been heard ground calling from very steep, rocky cliffs along the Na Pali coast and in Waimea Canyon on the island of Kaua`i.. ‘Akē‘akē feed by scooping up prey with their bill at, or just below the surface of the sea. They may fly over the project site between nesting and foraging habitats, but do not use habitats at the project site.

Koa‘e kea (White-tailed Tropicbird, *Phaethon lepturus dorotheae*), ‘Ua‘u kani (Wedge-tailed Shearwater, *Puffinus pacificus*), ‘Iwa (Great Frigatebird, *Fregata minor palmerstoni*), Moli (Laysan Albatross, *Phoebastria immutabilis*), and ‘A (Brown Booby, *Sula leucogaster plotus*)

These five species of seabirds are protected by the federal Migratory Bird Treaty Act and are listed as species of greatest conservation need by the State of Hawai‘i. Moli and ‘ua‘u kani nest nearby in coastal habitats at PMRF, Nohili dunes and/or Polihale State Park. These birds may be seen over the project site, but do not utilize any habitat therein.

Hunakai (Sanderling, *Calidris alba*), ‘Ulili (Wandering Tattler, *Heteroscelus incanus*), ‘Akekeke (Ruddy Turnstones, *Arenaria interpres*), and Kolea (Pacific Golden Plover, *Pluvialis fulva*)

These four species of migratory shorebirds are protected by the Migratory Bird Treaty Act and are listed as species of greatest conservation need by the State of Hawai‘i. The U.S. Pacific Islands Regional Shorebird Conservation Plan lists the kolea as a species of primary importance; the ‘ulili is listed as important and the ‘akekeke is listed as a species of secondary importance (Engilis and Naughton 2004). All four are commonly observed at the adjacent Kawai‘ele parcel during the winter months.

Koloa Mōhā (Northern Shoveler, *Anas clypeata*), Koloa Mapu (Northern Pintail, *Anas acuta*), American Wigeon (*Anas americana*), Lesser Scaup (*Aythya affinis*), and Canvasback (*Aythya valisineria*)

These five species of migratory waterfowl are protected by the Migratory Bird Treaty Act. All species, with the exception of the canvasback, are listed as species of greatest conservation need by the State of Hawai‘i. Populations of migratory waterfowl wintering in the Hawaiian Islands have sharply declined since historical times, in part due to the loss of wetland habitats. Conservation actions identified for the protection of these species by the State of Hawai‘i include protection and restoration of additional wetland habitat, especially where it can be reclaimed from abandoned urban or agricultural uses (Mitchell et al. 2005).

Koloa mōhā are the most abundant migratory dabbling duck that winters in the main Hawaiian Islands with a state-wide population averaging 296 birds from 1986 to 2003

(Mitchell et al. 2005). Koloa mōhā have been observed in small numbers (≤ 6 birds) on the Mānā Plain on two occasions during the winter Hawai‘i Statewide Waterbird Survey. During the winter these dabbling ducks use a variety of wetland habitats where they forage on aquatic invertebrates and seeds.

Koloa mapu are commonly seen in the main Hawaiian Islands, but are not as abundant as the koloa mōhā. The average winter population of koloa mapu from 1986 to 2003 is estimated at 190 birds (Mitchell et al. 2005). Koloa mapu have been observed in small numbers (≤ 3 birds) on the Mānā Plain on five occasions during the winter Hawai‘i State Waterbird Surveys. During the winter the koloa mapu use a variety of wetland habitats and forage primarily on seeds and leafy parts of plants as well as aquatic invertebrates.

American wigeon are rare winter migrants in Hawai‘i. State Waterbird Survey counts averaged 20 birds from 1986 to 2003 (Mitchell et al. 2005). American wigeon have not been observed on the Mānā Plain during winter State Waterbird Surveys from 1986 to 2004. American wigeon use a wide range of winter habitats and forage primarily on leaves and seeds of aquatic vegetation.

Lesser scaup are commonly seen in low numbers wintering in the main Hawaiian Islands. Range-wide the wintering population of lesser scaup appears to have declined by 50% since the 1960s. Wintering lesser scaup populations in Hawai‘i from 1986-2003 averaged 56 birds (Mitchell et al. 2005). One lesser scaup was observed at the adjacent Kawai‘ele parcel during the 1989 winter Hawai‘i State Waterbird Survey. Lesser scaup feed primarily on aquatic invertebrates, but specific diet items of lesser scaup wintering in Hawai‘i have not been documented.

Canvasbacks are rare winter migrants to Hawai‘i. They have not been observed on the Mānā Plain during winter State Waterbird Surveys from 1986 to 2004. They forage primarily on aquatic vegetation in deep, open water wetlands during the winter.

‘Ōpe‘ape‘a (Hawaiian Hoary Bat, *Lasiurus cinereus semotus*)

‘Ōpe‘ape‘a are Hawai‘i’s only native terrestrial mammal and are state and federally listed as an endangered species. They have been reported from all the main Hawaiian Islands but evidence of breeding populations is limited to the islands of Kaua‘i and Hawai‘i. ‘Ōpe‘ape‘a have been reported on the Mānā Plain, but no roost sites have been documented there. ‘Ōpe‘ape‘a occur across a wide range of habitats from sea level to 7,500 feet elevation. They use echolocation to locate prey, including moths, beetles, crickets, mosquitoes, and termites. Threats to ‘ōpe‘ape‘a include habitat loss, pesticides, predation, and roost disturbance.

Globe skimmer (*Pantala flavescens*)

Globe skimmers are odonates, an order of terrestrial invertebrates recognized as a Species of Greatest Conservation Need by the State of Hawai‘i. Globe skimmers are common in stream and wetland habitats throughout the Hawaiian Islands. The larvae and adults are described as “great hunters” and prey on crustaceans, mosquitoes and other insects

(Bishop Museum 2010). Globe skimmers and other native odonates are threatened by habitat loss and non-native introduced invertebrates, fish, and frogs (Mitchell et al. 2005).

3.3.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative no changes to the current assemblage of plant and wildlife species would occur. The site would continue to be dominated by non-native vegetation and introduced non-native wildlife and would be of little value to endangered Hawaiian waterbirds and other indigenous wildlife. The main drainage canals and abandoned irrigation ditches currently found on site would only provide marginal habitat for endangered waterbirds. Without fencing and predator control, the endangered waterbirds that come to utilize these low quality canal and ditch habitats will continue to suffer from predation pressure by non-native introduced mammals.

Preferred Alternative

Existing Habitats and Special Status Species
The proposed project would have a positive beneficial impact on native flora and fauna by removing invasive vegetation, managing water levels for productive wetland functions, and controlling non-native predators and other non-native fauna. Native wetland and coastal upland vegetation will be established by planting, seeding, and controlling water-levels to create favorable conditions for the germination and growth of native wetland plants. Wetland restoration proposed under this alternative will create at least 84 acres of wetland habitats, including emergent and submergent vegetation communities, open water areas, and mud flats for use by endangered Hawaiian waterbirds and other special status species. The proposed project will increase the acreage of wetland and open water habitat on the Mānā Plain by 45%.

Currently the project site only contains low quality wildlife habitat that is dominated by non-native plant and animal species. No threatened, endangered, or candidate species of plants are present within the project site. Therefore, the project will not have any adverse effects on threatened, endangered, or candidate plant species. The impacts to other native vegetation within the project site will be minimal as these species are very sparse and proposed restoration actions will increase their numbers and distribution following proposed restoration actions. The few indigenous plant species that do occur on the site and are common in dry coastal areas and are expected to germinate naturally from seed as they have done at the adjacent Kawaiʻele site following habitat enhancements. Native plant species will also be re-established by out-planting and broadcast seeding. No permanent loss of native species will occur as the project site will be restored to native habitat, and the overall extent of native wetland and upland coastal habitats will increase.

Based on experience with other managed wetlands on Kauaʻi, the proposed wetland restoration under this alternative will be beneficial for endangered Hawaiian waterbirds. Combined with

other physical and biological processes, seasonal and inter-annual variations in hydrologic inputs create conditions favorable for developing diverse plant communities that are spatially heterogeneous (Gosselink and Turner 1978, Cronk and Fennessy 2001) and provide essential resources for wetland dependent wildlife. The proposed project is expected to increase the population of endangered Hawaiian waterbirds that nest and forage on the Mānā Plain.

The impact to special status wildlife during construction activities will be minimal since no threatened, endangered, or candidate wildlife occur in the area to be grubbed or graded. Endangered Hawaiian waterbirds are occasionally observed using the drainage canals within the project site for foraging and loafing and may be temporarily disturbed as a result of construction activities. Kawai‘ele, the Mānā Base Pond, and other canals adjacent to the project site and away from construction activities are available for birds to disperse to during construction activities. If these birds disperse to Kawai‘ele or the Mānā Base Pond, they will be dispersing to higher quality habitats and therefore these birds could benefit from dispersal caused by construction because of the increased food resources available at these sites. Energetic costs associated with flight due to construction are expected to be minimal and injury or death highly unlikely.

No nests or young pre-fledging endangered Hawaiian waterbirds have been observed within the project site. Canals are currently maintained to be free of vegetation making it unlikely that endangered Hawaiian waterbirds nest within the project site. However, to ensure that there are no adverse impacts to nesting endangered waterbirds, the planned construction area will be searched for nesting birds within 3 days prior to the start of construction. If nests are discovered all construction activities within the facinity of the nests will be postponed so as not to disturb nesting birds. This will continue until eggs hatch and the young fledge.

3.4 Archeological and Cultural Resources

3.4.1 Affected Environment

The Mānā Plain has a rich cultural history dating back to ancient Hawaiian times. Polihale Ridge, north of the project site, is the leaping-off place for souls on their way to Po, the underwold, which is located offshore beneath the ocean (Yent 2005:7). Numerous heiau or religious temples, house sites, and burials on the Mānā Plain have been identified outside of the project site and are summarized by Yent (2005).

Hawaiian settlements on the Mānā Plain were small and concentrated along the foothills and mauka or upland valleys and temporary habitation, including fishing camps, occurred on the coastal sand dunes. The majority of inhabitants on the Mānā Plain were fisherman and gourd cultivators whose products were traded for poi and other upland products with other inhabitants of the island (Yent 2005). Inhabitants of Kolo, north of the project site, grew taro in the freshwater marshes on rafts which would fluctuate with the water levels during the rainy season. Taro was also grown near springs that provided a source of freshwater.

By the mid-1800s most of the taro fields in the area had been converted to rice. Kekaha Sugar Company was started in 1878 and wetlands were drained and filled to reduce seasonal flooding in order to grow sugarcane. A map from 1910 (see Figure 3.2 - 7) shows ditches dug at Kekaha and along the mauka portion of the Mānā Plain and two areas of open water and wetlands on the makai or seaward portion of the plain. Draining of these wetlands and Kawaiʻele, Nohili, Kolo, and Limaloa pond areas continued through the late 1950s and subsequently, these areas were planted with sugarcane.

A review of historical references and archaeological reports done for other projects conducted in the vicinity of the Mānā Plain suggests that Kawaiʻele Pond once covered most of the project area. Land alteration in the early 20th century for the cultivation of sugarcane resulted in the draining of the Kawaiʻele Pond. Agricultural practices were conducted within the boundaries of the project site until the mid -1990s. Much of the coastal dune in the vicinity of the project site was also altered throughout the early to mid-1900s. Formerly owned by Kekaha Sugar Company, the sand dunes makai of the project site were acquired by the U.S. Army during 1940 and the area was used for military operations during World War II. This area was officially designated as the Bonham Air Force Base during 1954. U.S. Navy operations started at the base during 1956 and the Pacific Missile Range Facility was established during 1958.

An archeological survey of the project site was conducted during 2004 by Hawaiʻi State Parks archaeologists Martha Yent, and Alan Carpenter, with assistance from Nancy McMahon, a Kauaʻi archaeologist with the State Historic Preservation Division. During the assessment 22 trenches were excavated along eight transects throughout the project area. The trenches measured 24” across and were 5 to 10 meters in length. The depth of the trenches varied but all were dug down to below the water table. All excavated soils were visually inspected, stratigraphic profiles were recorded, and photographs were taken prior to back filling.

Results of the archaeological assessment indicated a lack of subsurface cultural deposits and artifacts (Yent 2005). Any archeological surface remains were likely destroyed by prior land use activities. The significance of the project area for its palynological and/or paleotological research potential is also limited. No pollen was found in pond soils and no fossil bird bones were found in any of the excavated trenches.

3.4.2 Environmental Consequences

No Action Alternative

Under this alternative, no ground-disturbing construction activities would occur therefore no archeological or culture artifacts would be destroyed. Wetland habitats, part of the cultural landscape on the Mānā Plain, will not be restored and consequently the opportunities for increased education and awareness of the rich cultural history of the Mānā Plain will be deminished. Under this alternative, no informational kiosks or other outreach materials will be developed to increase the awareness of cultural resources on the Mānā Plain.

PREFERRED ALTERNATIVE

Under the proposed project alternative, restoration actions will have no negative impact on cultural or archeological resources and will positively increase the awareness of these resources. An archaeological assessment, conducted in compliance with HAR§13-275-5 (identification and inventory of historic properties), indicated a lack of surface and subsurface cultural deposits and artifacts. DOFAW consulted with the State Historic Preservation Office and the proposed alternative is not likely to have an adverse effect on any significant historic properties.

Construction of restored wetland habitats will reestablish part of the cultural landscape of the Mānā Plain. Native plant species, used by ancient Hawaiians, will increase as a result of the proposed project. Information on the cultural history of the area will be included on interpretive panels and educational displays.

Although trenches were surveyed for archeological remains throughout the project site, articles of archaeological or cultural relevance may be inadvertently discovered during construction. In the event that any prehistoric, historic or archaeological sites or remains are found, work in that immediate area would cease and DOFAW staff would notify the State Historic Preservation Division and follow rules outlined in HAR §13-280-3 and HRS §6E-43.6. Work in the immediate area would not recommence until approved by the Historic Preservation Division according to HAR §13-280-4 and HRS §6E-43.6.

3.5 VISUAL RESOURCES

This section identifies the existing visual resources within and near the project site. Identification of visual resources associated with the area is based on criteria in the Kaua‘i General Plan (County of Kaua‘i 2000).

3.5.1 AFFECTED ENVIRONMENT

The island of Kaua‘i is known for “the beauty and great variety of its landscape” (County of Kaua‘i 2000:3-4). The view plane of Kauai’s pali (cliffs) from the project site extends from Mākaha Ridge to the north, to Kaleinamanu Ridge to the south a distance of nearly nine miles. An invasive non-native tree, haole koa (*Leucaena leucocephala*), dominates the eastern portion of the project site along the highway, and the southern portion of the project site. Along the southern portion of the site, this tree obscures the view of Kauai’s pali (cliffs) to the north and east (Figure 3.5 - 1).

Figure 3.5 - 1. Existing viewplane looking north from the southern boundary of the project site.

The project site is currently undeveloped with the exception of drainage canals, irrigation ditches, and two-track access roads used to maintain the drainage canals. Haole koa trees also obscure the view of the project site from 1) Kaumualiʻi Highway, 2) the gravel road to the south of the highway, and 3) the pull off area at Kawaiʻele. Other non-native grasses and shrubs are present within the project site however they do not obscure the view plane of the site or the surrounding landscape.

The Pacific Ocean and associated coastal shoreline are not visible from the project site. Human-made structures that are visible in the vicinity of the project site include Kaumualiʻi Highway, the Kawaiʻele pump station and power supply lines, power lines adjacent to the project site along State Highway 50 and the gravel road to the south of the project site, the highway itself, and several buildings and a communication tower inside the Pacific Missile Range Facility. The proposed site is low relief ranging in elevation from 0 to 5 feet above mean sea level (amsl) and is lower in elevation than the surrounding landscape, including Kawaiʻele, PMRF, and the highway.

3.5.2 Environmental Consequences

No Action Alternative

Under the no action alternative, the view plan of the project site and the surrounding landscape will remain partially obscured by invasive trees. This includes the view plane from the pull off area at Kawaiʻele which is a public viewing area, as well as the view plane from Kaumualiʻi Highway. Locations dominated by low-growing invasive vegetation where ridgelines that dominate the western landscape of Kauaʻi are visible are on the western portion of the project site and are not accessible by the public. Under the no-action alternative, these conditions will not change.

PREFERRED ALTERNATIVE

The proposed project will positively benefit the view plane of west Kaua‘i by removing non-native haole koa trees that currently impede the view of Kauai’s pali. The proposed project will also create views of wetland habitats visible from Kaumuali‘i Highway. Planting of native vegetation will create views of a more native Hawaiian character associated with the historical wetlands on the Mānā Plain and provide viewing opportunities of native endemic Hawaiian waterbirds in a natural setting. Planned viewing areas such as elevated observation decks and interpretive walking trails will provide new viewing opportunities of the restored wetlands and associated uplands for the public. These impacts will positively contribute to the “vividness” and “intactness” of the view plane, qualities identified by the County of Kaua‘i (2000) as important for preserving the scenic qualities of the island.

Construction activities and the proposed visitor/environmental education center will have minimal impacts on the view plane and will ultimately benefit visual resources. During the construction phase of the project, the presence of machinery will temporarily reduce the visual aesthetics. However, these impacts are minimal and similar to those that occurred with equipment used for agricultural production.

Electrical power needed to run the pump that will supply well water to the wetlands is planned to be augmented by photovoltaic (solar) power. However traditional sources of electrical power will be necessary to provide enough energy for the initial start-up and priming of the pump. Outside of the project site, a power line and poles will be installed to link an existing power source to the pump. The new power line will be located outside of the project site in close proximity to other power lines and will not negatively impact the existing view plane from Kaumuali‘i Highway. The pump needed to supply surface water from the canal to the northern wetland basins will be located near an existing power line, so no additional poles will be needed to run power to this pump. Therefore, visual resources will not be negatively impacted.

The proposed visitor/environmental education center along with elevated observation areas, once constructed would block a small fraction of the increased view plain made available after completion of the restoration project. However, the resulting vantage points from these structures will provide visitors a much more expansive improved view of the project area and surrounding geological features over what is currently available. In addition, the project will minimize the intrusion of any buildings on the visual environment through architectural design criteria and landscaping deemed appropriate for the surrounding environment.

The visitor center and baseyard maintenance facility will be one-story buildings. The visitor center will include improved views of the restored wetlands and Kauai’s pali. Again, solar power is planned to supplement the electrical needs of the visitor/environmental education center. Solar panels will be incorporated into the design of the center’s roof so as to minimize their impact on the buildings aesthetic properties. A power line will run from the existing power line along the highway or gravel road to supply power to the center and baseyard maintenance facility. Native landscaping will be used around the visitor center and maintenance facility buildings and will be designed to blend into the surrounding environment. These measures will minimize the visual impacts of the buildings.

A fence to control mammalian predators and other non-native mammals will be built within the project site. Fence height will be between 5 and 6 feet tall depending on funding availability. This is similar to other fences located along Highway 50. Fencing materials will consist of chain link, which will contribute to its transparency. In addition, the existing haole koa that surrounds the site will be removed for fence construction and continually managed as part of fence maintenance. Therefore, views of the project site from highway 50, as well as the views from inside the project area looking out to surrounding terrain should be enhanced by the construction and maintenance of this fence.

3.6 AIR QUALITY

3.6.1 AFFECTED ENVIRONMENT

The closest and only air quality monitoring on the island of Kaua‘i is in Līhu‘e. This station measures coarse particulate matter 10 microns or less in aerodynamic diameter (PM_{10}). No other air pollutants are monitored at this station. The 2006 annual mean for PM_{10} at this station was 11 $\mu g/m^3$ and air quality never exceeded the federal standard of 150 $\mu g/m^3$; the highest recorded value was 34 $\mu g/m^3$ (Department of Health 2007). No air quality data were reported for the island of Kaua‘i during 2009 or 2010 (Department of Health 2010, 2011). Kauai’s air quality meets federal and state environmental health standards due to the lack of major polluting industries and trade winds that disperse polluted air over the ocean (Carter and Burgess, Inc. 2002).

Air quality of the west side of Kaua‘i is affected by pollutants from natural, vehicular, agricultural, and military sources. However, air quality in the vicinity of the project site is considered to be good due to the low density of development in the region and the relatively few point source air pollutants. In the area surrounding the project site, air quality is affected by aircraft, rocket launches, back-up generators, diesel-fueled vehicles, and vehicular traffic at the Pacific Missile Firing Range, vehicular related emissions generated from traffic along State Highway 50, and agricultural activities to the east of the project site, including dust from plowing and maintenance of irrigation ditches. With the exception of equipment emissions when cleaning and maintaining the drainage canals, no point source pollutants exist within the project site. Plowing and burning associated with sugarcane production has not occurred at the site since 1997.

3.6.2 ENVIRONMENTAL CONSEQUENCES

NO ACTION ALTERNATIVE

Under this alternative no construction or management of wetland habitat would occur and air quality would remain the same as current conditions.

PREFERRED ALTERNATIVE

The proposed project will not result in negative long-term effects to air quality. The air quality levels will be temporarily affected by the operation of heavy machinery during the construction phase, however these effects will be short-term and minimal. Minimal fugitive dust from construction activities is expected to be minor and similar to previous levels when the area was worked for crop production. There are no homes or businesses immediately adjacent to the project site that may be affected. Buildings at the Pacific Missile Range Facility are located away from the project site. During construction, dust suppression BMPs will be completed and a dust control plan will be developed and implemented following State of Hawai‘i regulations for air quality and air pollution control. Engine exhaust from construction equipment emissions will be minimized by the proper maintenance and operation of equipment.

3.7 NOISE

3.7.1 AFFECTED ENVIRONMENT

With the exception of occasional vehicles operated by DOFAW or other project partners, no noise generating point sources occur within the project site. Noise sources in the vicinity of the project site include the Kawai‘ele pump station, operations at PMRF, vehicular traffic at PMRF and Highway 50, and equipment on surrounding agricultural lands and the Kawai‘ele parcel of the Mānā Plains Forest Reserve. Noise generated from operations at PMRF include aircraft and missile activities that occur on the facility.

3.7.2 ENVIRONMENTAL CONSEQUENCES

NO-ACTION ALTERNATIVE

Present ambient noise levels in the project area would not be affected under the No-Action Alternative since the types and levels of current activities would not change.

PREFERRED ALTERNATIVE

The proposed project will not generate negative long-term impacts on noise levels. Noise from vehicles and human voices will result from management, passive outdoor recreation, and environmental education activities. However, these sources will have minimal, if any impact on noise levels. Other sources of noise associated with management of wetland habitats include pumps installed for water delivery and occasional equipment to control invasive species. These noise levels are similar to existing noise generated by previous agricultural practices at the project site and existing agricultural land use practices surrounding the project site. No residential communities are located immediately adjacent to the project site. The closest developed area is the Pacific Missile Range Facility to the west.

Minor noise will result from construction activities and long-term management. Ambient noise levels will temporarily increase during the construction period with the use of heavy equipment, including bulldozers, tractors, and diesel-powered trucks. Typical ranges of construction equipment that will be used vary from 70 to 85 dBA at 50 feet (USDOT 2011). Mufflers will be maintained on all equipment and vehicles to control construction noise. Construction and management activities will only occur during daylight hours. All County and State regulations will be followed during construction and management of the proposed project.

3.8 TRANSPORTATION

3.8.1 AFFECTED ENVIRONMENT

Kaumualiʻi Highway (State Highway 50) runs adjacent to the eastern boundary of the project site and is the main roadway serving the project area. A dirt road, not open to the public, is located along the southern boundary of the project site. This dirt road is used to access the Kawaiʻele pump station and the southern portion of the project site. Traffic along Kaumualiʻi Highway in the vicinity of the project site is relatively light, as no residential communities are located between the project site and Polihale State Beach, where Highway 50 terminates. Primary access to the Pacific Missile Range Facility is through its main gate off Highway 50, approximately one mile south of the project site. The majority of vehicular traffic utilizing Highway 50 in the vicinity of the project area is for recreational access to Polihale State Park or for agricultural activities in the surrounding area.

Currently, public vehicular access is restricted within the project site. Physical barriers such as locked gates are placed where existing 2-track dirt roads can be accessed from Highway 50. The area is also posted with no trespassing signs designating it as state property. The 2-track dirt roads within the project site were historically used for sugarcane cultivation activities. Presently these 2-track dirt roads are used by state employees and members of cooperating agencies to access the project site and by ADC and the U.S Navy to maintain the drainage canals.

3.8.2 ENVIRONMENTAL CONSEQUENCES

NO-ACTION ALTERNATIVE

There would be no traffic impacts under this alternative, as there would be no change in the type or level of activity presently occurring within the project site.

PREFERRED ALTERNATIVE

The proposed restoration, passive outdoor recreation, and environmental education activities will likely increase vehicular traffic along Highway 50. Visitor services improvements such as a parking lot and new driveway access will be the primary access point for the public. The parking lot will accommodate cars, vans, and buses. It is not likely that the increased vehicular traffic

accessing the project site would cause any traffic delays or would require any modification to the existing Highway 50 (DOFAW 2008). If the additional vehicular traffic generated as a result of the proposed project results in unsafe conditions, a turn lane could be added near the entrance to the project site. For example, a turn lane was recently installed approximately two miles south of the site at the entrance to the Pioneer operational facility.

Additional traffic will occur when construction equipment is transported to the project site and when construction workers travel to and from the project site. Prior to construction, a traffic control plan will be prepared to comply with temporary construction-related traffic control measures necessary under County and State regulations. However, no traffic delays are anticipated as a result of the construction activities since the number of workers is anticipated to be small (< 10 per day). No lane closures will be required during construction activities. Following construction, DOFAW personnel will regularly travel to the site to conduct management and maintenance activities. Maintenance and management activities are expected to require 1-2 vehicles traveling to the site each work day, with larger crews occasionally needed (< 5 vehicles per day).

3.9 SOCIOECOMONICS

3.9.1 AFFECTED ENVIRONMENT

The project site is located in the county of Kaua‘i with an estimated total population of 67,091 during 2010 (U.S. Census Bureau 2011). The west Kaua‘i community, including the Kekaha-Waimea and Kaunakakai-Hanapepe census districts has an estimated population of 9,332 (U.S. Census Bureau 2011). Nearly one fourth of these residents are ages 5-19, or school aged. One high school, a middle school, two elementary schools and one K-12 charter school serve these west side residents.

An estimated 1,299,045 individuals visited the island of Kaua‘i during 2007, dropping to 1,034,100 during 2008 and 928,000 during 2009 following a recession in the U.S. and world economies (University of Hawai‘i 2009a). Total visitor arrivals to the island of Kaua‘i have since increased to 1,015,026 during 2011 (Figure 3.9 - 1) (UHERO-Kaua‘i Interactive Database 2012). Although total visitors are not available for 2011, the average daily visitor counts for Kaua‘i was 21,800 and daily spending per visitor averaged $175.15 during the third quarter of 2011 (Island Matters LLC 2011). Money spent by these visitors can represent one third of Kauai’s income. Areas on the west side of Kaua‘i that commonly attract visitors include Waimea Canyon and Polihale Beach.

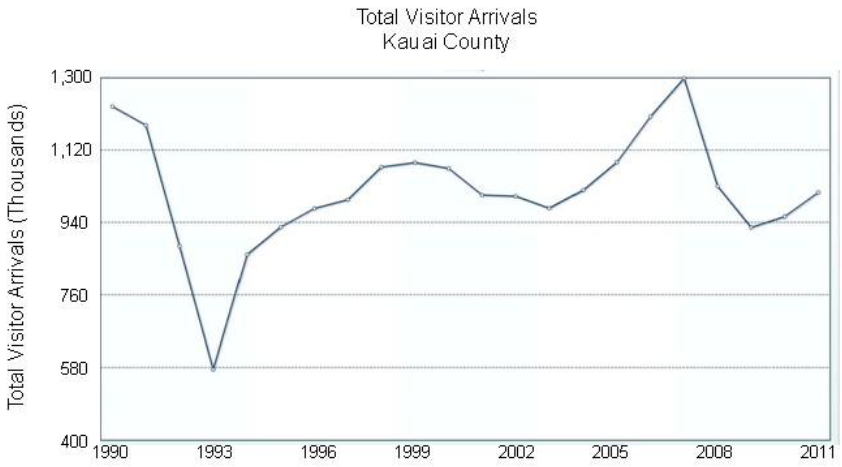

Figure 3.9 - 1. Annual total visitor arrivals to Kaua‘i County from 1990 to 2011. Data from UHERO–Kaua‘i Interactive Database (2012).

3.9.2 Environmental Consequences

No Action Alternative

By adopting the no action alternative, none of the potential benefits resulting from the restoration project, either social or economic, would be realized.

Preferred Alternative

The proposed project will have short and long-term positive socio-economic impacts for the County of Kaua‘i, and more specifically, for the local communities on the west side of the island. Social benefits would include opportunities for school children to learn about native and endangered Hawaiian plant and animal species. The proposed project will serve as an outdoor classroom, and the planned interpretive/education center will facilitate this learning experience. Although the primary theme of these educational resources will be on the biological resources of the area, cultural and historical resources will also be incorporated into education programs. Cultural education components will address how different plants and animals found within the restored project site were utilized by native Hawaiians.

The local economy could realize benefits from the project’s completion, as it has potential to draw more visitors to the west side of the island. The U.S. Fish and Wildlife Service estimates there are over 51 million bird watchers in the U.S. alone. During 2006, birders spent an estimated 12 billion dollars on trip expenditures (Carver 2009). Providing a rare opportunity for birdwatchers to view Hawaii’s endangered waterbirds, the project has the potential to draw additional visitors to the west side of Kaua‘i. With more visitors coming to the west side of Kaua‘i to visit the wetlands, there is increased potential for money to be spent at local businesses in these communities.

3.10 MILITARY RESOURCES

3.10.1 AFFECTED ENVIRONMENT

OVERVIEW

The Pacific Missile Range Facility located on the Mānā Plain west of the project site tests missile defense systems by conducting launches of targets and conducting flight tests of intercepting missiles. PMRF provides training for U.S. Navy and other Department of Defense personnel using existing equipment and technologies for real world requirements to maintain and achieve required states of readiness (Pacific Missile Range Facility 2010). It is also the world's largest instrumented multi-environment, military test range capable of supporting subsurface, surface, air, and space operations. PMRF includes 2,385 acres of land at the base, over 1,100 square miles of instrumented underwater range, and over 42,000 square miles of controlled airspace.

The runway at PMRF is 2,000 feet from the project site. The 215 acres of land in between PMRF and the project site is designated as an anti-terrorism/force protection setback and includes previously cultivated agricultural fields dominated by herbaceous vegetation, drainage canals and ditches, coastal upland areas dominated by non-native shrubs and small trees, and open grasslands near the runway. A 2,110-acre restrictive easement at the north end of PMRF has been established to protect all persons, private property, and vehicles during testing/training events at PMRF. The Kawai‘ele pump station is leased and operated by the U.S. Navy. Figure 3.10 - 1 (Pacific Missile Range Facility 2010) shows the location of the proposed projects in relation to the PMRF anti-terrorism/force protection and the restrictive easement.

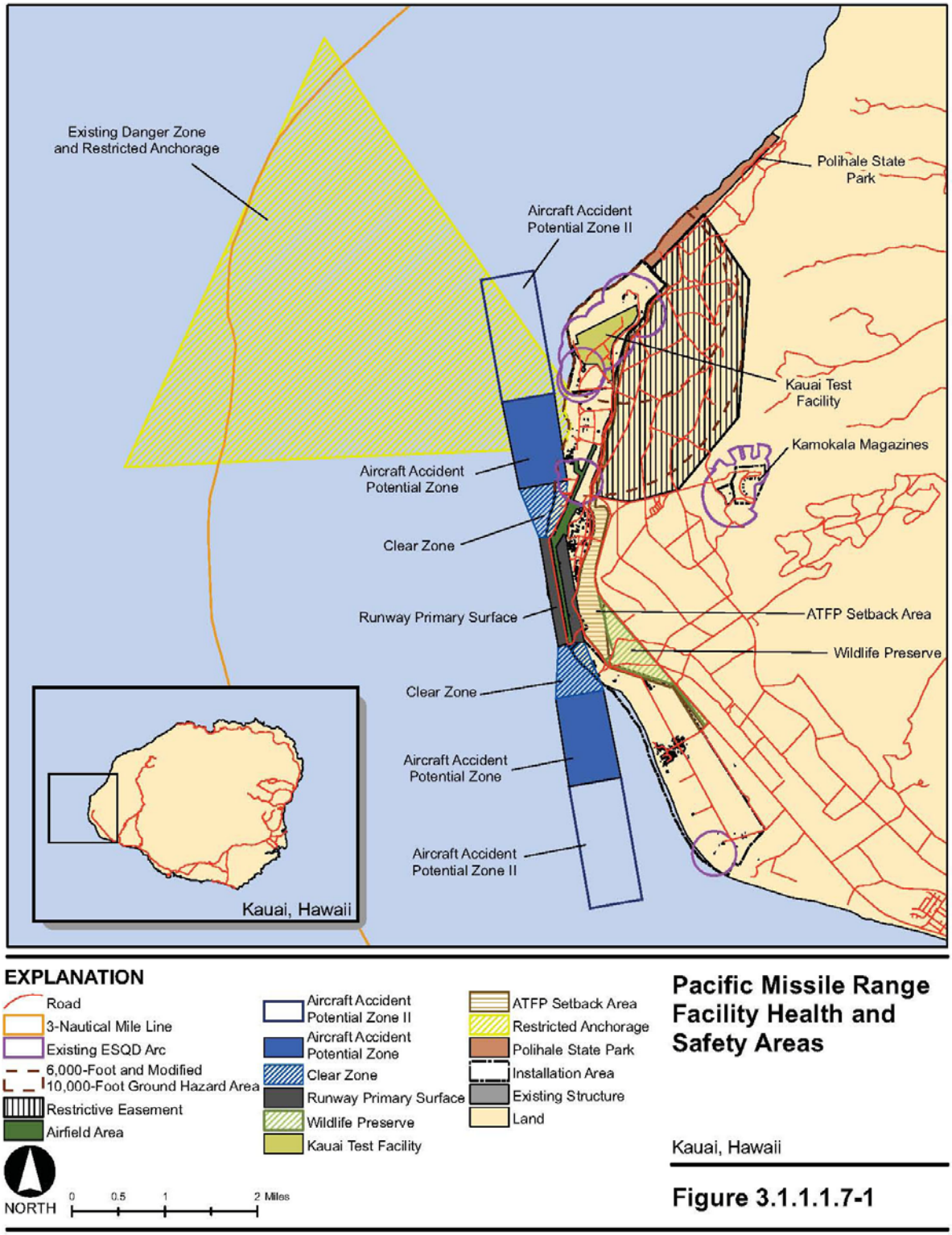

Figure 3.10 - 1. Location of the Mānā Plains Forest Reserve (green hatch marks and labeled Wildlife Preserve) in relation to health and safety areas at the Pacific Missile Range Facility. ATFP is the anti-terrorism/force protection setback; ESQD is the explosive safety quantity distance area (source: Pacific Missile Range Facility 2010:3-24).

WILDLIFE HAZARDS TO AIRCRAFT

According to a recent study of wildlife hazards to aircraft, deer (*Odocoileus* sp.) are the most hazardous wildlife to civil aircraft (Dolbeer et al. 2000, DeVault et al. 2011) and ranked 18th most hazardous (out of 23) to military aircraft. The most hazardous wildlife species to military aircraft was vultures (*Cathartes* sp.) (Zakrajsek and Bissonette 2005). Vultures are not native to Hawai‘i and have not been recorded as visitors or accidental to the Hawaiian Islands (Pyle 2002, Hawai‘i Audubon Society 2005).

The next most hazardous wildlife to aircraft were geese (*Chen caerulescens*, *Branta bernicla*, *Anser albifrons*, and *B. canadensis*) (Zakrajsek and Bissonette 2005, DeVault et al. 2011). All of these geese species are “accidental stragglers” or “occasional migrants” to Hawai‘i (Pyle 2002). A closely related species, nēnē (Hawaiian Geese, *B. sandvicensis*), is endemic to the Hawaiian Islands and its population on the island of Kaua‘i is increasing. For birds, avian body mass was strongly associated with percentage of all strikes that caused damage, and the relative hazard score increased with body mass (DeVault et al. 2011). Strikes involving multiple birds were a contributing factor to damaging strikes for large bird species, but were not an important predictor of damaging strikes for smaller birds (DeVault et al. 2011). DeVault et al. (2011) concluded that the greatest avian strike hazards to aircraft were large (> 1,000 g) flocking species.

Wildlife Hazards at PMRF

The PMRF has a Bird Aircraft Strike Hazard (BASH) Plan to reduce the potential for collisions between aircraft and wildlife. The PMRF BASH plan lists Laysan Albatross (*Phoebastria immutabilis*), a long-lived seabird, as the most significant hazard to aircraft (Pacific Missile Range Facility 2008). Other avian hazards identified include resident and migrating waterfowl, wading birds, gallinaceous birds, shorebirds, owls, sky larks, cattle egrets, myna birds, and meadowlarks. Mammalian hazards identified include rodents, deer, feral pigs, and bats (Pacific Missile Range Facility 2008). Reported bird aircraft strikes at the PMRF from 2004 through January 2012 are presented in Table 3.10 - 1.

Table 3.10 - 1. Bird aircraft strikes reported at the Pacific Missile Firing Range from 2004 – January 2012 (Pacific Missile Firing Range 2012).

Date	Species	Date	Species
06-14-04	Sparrow	11-30-06	Unknown
06-25-04	Pheasant	01-17-07	Zebra dove
10-18-04	Unknown	07-15-07	Barn Owl
04-02-05	Unknown	10-09-08	Plovers (flock)
10-20-05	Hawaiian Owl	09-21-11	Killdeer
08-01-06	Cattle Egret		

The PMRF BASH program includes active and passive bird control techniques including bird hazard warning system, condition reports, and notifications, as well as crew and land management procedures. Two avian species have been actively relocated and/or hazed from PMRF through permits from the U.S. Fish and Wildlife Service, to decrease bird-aircraft strike hazards. In cooperation with the USDA Animal and Plant Health Inspection Service, the PMRF, relocates viable Laysan albatross eggs to nests at Kilauea Point National Wildlife Refuge that

have non-viable eggs (Pacific Missile Range Facility 2010). The PMRF has also relocated, with the assistance of DOFAW staff, nesting nēnē and goslings to Hanalei National Wildlife Refuge. Nēnē have been recorded at PMRF since 2007, but no nesting was recorded until November 2009 (Pacific Missile Range Facility 2010). Nēnē unsuccessfully nested at PMRF during 2010 and two nests were observed during 2011. Nēnē are also observed foraging on the lawns near the beach cottages, the lawns near the Subway restaurant and at those surrounding the Hawai‘i Air Guard Facility. In addition, the PMRF is also continuing communications work with base staff and visitors on the importance of not feeding nēnē, another factor that is attracting nēnē to the base (Pacific Missile Range Facility 2010).

Kawai‘ele, which has had open water habitat since the early 1990s following sand mining activities and has been a wildlife sanctuary since 1998, has not attracted regular breeding population of nēnē, as have other open water and wetland areas on Kaua‘i. In fact, the only documented case of nēnē nesting at Kawai‘ele occurred during the winter of 2011, when a single pair nested in the sanctuary. Nēnē, although not a wetland obligate species, are included as birds surveyed during Hawaii’s bi-annual waterbird surveys due to their status as endangered species. During the twelve bi-annual surveys conducted between January 2006 and August 2011 no nēnē were observed at Kawai‘ele (DOFAW, unpublished data). Nēnē have been observed at Kawai‘ele during their annual molt (the process in which feathers are lost and regrown). During this period the birds are unable to fly, and will seek refuge from predators in the deep-water (greater than 4 feet) aquatic habitat at Kawai‘ele. The infrequency of nēnē observed at Kawai‘ele as well as the lack of a regular breeding population is likely due to the limited amount of short cover vegetation and food sources preferred by nēnē. These conditions should be consistent with those that will be found at the Mānā project site, as planned shoreline habitat management activities will mimic those currently in practice at Kawai‘ele.

NATIONAL SECURITY

The Agricultural Preservation Initiative (API) was approved by the State of Hawai‘i Board of Land and Natural Resources during 2004. The API ensures that land on the Mānā Plain owned by the State of Hawai‘i and leased to the Agribusiness Development Corporation remains as agricultural lands until 2030. The API also includes 215 acres of land leased by the U.S. Navy as an anti-terrorism/force protection setback area. This leased area is located to the west of the project site and includes the Kawai‘ele pump station. Portions of this area were initially part of the acreage set aside by the Hawai‘i Board of Land and Natural Resources as former wetlands to be restored as part of the Mānā Plain Wetland Restoration Project. A 2003 agreement between the U.S. Navy and DLNR effectively removed these lands from the restoration plan to allow for a 2,000 ft buffer zone between the main runway on the base and the restored wetlands. The anti-terrorism/force protection setback area is shown on Figure 3.10 - 1. The API thus allows PMRF to maintain compliance with the federal guidelines for anti-terrorism/force protection criteria and improve homeland defense and national security.

3.10.2 Environmental Consequences

No Action Alternative

No changes will be made to the proposed project site, so no changes in surrounding land uses or wildlife populations will occur. Laysan albatross, Hawaiian geese, and other species identified as wildlife hazards to aircraft will continue to be present at the Mānā Plain and at PMRF. Bird aircraft strike hazards will continue to be managed through the PMRF Bird Aircraft Strike Hazard Plan (Pacific Missile Range Facility 2008). DOFAW will continue to cooperate with the navy to relocate birds that have nested on the base. The project site is outside of the anti-terrorism/force protection setback, so there will be no effect on national security.

Preferred Alternative

Wildlife Hazards to Aircraft

Endangered Hawaiian Waterbirds

The proposed project will result in an increase in wetland habitat available for wetland-dependent wildlife on the Mānā Plain. Due to limited wetland habitat throughout Hawaiʻi, it is anticipated that the four species of endangered Hawaiian waterbirds populations will increase as a result of the proposed project. These species are relatively small (average mass < 725 g) compared to larger more hazardous species and do not exhibit large flocking behavior seen in their migratory counterparts. The average mass for the four endangered waterbirds targeted to benefit from this project are listed in Table 3.10 - 2.

Given the lack of suitable habitat for the four target species of endangered Hawaiian waterbirds on the makai side of the PMRF runway and the lack of suitable habitat for these species on and immediately adjacent to the runway, the threat to aircraft is thought to be negligible. Based on this information, the location and size of the proposed project was agreed upon by both the U.S. Navy and DOFAW in 2003 and no increases in bird aircraft strike hazards are anticipated as a result of the proposed project.

Table 3.10 - 2. Average mass of four species of endangered Hawaiian waterbirds.

Species	Average Mass (g)	Species	Average Mass (g)
Hawaiian stilt		Hawaiian duck	
Male	199	Male	605
Female	206	Female	491
Hawaiian moorhen		Hawaiian coot	
Male	415	Male	724
Female	349	Female	560

The coexistence of wetland habitat for endangered waterbirds and military air operations in the state of Hawaiʻi is not unique to this project. Marine Corps Base (MCB) Hawaiʻi, at Kāneʻohe

Bay on the island of Oʻahu, contains more than 130 acres of wetlands (U.S. Army Corps of Engineers 2009). Figure 3.10-2 shows the locations of these wetland areas. Thirteen individual wetland sites have been identified on the base. These wetlands provide habitat for the same four species of endangered Hawaiian waterbirds for which the Mānā Plain Restoration Project has been developed. "Of all the Department of Defense services in Hawaiʻi, MCB Hawaiʻi is the most active in managing its wetlands. MCB Hawaiʻi recognizes the value and importance of this resource which impacts the health of the entire watershed's environment. A good example was the enlargement of the Percolation Ditch Wetland by planting and grading in 2006. This effort more than doubled the area of that wetland." (U.S. Army Corps of Engineers 2009).

Since the early 1980s, wetland management activities at MCB Hawaiʻi have included invasive vegetation control. The endangered Hawaiian waterbirds that inhabit the base are direct benefactors of these activities. "Increased stilt reproduction is most noted where there is deliberate manipulation of invasive plants. Two of the main species targeted for control (at Kāneʻohe) are mangrove *(Rhizophora mangle)* and pickleweed *(Batis maritima)"* (Drigot 2000). One method utilized to accomplish this is through annual "mud ops" maneuvers by Marine Corps Assault Amphibian Vehicles (AAVs). "These 26-ton vehicles are normally excluded from the wildlife reserve, but each year, just before onset of stilt nesting season, they are deliberately deployed in supervised plow-like maneuvers. The AAV vehicles break open thick mats of pickleweed, improving stilt nesting and feeding opportunities. Their plowing action creates a checker-board pattern of "moats and islands" that inhibits predator (e.g., the non-native mongoose) access to stilt eggs. It also helps newly-hatched stilts find aquatic food, such as flies, larvae, crustaceans. Stilt chicks must feed themselves from birth" (Drigot 2000).

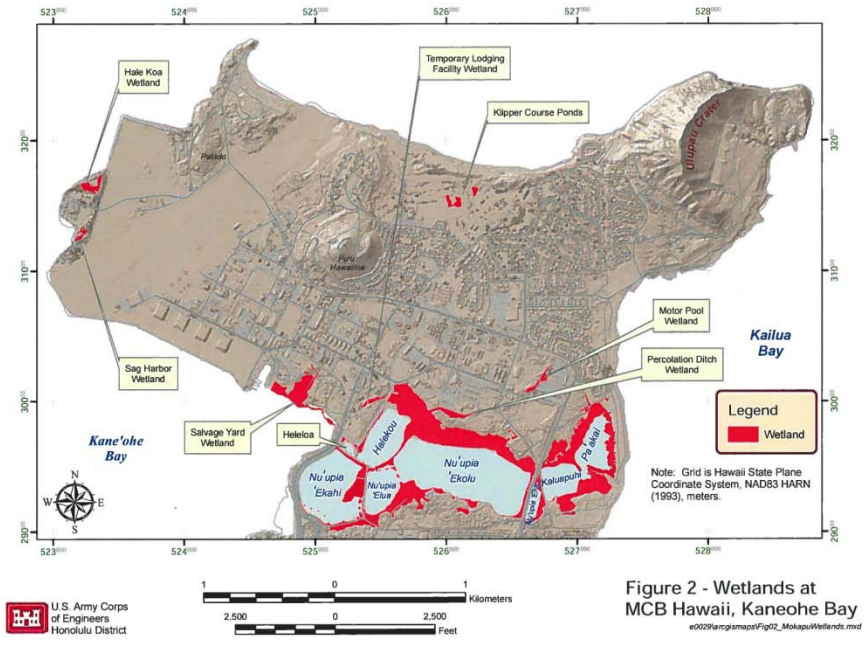

Figure 3.10 - 2. Distribution of 130 acres of wetland habitat located at the Marine Corps Base Hawaiʻi, at Kāneʻohe on the island of Oʻahu (source: U.S. Army Corps of Engineers 2009:11)

In the 1990s more than 2 million dollars were spent to help remove approximately 20 acres of mangrove forests that were inundating portions of the MCB Hawaii's wetlands, as well as to monitor the wetland's recovery (Drigot 2000). A more recent example of wetland habitat management occurred in 2002 when marines of MCB Hawaiʻi continued their efforts to eradicate invasive mangrove forests by clearing the Sag Harbor Wetlands (U.S. Army Corps of Engineers 2009). According to imagery on Google Earth, the Sag Harbor Wetlands lie less than 1,500 feet from runway 04/22, the principal runway at MCB Hawaiʻi (Figure 3.10 - 3).

In 2009 The U.S. Army Corps of Engineers reported that "MCB Hawaiʻi wetlands have increased and improved since the 2002 survey and it is hoped that the upward trend will continue into the future. Stewardship of the environment and our natural resources benefits everyone". These references to the wetland management practices that are occurring on MCB Hawaiʻi, Kāneʻohe, show that wetlands which provide habitat for the four endangered species of Hawaiian waterbirds, can coexist with military installations that engage in air operations.

Figure 3.10 - 3. Sag Harbor Wetland at Marine Corps Base Hawaiʻi at Kāneʻohe on the island of Oʻahu in relation to runway04/22.

Other native waterbirds (wading birds)

Long-legged waders, including herons, are identified as species that need to be controlled within the airfield to reduce aircraft strike hazards. Black-crowned night herons are native to Hawaiʻi and occur on the Mānā Plain. Drainage ditches and canals on PMRF and adjacent lands are maintained free of vegetation to reduce perch sites used by herons when foraging. These practices will continue on drainage ditches that bisect the project site. DOFAW will remove

additional shrubs along abandoned field ditches as part of the proposed project, further reducing foraging perches for herons.

Migratory waterbirds

Migratory waterfowl are also identified as hazardous to flight safety due to their large numbers and generally higher altitude (Pacific Missile Range Facility 2008). Although once common in the Hawaiian Islands, the number of migratory waterfowl in Hawaiʻi has significantly decreased as a result of wetland habitat loss. At the turn of the century, about 40,000 migratory ducks wintered at historical Hawaiian wetlands (USFWS 2012). However, recent surveys estimate that statewide populations of northern shovelers, northern pintail, and other migratory ducks are considerably lower (see Section 3.3 with data summarized from Mitchell et al. 2005). Northern shovelers and northern pintails have been periodically observed in small numbers (< 6 birds) on the Mānā Plain. The proposed project will increase the area of wetland habitat on the Mānā Plain, however, with state-wide estimates of less than 300 individuals for each species, the proposed project is not expected to result in a significant increase in the number of migratory ducks.

Shorebirds, including Pacific golden plovers and sanderlings, migrate to Hawaiʻi during the late summer/fall to overwinter. "The most significant hazard from these birds occurs when large numbers flock in tight groups, particularly during migration and along coastlines" (Pacific Missile Range Facility 2008:23). Both species use mudflat habitats; Pacific golden plovers use short cover upland areas throughout the Hawaiian Islands and often roost on rooftops. The proposed project is likely to increase the number of shorebirds within the project site; however, migratory flocks that follow coastlines will be present with or without the proposed project. Therefore proposed actions are not likely to increase the number of birds that fly across the runway or airplane flight paths.

Other native bird species

Hawaiian short-eared owls (*Asio flammeus sandwichensis*) are native to Hawaiʻi and prey on small rodents, birds and insects. Because Hawaiian owls are not wetland obligate species, they are not expected to increase as a result of this project. The proposed project will not increase habitat used by Laysan albatross (*Phoebastria immutabilis*) or other seabirds and therefore will not affect the aircraft strike hazard of this species.

Nēnē (*Branta sandvicensis*) use a wide variety of habitats and are attracted to open areas on Kauaʻi, particularly open water areas surrounded by short irrigated grasses. Nēnē are not wetland obligate species and are not expected to increase as a result of the proposed project. The dominant upland and wetland plant species that will be restored as part of this project are not known food sources or known nesting habitat for nēnē. In addition, no irrigated, fertilized or mowed grasses will occur at or near the visitor center or within the project site. Berms surrounding the wetland basins will be vegetated with mesic and xeric plant species not known to be a food source for nēnē. Restored wetlands will be managed as seasonal wetlands and will not be permanently flooded. In addition, restored wetland will have shallow water depths (< 2.5 ft). The proposed project will not be managed for nēnē and it is not anticipated that the population of nēnē on the Mānā Plain will increase due to the implementation of the proposed project.

DOFAW encourages the PMRF to remain diligent in their attempts to discourage nēnē from foraging and establishing nests on the base, as well as to continue working with The U.S. Fish and Wildlife Service to keep their permits updated, which will enable the U.S. Navy to legally respond to nene on site. In addition, DOFAW staff will continue to assist PMRF with nēnē at the facility, relocation operations, and will collaborate with PMRF to adopt vegetative management strategies for the PMRF in order to make the landscape of PMRF less attractive to nēnē.

Non-native and accidental birds and non-native mammals

Control and removal of cattle egrets (*Bubulcus ibis*) and barn owls (*Tyto alba*), known to prey on endangered waterbirds, and non-native mammals will be expanded as part of the proposed project and will therefore reduce the aircraft strike hazard for these species. Zebra doves (*Geopilia striata*), house sparrows (*Passer domesticus*), and ring-necked pheasants (*Phasianus colchicus*) are not native to Hawai‘i and are not associated with wetland habitat. These 3 species will likely decrease due to the removal of upland grasslands and shrubs; therefore, known bird aircraft strike hazards for these species at PMRF should also decrease. Killdeer (*Charadrius vociferous*) are classified as accidental to Hawai‘i and are not expected to increase as a result of this project.

NATIONAL SECURITY

The project site is outside of the boundaries of both the 2,110 acre restrictive easement as well as the 215 acre anti-terrorism/force protection (ATFP) setback. Therefore, the implementation of the proposed project would leave these areas both intact and unchanged. The project site will be fenced and all access roads will be gated with locked gates. Wetland habitats are also less desirable to walk through compared to dry ground and therefore have the potential to enhance the effectiveness of the protective buffer ATFP setback to the base.

3.11 AGRICULTURAL RESOURCES

3.11.1 AFFECTED ENVIRONMENT

The earliest agricultural activities on the Mānā Plain included gourds and taro (Yent 2005). Taro was planted near springs on the base of the cliffs to the west of the project site and on floating rafts at Kolo (Yent 2005). During the 1860s rice farming began in the Waimea River Valley and spread to the Mānā Plain (Faye 1997). Rice production on Kaua‘i and throughout Hawai‘i declined as commercial production in California increased during the 1920s (Haraguchi 1987). A map of the Mānā Plain dated 1920 shows rice cultivation surrounding the historically permanently flooded ponds (Faye 1997).

The first commercially grown sugarcane on the west side of Kaua‘i was planted during 1878 near Kekaha by Valdemar Knudsen and Captain Han L’Orange (Hawaiian Sugar Planter’ Association 2004). By 1886 sugarcane was planted at Mānā by H. P. Faye, and the Kekaha

Sugar Company was formed in 1898 (Hawaiian Sugar Planters' Association 2004). Around 1922 sugar producers began draining the low-lying marshlands, reclaiming between 2000 and 3,200 acres by 1931 (Hawaiian Sugar Planters' Association 2004). Draining and filling of wetland habitats continued until the late 1950s when the last of the low-lying marshes were drained and planted to sugarcane. Sugarcane was grown at the project site until the mid-1990s.

Diversified agriculture at Mānā dates back to the 1930s when the sugar plantation supported a large 24-acre vegetable garden which helped make the Kekaha Sugar Company self-sufficient in its food supply (Hawaiian Sugar Planters' Association 2004). Since the decline in sugarcane production in the late 1990s and the closure of Kekaha Sugar Company in 2001, diversified agriculture has expanded across the Mānā Plain. The Agribusiness Development Corporation (ADC) was established to "coordinate the development of Hawaii's agricultural industry and to facilitate its transition from a dual-crop (sugarcane and pineapple) industry to a diversified, multi-crop and animal industry" (Agribusiness Development Corporation 2008:2).

ADC assumed management control of the 12,500 acres of state-owned agricultural lands and related infrastructure on the Mānā Plain during 2003 under Executive Order No. 4007. ADC has an agreement with the Kekaha Agriculture Association for the operation and maintenance of the agricultural infrastructure and has issued long-term land licenses to several of the tenants. The favorable climate, fertile soil, and irrigation system makes the area on the most productive farming regions in the state with an estimate farm gate value of crops produced between $35 and $50 million ((Agribusiness Development Corporation 2008). The agricultural lands on the Mānā Plain have been identified as important agricultural lands (IAL) in the County of Kaua'i (University of Hawai'i 2011).

Four seed companies conduct agricultural practices on a total of 11,900 acres in and around the Mānā Plain (Van Voorhis 2011). These companies, BASF, Pioneer HI-Bred, Syngenta Hawai'i, and Dow AgroScience mainly produce corn, sunflower, soybean, and cotton. They employ between 490 and 635 individuals from the county of Kaua'i, depending on the season. (Van Voorhis 2011). Agricultural lands immediately adjacent to the project site are fallow.

Aquaculture is another agricultural industry on the west side of Kaua'i. A salt-water shrimp farm, owned by Sunrise Capital Inc., is located approximately five miles southeast of the project site. The shrimp farm includes hatchery and grow-out facilities and consists of 40 one-acre ponds and 8 half-acre ponds. Approximately half of the ponds were in production as of January 2012, with the majority of the ponds producing Pacific white shrimp (*Litopenaeus vannamei*), distributed for sale on the islands of Kaua'i, O'ahu, Maui, and Hawai'i (Kaua'i Shrimp 2012).

3.11.2 Environmental Consequences

Two main concerns of agricultural producers on the Mānā Plain are 1) crop depredation by birds and 2) transmission of diseases, specifically the white spot syndrome virus (WSSV).

Agricultural producers have observed birds feeding on seeds, seedlings, immature ears, and mature seed. A survey of 998 members of the Hawai'i Farm Bureau was conducted during 2004 to identify the major Hawaiian avian species responsible for crop damage. The findings

indicated that non-native, invasive species of birds accounted for the majority of crop destruction state-wide (Koopman and Pitt 2007). Cardinals (*Cardinal cartinalis*) accounted for the most frequent species of depredation at 12%, and gallinaceous birds, including pheasants, quail, and chicken, made up the next 31% of birds destroying crops. The Hawaiian goose has also been reported to feed on agricultural crops. The four species of endangered waterbirds expected to increase as a result of this project are not known to feed on seed crops.

During 2004 and 2008 outbreaks of WSSV occurred at the shrimp farm in Kekaha. WSSV is a virus caused by a bacteria originating in China in the early 1990's (The Fish Site 2007). In most cases reported, farmed crustaceans are believed to have become infected by birds preying on dead carcasses of imported infected crustaceans, and then carrying the disease to a crustacean farm. The owner of the Kekaha shrimp farm thinks that birds foraging on imported frozen shrimp dumped at Kekaha landfill are responsible for the outbreak of WSSV at the Kekaha shrimp farm (Curtis 2010). Another article states that Sunrise Capital "blames seabirds" for eating the frozen shrimp and then contaminating the aquaculture facility (Azambuja 2011). The County of Kaua'i disputes the claim, but settled out of court for $250,000 to avoid a lengthy court case. Scavenging birds commonly forage at landfill sites and may travel long distances between roosting and foraging sites. Cattle egrets are commonly observed foraging at the Kekaha landfill; as many as 66 cattle egrets have been observed at the leach pond near the landfill during the State biannual waterbird survey (DOFAW, unpublished data).

NO ACTION ALTERNATIVE

Under this alternative, no changes in bird populations or native plant species will occur. The project site will continue to be dominated by non-native, invasive vegetation and introduced bird species, including those that are known to prey on agricultural seeds (e.g., cardinals and pheasants). Without surrounding landowners taking measures to make areas on the Mānā Plain less attractive to the Hawaiian geese, the recent expansion of the Hawaiian goose population on the west side will continue. Control of introduced cattle egrets, a potential vector for the transmission of WSSV, would not be expanded onto the project site under this alternative.

PREFERRED ALTERNATIVE

The preferred alternative of the proposed project would, in removing the non-native, invasive vegetation, decrease the number of introduced bird species, including those that are known to prey on agricultural seeds (e.g., cardinals and pheasants) at the site. It will benefit the endangered waterbird population on the island of Kaua'i, and increase the numbers of native plants occurring there. In addition, a small area of the Mānā Plain would be restored to its historical and functional state.

There exists no research indicating that the endangered waterbirds inhabiting the Mānā Plain have contributed to seed crop depredation, thus there is not expected to be any increase in seed crop depredation by the implementation of this planed restoration project. However, if this behavioral adaptation should occur DOFAW would work in cooperation with the agricultural

community, the U.S. Fish and Wildlife Service, and the Natural Resources Conservation Service to develop strategies to minimize the potential for crop damage. In addition DOFAW will collaborate with the afore mentioned entities to develop strategies to reduce the risk of seed crop depredation from known species of birds that engage in feeding activities which are detrimental to these agricultural crops.

The Hawaiian waterbirds that the proposed project would be created for are not known vectors of WSSV. The proposed site is not expected to provide habitat for shrimp, or the bird species suspected of having transferred WSSV. Additionally, following the outbreaks of WSSV, Kekaha Shrimp Farm installed protective nets over each of their ponds to protect the shrimp from future disease. Therefore, there is little reason for concern over the possibility of additional WSSV outbreaks resulting from this restoration project.

The environmental consequences resulting from this proposed project on the agricultural resources of the Mānā Plain area are expected to be minimal. It is expected that populations of the four species of endangered waterbirds in and around the project area will increase as a result of this restoration; however, as the life histories of these birds are reliant upon the habitat provided by wetlands, and not agricultural lands, these increased numbers are not expected to result in any damage to crops.

Nēnē are known to inflict damage on seed crops however they have a different life history requirement than the four waterbird species that will benefit from this project. The habitat requirements of nēnē, will not be provided within the restoration area, nor will management techniques be utilized that would benefit these birds. Therefore, the intent of the proposed project, to create habitat for Hawaiian endangered waterbirds, should not be linked to the birds currently contributing to seed crop depredation.

CHAPTER 4: INDIRECT AND CUMULATIVE EFFECTS

The return of wetland habitat and the native plant and animal species associated with it will revitalize the Hawaiian culture once present in the areas' wetlands centuries ago. It will provide another site on the island of Kaua'i, and in the State of Hawai'i, that will contribute to the recovery of endangered waterbirds and where native Hawaiians, island residents and visitors can go to experience the natural and cultural benefits of wetlands.

4.1 INDIRECT AND CUMULATIVE EFFECTS UNDER NO ACTION ALTERNATIVE

Under the No Action Alternative, the project site would not contribute to the recovery of endangered Hawaiian waterbirds because no additional habitat would be restored to increase their population. Water quality would not be improved because no wetland habitats would be created to filter excess nutrients, and irrigation waste (e.g., plastic tubing) would not be removed from the site and would continue to leach chemicals into the environment. The project site would continue to be dominated by non-native vegetation and contribute to the spread of these species across the Mānā Plain.

4.2 INDIRECT EFFECTS WITH PROPOSED ACTION

Indirect effects may occur at a distance from the project area or at a later time. Such effects may include impacts on surrounding environmental resources or public and private facilities. This assessment is concerned with impacts that are likely to occur and not with the speculation of any impact that can be conceived.

The proposed project is not expected to have any indirect impacts on the resident human population, surrounding land use patterns or existing public infrastructure. Much of the surrounding area is used for diversified agricultural. The project site is located on state land and has been under management of DOFAW since 2003, when the State Board of Land and Natural Resources transferred the management jurisdiction of the land to DOFAW. Therefore this project will not change the future land use patterns for any agricultural businesses.

The planned actions do not call for residential housing, nor is this a legal potential use of this DOFAW-managed land; therefore the project would not affect public facilities such as schools or parks that might result from the immigration of new residents to a community. Part of the planned restoration activities includes the construction of a visitor center. The visitor center will have an indirect effect on the surrounding area, as residents and visitors to Kaua'i are likely to frequent the area more often. However, no improvements will need to be made to expand existing infrastructure systems due to increased visitation. Construction of this project will generate limited short-term construction jobs that are not expected to result in any in-migrating of workers. It is anticipated that DOFAW employees, staff from partnering agencies, and qualified local contractors on Kaua'i will be used for construction activities. The number of construction workers needed to complete the project would be minimal, as would be the

frequency at which they entered and exited the site, so this additional traffic would not significantly add to the overall traffic already existing in the area.

4.3 Cumulative Effect with the Proposed Action

Cumulative effects are defined as effects on the environment that result from the incremental impact of a project when combined with actions from the past, present or future. The prediction of future impacts is important in regards to formulating cumulative impact analyses. To estimate the probability of these impacts, one must utilize information obtained from reliable sources such as approved development or construction plans, entitlements, and similar documents.

4.3.1 Effects on Physical and Natural Environment

The proposed project will restore wetland habitats to the Mānā Plain. The proposed project will remove invasive vegetation by grubbing, and management actions will be used to control the reestablishment of these species following restoration. The removal of these non-native species will result in fewer of their seeds entering the environment and reduce the risk of these species spreading to adjacent lands. Mechanical removal of invasive species will be used as the primary method for eradication and control; therefore, fewer chemicals will enter the environment compared to when the land was in sugarcane production. If additional control of invasive vegetation is necessary, herbicides will only be used if mechanical means are not effective, and will be used according to all labels and regulations.

The restored wetland habitats will filter excess nutrients, therefore increasing water quality. Nutrients will be filtered from surface water used as a water source for some of the wetland basins and therefore increase the water quality of that water which would otherwise be pumped through the Kawai‘ele pumping station to the ocean. The use of groundwater as a water supply is not likely to affect other existing wells since a relatively small amount of water compared to historical uses will be required for the restored wetland habitats. The use of groundwater will also not affect irrigation of existing and future crops on the Mānā Plain because surface water is available from the KEIDS to meet these needs.

As described in section 3.10, the proposed project will not directly increase the population of nēnē on the Mānā Plain. However, if habitat management actions at PMRF do not change and continue to attract and provide high quality forage and nesting sites for nēnē, then those nēnē that are attracted to habitats at PMRF may temporarily use the project site for loafing.

4.3.2 Effects on Social and Economic Factors

Improvements to the project site should not influence property values or the tax base of nearby communities, as the improvements will occur on state lands. Restoration of wetland habitats at the project site will provide another attraction for visitors on the west side of Kaua‘i. Visitors may therefore spend more time on the west side resulting in increased sales for local businesses.

Restoration of wetland habitats at the project site will increase opportunities for environmental education at local schools and through the Hawai‘i Youth Conservation Corps which may increase interest in natural resource conservation jobs among local youth and provide them with the necessary hands-on skills to effectively compete for local jobs.

4.3.3 Effects on Infrastructure and Public Facilities

No cumulative impacts of added burden are anticipated on police or fire protection forces, medical or school facilities. In addition, no major off-site infrastructure improvements would be required for this project. Thus, the implementation of this project should not add to the cumulative impacts of the infrastructure or public facilities of the island of Kaua‘i.

CHAPTER 5: COMPLIANCE WITH EXISTING LAWS

5.1 COUNTY

5.1.1 GRADING, SEDIMENT, AND EROSION CONTROL ORDINANCE 808

The purpose of this ordinance is to provide standards to safeguard the public health, safety and welfare. Also to protect property; to control soil erosion and sedimentation by setting standards for grading, grubbing and stockpiling. Another purpose of the ordinance is to protect historic properties and burial sites in the County of Kaua‘i. Lastly the ordinance establishes the administrative procedures, minimum requirements for issuance of permits and provides for the enforcement of such requirements. DOFAW will obtain the necessary permit issued by the county of Kaua‘i prior to the commencement of construction activities, and will abide by the requirements set forth by those permits

5.1.2 GENERAL PLAN

There are a number of sections of the County’s General Plan that relate to the assessment of potential project impacts.

Chapter 3. Caring for Land, Water and Culture sets policies relating to land, waters and culture and also for managing human activities to maintain the quality of the environment – particularly the quality of Kauai’s waters and watersheds. As stated in the Kaua‘i 2020 Vision the concepts of ahupua‘a and watershed link the mountains, lowlands and ocean as one basic ecological unit.

> Relevant sections in Chapter 3 to the proposed project include: heritage resources, scenic views, archeological resources, and watersheds, streams and water quality. The proposed project will contribute to the restoration and preservation of land, water, and cultural resources on the Mānā Plain.

Chapter 5. Preserving Kauai’s Rural Character discusses the elements of the physical environment that make Kaua‘i a rural place. It sets forth the framework and policy for: land use; agriculture and open designations on the General Plan Land Use Map; and scenic roadway corridors, as shown on the Heritage Resources Map.

> The proposed project will conserve land and water resources, open space, and scenic views, all of which contribute to Kauai’s rural character.

Chapter 7. Building Public Facilities and Services address the following building services: water supply, drainage and flood control, electric power, individual wastewater systems, solid waste and parks and recreation. The County of Kaua‘i is dedicated to mitigating the effects of all natural hazards. The county's Department of Public Works (DPW) is responsible for reviewing building permits in order to minimize public and private losses from flooding. The DPW utilizes the Digital Flood Insurance Rate Maps (DFIRMs), published in September of 2005 by the

Federal Emergency Management Agency (FEMA), for determining if proposed building sites are within flood prone areas. Subsequently, the Division of Engineering within the DPW is responsible for reviewing building permits and requires property owners to build structures in accordance with the County of Kaua‘i Floodplain Management Ordinance (No. 630/696).

> The Department of Public Works, Division of Buildings is "responsible for facility development, code enforcement, building construction and maintenance, and janitorial services. All programs are responsible for providing the people of Kaua‘i with safely constructed public and private facilities, and well-maintained County facilities." This project will comply with all requirements established by the County of Kaua‘i. When funding is obtained for the visitor center and prior to construction, DOFAW will submit all required materials to obtain a building permit from the County of Kaua‘i. The visitor center will also comply with the County energy code (Ordinance 890, Article 6) and Floodplain Management Ordinance (No. 630/696). All signs constructed long trails or for at interpretive areas will comply with Chapter 15, Article 4 of the Kaua‘i County Code and permits will be obtained as needed.

5.1.3 KAUA‘I ECONOMIC DEVELOPMENT PLAN

The Kaua‘i Economic Development Plan (KEDP) updates the economic development vision from the Kaua‘i General Plan. The KEDP economic development vision highlights 10 components, including a "strong, stable, and diversified" economy and the "preservation of Kauai's special environment and culture."

> The proposed project will restore the natural heritage of the Mānā Plain incorporating the cultural significance of the area. In addition, the proposed project will contribute to the goals of the KEDP by facilitating career planning for students through exposure to natural resource management, hands-on experience in management and scientific research, and improving the skill level of students entering the workforce.

5.2 STATE

5.2.1 STATE LAND USE DISTRICT – AGRICULTURAL/OPEN

The State of Hawai‘i Revised Statutes Title 13, Chapter 205 classifies all lands within the State of Hawai‘i as urban, rural, agricultural, or conservation land use districts. The State land use district boundary map classifies the Mānā Plain wetland restoration site and surrounding lands as agricultural. Permitted uses within agricultural districts are outlined in HRS 205-4.5 and include the restoration, rehabilitation, or improvement of buildings or sites for historic or scenic purposes. On November 5, 2003 the Board of Land and Natural Resources set aside the project site as an addition to the Kawai‘ele Waterbird Sanctuary. The restoration activities at the project site are in compliance with HRS 205-4.5.

5.2.2 COASTAL ZONE MANAGEMENT

State of Hawai‘i Revised Statutes Chapter 205A, regarding coastal zone management calls for state agencies to give full consideration to ecological cultural, historic, aesthetic, recreational, scenic and open space values, coastal hazards and the need for economic development, in order to provide adequate coastal zone management. DOFAW restoration activities to be undertaken during this project will remain in compliance with the objectives and policies put forth in this chapter.

5.2.3 STATE HISTORIC PRESERVATION

State of Hawai‘i Revised Statutes Chapter 6E provides general authorities for preservation of historic and cultural properties for the education, inspiration, pleasure, and enrichment of the citizens of Hawai‘i. State of Hawai‘i Administrative Rules, Chapter 13-275 establishes the procedures for historic preservation review for governmental projects in order to promote the use and conservation of historic properties. State of Hawai‘i Administrative Rules, Chapter 13-280 provides an expedited process to handle the inadvertent discovery of a historic property, other than a burial site, after the archeological assessment.

> As discussed in section 3.4, DOFAW in cooperation with Hawai‘i State Parks and the State Historic Preservation Division, conducted an archaeological survey of the project site. This was in compliance with HAR §13-275-5 (identification and inventory of historic properties) and indicated a lack of surface and subsurface cultural deposits and artifacts. DOFAW consulted with State Historic Preservation Division and the proposed is not likely to have an adverse effect on any significant historic properties. In the event that any prehistoric, historic or archaeological sites or remains are found, work in that immediate area would cease and DOFAW staff would notify the State Historic Preservation Division and follow rules outlined in HAR §13-280-3 and HRS §6E-43.6. Work in the immediate area would not recommence until approved by the Historic Preservation Division according to HAR §13-280-4 and HRS §6E-43.6.

5.2.4 ENDANGERED SPECIES

Hawai‘i Administrative Rules, Chapter 13-124-3 prohibits the take, possession, processing, selling, or transport of species listed as threatened and endangered by the federal government. This chapter also protects indigenous wildlife from harm and prohibits removing, damaging, or disturbing the nest of any species of indigenous, threatened or endangered species. The restoration and management strategies planned for this restoration project as discussed earlier in this document, will protect endangered waterbird species, as well as other avian species that are protected under Chapter 13-124-3 rules.

Hawai‘i Administrative Rules, Chapter 13-107 provides for the conservation, management, protection and enhancement of native endangered and threatened plants. DOFAW management strategies planned for this restoration project as discussed earlier in this document, will conserve, manage for, protect and enhance the habitat on which species of native endangered and threatened plants depend.

5.2.5 STATE ENVIRONMENTAL POLICY

This section discusses the project’s conformance and consistency with the pertinent goals, policies, and guidelines described under Chapter 344, HRS, State Environmental Policy.

Section 344-3(1).Conserve the natural resources, so that land, water, mineral, visual, air and other natural resources are protected by controlling pollution, by preserving or augmenting natural resources, and by safeguarding the State’s unique natural environmental characteristics in a manner which will foster and promote the general welfare, create and maintain conditions under which humanity and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of the people of Hawai‘i.

> This project will be consistent with this policy as discussed throughout the various sections of this document. The proposed project activities consist of wetland restoration, primarily through removing invasive plants, constructing wetland basins and reestablishing native plant populations. These improvements would subsequently improve habitat for endangered waterbirds, which will aid in the recovery of these species. Therefore, project activities are expected to have positive impacts on unique natural resources, and in fact should aid in safeguarding those resources found on the Mānā Plain. Restoration activities, as well as the associated structures will be designed and constructed to minimize impacts, control pollutants during construction by implementing best management practices, and include review and approval of plans by appropriate agencies. Archaeological monitoring during restoration activities would mitigate potential impacts on subsurface sites that may be present, and procedures have been developed to be followed in the event any sites are unearthed.

Section 344-3(2).Enhance the quality of life by:

A. *Setting population limits so that the interaction between the natural and manmade environments and the population is mutually beneficial.*
B. *Creating opportunities for the residents of Hawai‘i to improve their quality of life through diverse economic activities which are stable and in balance with the physical and social environments.*
C. *Establishing communities which provide a sense of identity, wise use of land, efficient transportation, and aesthetic and social satisfaction in harmony with the natural environment which is uniquely Hawaiian.*
D. *Establishing a commitment on the part of each person to protect and enhance Hawaii’s environment and reduce the drain on nonrenewable resources*

> The proposed project would be consistent with these environmental policies regarding the quality of life. Project improvements would not affect the future resident population on

the Mānā Plain, and restoration improvements should improve the interaction between natural and man-made environments by providing educational and recreational opportunities for the public. The project could generate long-term economic activities for residents, with the possibility of increased numbers of visitors to the western region of Kaua‘i. Construction activities would create short-term job opportunities for those in the construction industry, and thus could generate indirect benefits to local businesses. Improvements would be a prudent use of land because it will help restore habitat and the function of Mānā Plain wetland as a wildlife sanctuary. Removal of invasive vegetation and the subsequent reintroduction of native plants would support a natural environment that is unique to Hawai‘i.

Section 344-4. Guidelines:

1. Population.

A. Recognize population impact as a major factor in environmental degradation and adopt guidelines to alleviate this impact and minimize future degradation

B. Recognize optimum population levels for counties and districts within the State, keeping in mind that these will change with technology and circumstance, and adopt guidelines to limit population to the levels determined.

The proposed project would not affect the existing or future residence on the west side of Kaua‘i. The proposed project does not involve construction of any new homes, however does include one visitor’s center. Therefore resident population will not be affected by migration.

2. Land, water, mineral, visual, air, and other natural resources

A. Encourage management practices which conserve and fully utilize all natural resources;

B. Promote irrigation and waste water management practices which conserve and fully utilize vital water resources;

D. Encourage management practices which conserve and protect watersheds and water sources, forest, and open space areas;

E. Establish and maintain natural area preserves, wildlife preserves, forest reserves, marine preserves, and unique ecological preserves;

The project would be consistent with these guidelines because the restoration project would encourage management practices which conserve and fully utilize natural resources and conserve and protect watershed functions and water sources. Many aspects of the proposed restoration and associated structures incorporate practices that facilitate the conservation of natural resources. There would be no need for regular watering of vegetation as the native plants to be re-established would be historically found in the area and thus would be drought tolerant. The proposed project would conserve and protect some 105 acres of open space, in addition to establishing a unique ecological preserve.

3. Flora and fauna

A. Protect endangered species of indigenous plants and animals and introduce new plants or animals only upon assurance of negligible ecological hazard.

B. Foster the planting of native as well as other trees, shrubs, and flowering plants compatible to the enhancement of our environment.

The project would support the protection of four endangered waterbird species and native plants and animals by restoring wetland habitat. Other measures incorporated into the management activities established for this wetland by DOFAW would further support these protection efforts.

4. Parks, recreation, and open space

A. Establish, preserve and maintain scenic, historic, cultural, park and recreation areas, including the shorelines, for public recreational, educational, and scientific uses.

C. Promote open space in view of its natural beauty not only as a natural resource but as an ennobling, living environment for its people.

The project will support establishing, preserving, and maintaining the Mānā Plains Forest Reserve as a scenic, historic, cultural, park through restoration improvements and passive outdoor amenities planned. Improvements would also create cultural and educational opportunities to learn more about the Mānā Plain, its history, habitat, and cultural values. Historic or cultural resources will not be adversely impacted by restoration activities. Project improvements will create and enhance open space areas within the wetland.

5. Economic development.

C. Encourage federal activities in Hawai‘i to protect the environment.

E. Establish visitor destination areas with planning controls which shall include but not be limited to the number of rooms.

The proposed project is support by federal grants from the U.S Fish and Wildlife Service, which supports the policy to encourage federal activities in Hawai‘i to protect the environment. The planned restoration efforts include the construction of a visitor center with environmental education capabilities.

6. Transportation.

C. Encourage public and private vehicles and transportation systems to conserve energy, reduce pollution emission, including noise, and provide safe and convenient accommodations for their users.

The proposed design for the visitor and environmental education center, calls for the construction of a parking lot that could accommodate school and tour buses, in addition to being ADA compliant.

7. Energy.

A. Encourage the efficient use of energy resources.

The proposed design for the visitor and environmental education centers would incorporate photovoltaic systems there by reducing the demand for power generated

outside the facility. In addition, energy efficient products would be utilized whenever possible.

8. *Community life and housing.*
   E. *Recognize community appearances as major economic and aesthetic assets of the counties and the State; encourage green belts, plantings, and landscape plans and designs in urban areas; and preserve and promote mountain-to-ocean vistas.*

   Landscape architectural design will be incorporated into the proposed layout of the visitor and environmental education center. Native vegetation will used for landscaping and improve the aesthetics of these facilities. Viewing areas will also be located for observation of wetlands and waterbirds and will include views to the mountains.

9. *Education and culture.*
   A. *Foster culture and the arts and promote their linkage to the enhancement of the environment.*
   B. *Encourage both formal and informal environmental education to all age groups.*

   Project improvements will increase public accessibility to the area and provide for educational, cultural, and recreational opportunities. Classroom facilities at the visitor center and informational kiosks will facilitate both formal and informal environmental education opportunities for all age groups. DOFAW will continue working with Hawai‘i Youth Conservation Corps, and other educational institutions and community organizations to increase these opportunities.

10. *Citizen participation*
   A. *Encourage all individuals in the State to adopt a moral ethic to respect the natural environment; to reduce waste and excessive consumption; and to fulfill the responsibility as trustees of the environment for the present and succeeding generations;*
   B. *Provide for expanding citizen participation in the decision making process so it continually embraces more citizens and more issues.*

   Educational and cultural opportunities created by this project would support DOFAW’s effort to improve the wildlife habitat associated with Mānā Plain. Such opportunities would further the public’s understanding of this resource and its importance to the environment of Kaua‘i. The environmental review process undertaken for this project allows for public and government agency input during the review of the Draft EA. Public consultation efforts help provide decision-makers with a diverse array of information and comments to consider when evaluating this project.

5.2.6 WATER QUALITY AND WATER POLLUTION CONTROL

State of Hawai‘i Administrative Rules Chapter 11-54 Water Quality Standards established Hawaii’s general policy of water quality antidegradation (HAR §11-54-1.1) and states that:

a) Existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.
b) Where the quality of waters exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained or protected.
c) Where existing high quality waters constitute an outstanding resource, such as waters of national and state parks and wildlife refuges, and waters of exceptional recreational or ecological significance, the water quality shall be maintained and protected.

As discussed in section 3.2, water quality of the surface water from the canals, falls within the range of other coastal and lowland wetlands that support endangered waterbirds and native wetland plants on other State and Federal wildlife reserves in Hawaiʻi. No wetlands currently exist within the project site, so the use of both water sources is compatible with Hawaii's anti-degradation policy and compatible with the protection of Class 1a wetland ecosystems. The restored wetlands will likely improve the water quality of the canal water that is currently being pumped out to the Pacific Ocean through the Kawaʻiele pump station.

Surface water from the main canal water which feeds the Kawaiʻele outfall pump #002 may be used to supply some of the restored wetland basins. Therefore, water quality parameters of the surface water are evaluated against water quality standards that will apply to the project wetlands. Based on Chapter 54 of Title 11, Hawaiʻi Administrative Rules, titled "Water Quality Standards", wetland restored as part of the proposed project would be classified as inland waters, and more specifically as low wetlands or coastal wetlands.

Low wetlands and coastal wetlands are subject only to the basic water quality criteria set forth in section 11-54-4. These criteria are summarized in Table 5.2 - 1. Comparison of the existing surface water quality data summarized in Table 3.2 - 1 and Table 3.2 - 2 Table 3.2 - 2 to the water quality standards presented in Table 5.2 - 1 indicate that measured surface water quality parameters meet State water quality standards.

State of Hawaiʻi Administrative Rules Chapter 11-55 Water Pollution Control state that Hawaiʻi's general public policy on water pollution control is to:

1. Conserve state waters
2. Protect, maintain, and improve the quality of state waters
3. Provide that no waste be discharged into state waters without being given the degree of treatment necessary to protect the legitimate beneficial uses of the waters
4. Provide for the prevention, abatement, and control of new and existing water pollution
5. Cooperate with the federal government in carrying out these objectives

HAR §11-55-4 and associated appendices set the regulations and conditions for National Pollution Discharge Elimination System (NPDES) permits, notice of intent, and conditional "no exposure" exclusions. These regulations apply to discharge of any pollutant, construction activities that disturb more than one acre of land, substantially altering the quality of any discharges, or substantially increasing the quantity of any discharge. DOFAW will obtain an NPDES permit prior to the construction of the proposed project.

Table 5.2 - 1. Basic water quality criteria from the State of Hawai‘i applicable to all Hawai‘i waters classified as “low wetlands” or “coastal wetlands.”

Basic water quality criteria applicable to all waters
All waters shall be free of substances attributable to domestic, industrial, or other controllable sources of pollutants, including: (1) Materials that will settle to form objectionable sludge or bottom deposits; (2) Floating debris, oil, grease, scum, or other floating materials; (3) Substances in amounts sufficient to produce taste in the water or detectable off-flavor in the flesh of fish, or in amounts sufficient to produce objectionable color, turbidity or other conditions in the receiving waters; (4) High or low temperatures; biocides; pathogenic organisms; toxic, radioactive, corrosive, or other deleterious substances at levels or in combinations sufficient to be toxic or harmful to human, animal, plant, or aquatic life, or in amounts sufficient to interfere with any beneficial use of the water; (5) Substances or conditions or combinations thereof in concentrations which produce undesirable aquatic life; and (6) Soil particles resulting from erosion on land involved in earthwork, such as the construction of public works; highways; subdivisions; recreational, commercial, or industrial developments; or the cultivation and management of agricultural lands.
To ensure compliance with paragraph (4) above, all state waters are subject to monitoring and to the following standards for acute and chronic toxicity and the protection of human health. (A) "Acute Toxicity" means the degree to which a pollutant, discharge, or water sample causes a rapid adverse impact to aquatic organisms. The acute toxicity of a discharge or receiving water is measured using the methods in section 11-54-10, unless other methods are specified by the director. (B) "Chronic Toxicity" means the degree to which a pollutant, discharge, or water sample causes a long-term adverse impact to aquatic organisms, such as a reduction in growth or reproduction. The chronic toxicity of a discharge or receiving water is measured using the methods in section 11-54-10, unless other methods are specified by the director. (C) "Dilution" means, for discharges through submerged outfalls, the average and minimum values calculated using the models in the EPA publication, Initial Mixing Characteristics of Municipal Ocean Discharges (EPA/600/3-85/073, November, 1985), or in the EPA publication, Expert System for Hydrodynamic Mixing Zone Analysis of Conventional and Toxic Submerged Single Port Discharges (Cormix 1) (EPA/600/3-90/073), February, 1990. (D) "No Observed Effect Concentration Observed Effect Concentration" (NOEC), means the highest per cent concentration of a discharge or water sample, in dilution water, which causes no observable adverse effect in a chronic toxicity test. For example, an NOEC of 100 percent indicates that an undiluted discharge or water sample causes no observable adverse effect to the organisms in a chronic toxicity test.
Narrative toxicity and human health standards. (A) Acute Toxicity Standards: All state waters shall be free from pollutants in concentrations which exceed the acute standards listed in paragraph (3). All state waters shall also be free from acute toxicity as measured using the toxicity tests listed in section 11, or other methods specified by the director. (B) Chronic Toxicity Standards: All state waters shall be free from pollutants in concentrations which on average during any twenty-four hour period exceed the chronic standards listed in paragraph (3). All state waters shall also be free from chronic toxicity as measured using the toxicity tests listed in section 11-54-10, or other methods specified by the director. (C) Human Health Standards: All state waters shall be free from pollutants in concentrations which, on average during any thirty day period, exceed the "fish consumption" standards for non-carcinogens in paragraph (3). All state waters shall also be free from pollutants in concentrations, which on average during any 12 month period, exceed the "fish consumption" standards for pollutants identified as carcinogens in paragraph (3).
Numeric standards for toxic pollutants applicable to all waters. The freshwater standards apply where the dissolved inorganic ion concentration is less than 0.5 parts per thousand; saltwater standards apply above 0.5 parts per thousand. Values for metals refer to the dissolved fraction. See §11-54-4 for a comprehensive list of inorganic compound and metals standards.
Requirements applicable to discharges to state waters. See §11-54-4 for a these standards which shall be enforced through effluent limitations or other conditions in discharge permits.

5.2.7 AIR QUALITY

State of Hawai'i Administrative Rules Chapter 11-59 establishes numerical ambient air quality standards and seeks to protect public health and welfare and to prevent the significant deterioration of air quality. The air quality during construction and ongoing management activities at the project site, are expected to remain well within the ambient air quality standards set forth by Chapter 11-59.

State of Hawai'i Administrative Rules Chapter 11-60.1 Air Pollution establishes rules to prevent air pollution and the emission of any regulated or hazardous air pollutant. HAR §11-60.1-33 prohibits fugitive dust from becoming airborne without taking reasonable precautions and prohibits visual dust emissions beyond property boundaries. During the construction phase of the restoration project, due to the hydrological conditions of the soils found on the site, fugitive dust is not expected to be an issue. However if drier than normal conditions result in the potential release of fugitive dust, precautionary measures will be taken by DOFAW to prevent its release.

5.2.8 NOISE

State of Hawai'i Administrative Rules Chapter 11-46 Community Noise Control requires a noise permit if the noise levels from construction activities are expected to exceed the allowable noise levels stated in these rules. The machinery that is planned to be used during the construction phase of the project is similar to the types currently in use by the agricultural companies on lands adjacent to the project site, and thus are not expected to exceed allowable noise levels limits. However if construction activities are found to result in noise levels that exceed the allowable limits, DOFAW will obtain the required noise permits.

5.2.9 TRANSPORTATION

HRS Chapter 279A (Act 179, Session Laws of Hawai'i 1975) establishes a comprehensive multi-modal statewide transportation planning process which involves all levels of government in a cooperative process to develop coordinated transportation plans that develop a balanced , multi-modal statewide transportation system that serves clearly identified social, economic and environmental objectives and which includes the following system components: national system of interstate and defense highways and highways within the state highway system, airports, harbors and water-borne transit, surface mass transit, and major county roads.

HRS Chapter 226 (Act 100, Session Laws of Hawai'i 1978) directs the planning of a transportation system that promotes the efficient, economical, safe and convenient movement of people and goods; and a statewide transportation system that is consistent with and will accommodate planned growth objectives throughout the State. There are subtle but important differences between Chapters 279A and 226. Chapter 279A calls for a process that involves all levels of government in creating transportation infrastructure that meets statewide social, economic and environmental objectives and that produces an integrated system of air, harbor and road facilities. This plan and process are the responsibility of STP. Chapter 226, commonly referred to as the Statewide Planning Act, addresses an integrated multi-modal system that

accommodates planned growth. Title 23, USC 135 was enacted in 1968, and that federal law requires that each State shall develop a statewide transportation plan and a Statewide Transportation Improvement Plan.

It is not likely that the increased vehicular traffic accessing the project site would cause any traffic delays or would require any modification to the existing Highway 50 (DOFAW 2008). If the additional vehicular traffic generated as a result of the proposed project results in unsafe conditions, a turn lane could be added near the entrance to the project site. For example, a turn lane was recently installed approximately two miles south of the site at the entrance to the Pioneer facility.

5.3 FEDERAL

5.3.1 ENDANGERED SPECIES

Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended prohibits take of threatened and endangered species and provides for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend. As described in this document, the proposed project will benefit four endangered species of Hawaiian waterbirds. DOFAW will consult with the U.S. Fish and Wildlife Service as required by Section 7 of the Endangered Species Act.

5.3.2 MIGRATORY BIRDS

Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat. 755) as amended establishes a federal prohibition, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird." DOFAW will obtain the necessary permits to control non-native avian species that prey on endangered waterbirds

5.3.3 CLEAN WATER ACT

The Clean Water Act (CWA) of 1972 establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Sections 401 and 402 of the CWA are administered by the State of Hawai‘i and compliance with State regulations are listed above. Section 404 of the CWA requires permit from the U.A. Army Corps of Engineers for the discharge of dredged or fill material into a wetland, navigable water, or jurisdictional waters of the United States.

DOFAW collaborated with the Natural Resources Conservation Service to complete a wetland delineation of the area. No wetland habitats were delineated within the project

site and therefore no permit is required for the grubbing, grading, and contouring of wetland basins. The proposed restoration project will result in an increase in wetland habitats. Other restoration actions, including the installation of water control structures and moist-soil management activities are permitted under Nationwide Permit 27 and Nationwide Permit 30. DOFAW will consult with the U. S. Army Corps of Engineers and notify them of all project activities covered by nationwide permits prior to construction.

5.3.4 FEDERAL AVIATION ADMINISTRATION

FAA Advisory Circular (AC) 150.5200-33 dated May 1, 1997, updated by CA 150.5200-33B dated August 28, 2007 provides guidance on locating land uses having the potential to attract hazardous wildlife on or near public-use airports and airports with operating certificates issued under 14 CFR Part 139. The AC recommends a separation distance of 5,000 feet for airports serving piston-powered aircraft and 10,000 feet for airports serving turbine-powered aircraft when developing land uses that may attract hazardous wildlife populations near public-use airports. The FAA also recommends a separation distance of five statute miles between the edge of the air operations area and the wildlife attractant if the attractant could cause hazardous wildlife movement into or across the approach or departure space. Wetlands are listed as one of the land uses that are incompatible with safe public-use airport operations.

Federal MOA to Address Aircraft-Wildlife Strikes – This MOA between the Federal Aviation Administration, the U.S. Air Force, the U.S. Army, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and the U.S. Department of Agriculture establishes "procedures necessary to coordinate their missions to more effectively address existing and future environmental conditions contributing to aircraft-wildlife strikes throughout the United States." Signatories agree that the term airport refers to U.S. Air Force airfields and public-use airports in the FAAs National Plan of Integrated Airport Systems. Section 1-F of the MOA states that signatories will consider regional, local, and site-specific factors when developing and implementing land-use programs near airports, work cooperatively with authorities, and encourage stakeholders to develop land uses according to siting criteria for in Section 1-3 of FAA Advisory Circular (AC) 150.5200-33 dated May 1, 1997. Exceptions to the siting criteria will be considered if the land use development involves habitats that provide unique ecological functions or values, such as habitat for federally listed threatened or endangered species or groundwater recharge. Sections 1-G and 1-H of the MOA also states that agencies will work with landowners to support wetland restoration or enhancement efforts that do not increase aircraft-wildlife strike potentials and will review proposals to develop wildlife refuges that may attract hazardous wildlife.

The proposed project is within the guidelines of the Federal MOA listed above as the project site will provide unique ecological values and habitat for federally-listed endangered species. As discussed in section 3.10, bird-aircraft strike hazards are not expected to increase as a result of this project.

CHAPTER 6: AGENCY CONSULTATION AND PUBLIC INVOLVEMENT

6.1 Contributing Agencies and Organizations

The State of Hawai‘i DLNR DOFAW Kaua‘i office has partnered with a diverse group of agencies and individuals with expertise in multiple disciplines to assist with restoration planning (Figure 6.1 - 1). This restoration partnership includes individuals from Hawai‘i and the mainland with expertise related to wetland ecology and wetland restoration design, as well as specialists in hydrology, engineering, public outreach, soils, waterbird biology, and botany. Partners that assisted with the planning phases for the development of the restoration design and environmental assessment are listed in alphabetical order in Table 6.1 - 1.

Figure 6.1 - 1. Photos of field data collection and restoration planning activities for the Mānā Plains Forest Reserve wetland restoration project.

Table 6.1 - 1. Partners consulted by DLNR DOFAW for the development of the restoration design and the Environmental Assessment.

Affiliation	Location
DLNR Division of Aquatic Resources	Līhuʻe, HI
DLNR Historic Preservation Office	Honolulu, HI
Ducks Unlimited, Inc.	Honolulu, HI; Vancouver, WA
Hawaiʻi Wetland Joint Venture	Holualoa, HI
Kamman Hydrology and Engineering, Inc.	San Rafael, CA
NPS, Rivers Trails and Conservation Assistance Program	Honolulu, HI
Natural Resource Conservation Service, Pacific Islands Area Office	Honolulu, HI
Natural Resource Conservation Service, Hilo Soil Survey Office	Hilo, HI
PAHIO Development, Inc.	Princeville, HI
Pacific Coast Joint Venture	Vancouver, WA
Scaup & Willet LLC	Wayan, ID
University of Hawaiʻi	Honolulu, HI
USFWS, Pacific Islands Fish and Wildlife Office	Honolulu, HI
USFWS, Kauaʻi National Wildlife Refuge Complex	Kīlauea, HI
USFWS, Bosque del Apache National Wildlife Refuge	San Antonio, NM
USFWS, National Coastal Wetland Grant Office	Portland, OR
U.S. Geological Survey	Jamestown, ND
Wetland Management & Educational Services, Inc.	Puxico, MO

6.2 Public Outreach, Environmental Education, and Awareness

With support from multiple partners, including the National Park Service, the Hawai‘i Wetland Joint Venture, and PAHIO Development, Inc., DOFAW developed a brochure titled *Help Us Restore Wetlands and bring back Waterbirds to the Mānā Plain*, printed by a Kaua‘i-based business. This brochure is available at the DOFAW offices in Līhu‘e and Honolulu. The brochure is also available electronically at http://hawaii.gov/dlnr/dofaw/announcements/2012.

DOFAW has held several public outreach, environmental education events, and community volunteer work-days at the Mānā Plains Forest Reserve. Through the River, Trails, and Conservation Assistance Program, the National Park Service facilitated the development of *Friends of Mānā*, a group of local individuals interested in wetland restoration on the west-side of Kaua‘i. Members of the *Friends of Mānā* have assisted with native habitat restoration at Kawai‘ele.

Employees of Syngenta Hawai‘i have also volunteered their time at Kawai‘ele to plant native wetland species and remove non-native invasive vegetation. Their volunteer work was recognized in an article in *The Garden Island* http://thegardenisland.com/news/local/syngenta-employees-help-restore-wetland-raise-funds-for-halau/article_5fffc2c0-6ee6-11df-bdc9-001cc4c002e0.html. The Hawai‘i Nature Center also volunteered at Kawai‘ele.

The Mānā Plains Forest Reserve has been a work site for the Hawai‘i Youth Conservation Corps (HYCC) summer program since 2006. The HYCC summer program provides an opportunity for young adults to get involved in hands-on conservation service-learning programs. Approximately 10 individuals participate in the HYCC program at Kawai‘ele each year. They learn about native wetland plants and animals while helping restore native species and controlling invasive vegetation. Individuals work as part of a team and gain valuable life skills to prepare them for the future.

Mr. Jason Vercelli, biologist with DOFAW was recognized as the West Kaua‘i Soil and Water Conservation District’s *Cooperator of the Year* for the year 2011. Mr. Vercelli was recognized for his outstanding work restoring wetland habitats at Kawai‘ele and for his involvement in the HYCC program. *“Jason’s work in the community with the Hawaii Youth Conservation Corps is commendable; this project has provided education to the community about the sanctuary’s mission for preserving wildlife on the west side of Kauai*.”

DOFAW has recently partnered with the non-profit organization, KUPU, and the Hawai‘i Commission for National and Community Service. Through funding from the Corporation for

National and Community Service, DOFAW has been staffed with tow Americorps intern positions for 2011-2012. These interns have been specifically assigned to the Mānā Plains Forest Reserve. They assist in all the regular duties associated with Kawai‘ele and the Mānā Plain wetland restoration project, including planning, outreach, control of invasive species, and restoration of native species.

DOFAW is collaborating with the Kaua‘i Community College and local high school students who plan to construct several kiosks for the Mānā Plains Forest Reserve. Construction of the kiosks will provide students with carpentry-related skills. The informational kiosks will be placed at Kawai‘ele and will contain information on Hawaiian wetlands, native plants and animals, and cultural and historical aspects of the Mānā wetlands.

Wetland restoration and enhancement within the Mānā Plains Forest Reserve has been highlighted by the Hawai‘i Wetland Joint Venture (HWJV), whose mission is to "protect, restore, increase and enhance all types of wetlands, riparian habitat and associated uplands throughout the Hawaiian Islands through partnerships for the benefit of birds, other wildlife, people and the Hawaiian culture" (PCJV 2012). Planning for wetland restoration within the Mānā Plains Forest Reserve was the *Restoration Spotlight* in the March 2008 edition of *The Hawaii Wetland Monitor*, available online at: http://pcjv.org/hawaii/newsletters/Newsletter-0308.pdf

The HWJV also hosted a half-day workshop at the project site. Announcement of the workshop was distributed through the HWJV mailing list. During the workshop, DOFAW and project partners gave a brief tour of the project site and explained the planning components they were implementing to develop the wetland restoration design (Figure 8). Partners discussed the goals and objectives of the project and explained how they used the information on soils and topography to generate a conceptual restoration design.

6.3 PRE-ASSESSMENT CONSULTATION

The 30-day pre-assessment scoping period for this Environmental Assessment was announced in a press release by the State of Hawai‘i DLNR DOFAW on January 3, 2012. This notice was also posted on DOFAWs facebook page and via twitter. Ms.Vanessa Van Voorhis wrote an article on the proposed project for the Kaua‘i Garden News which was published on the front page of the January 4, 2012 paper and was also available on-line. DOFAW's press release was also distributed to partners in the Hawai‘i Wetland Joint Venture via email. Other known outlets include Damian Tucker's blog. In addition, letters were sent to agencies, organizations, and interested individuals listed below.

6.3.1 LOCAL AGENCIES, ORGANIZATIONS, & BUSINESSES

BASF
DOW Agro Sciences
Kaua‘i County Mayor

Kaua‘i County Council Members
Kekaha Agricultural Association
Ni‘ihau School
Pioneer Hi-Bred International
Syngenta Hawai‘i
West Kaua‘i Watershed Council

6.3.2 STATE AGENCIES

Department of Land and Natural Resources, Division of Aquatic Resources
Department of Land and Natural Resources, Division of Conservation & Resources Enforcement
Department of Land and Natural Resources, Division of State Parks

6.3.3 FEDERAL

Pacific Coast Joint Venture
U.S. Environmental Protection Agency, Region 9
U.S. Department of Army, Honolulu District, Corps of Engineers
U.S. Department of Navy, Pacific Missile Range Facility
U.S. Fish and Wildlife Service, Kaua‘i National Wildlife Refuge Complex
U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office

6.4 RESPONSES TO PRE-ASSESSMENT COMMENTS

The State of Hawai‘i DLNR DOFAW received nine written comments during the scoping period. These letters and DOFAW’s written responses are included in this section in their entirety. For comments received electronically, the email address of the sender has been blocked for privacy.

In addition to the nine written comments, informal inquires by phone and email regarding project location and project goals were also received and responded to by email or phone and have been addressed in previous sections of this EA.

From: Robert Westerman [redacted]
To: '"Jason.A.Vercelli@Hawaii.gov"' <Jason.A.Vercelli@Hawaii.gov>
Date: 01/03/2012 04:30 PM
Subject: Mānā Plain Forest Reserve Wetland Restoration Plan/EA

Aloha Jason, I would like to comment on the Mānā Plain Forest Reserve Wetland Restoration Plan/EA. I am concerned that as we let the reserve return to its original or more natural state we take into consideration the development that has taken place next to or near the reserve. 100 plus years ago canoes could traverse the entire swamp Nana to Kekaha and with the development of the sugar cane industry, military, the landfill site and the increase in population in Kekaha there has been significant realignment of the natural waterways. Years of construction of the new waterways and dewatering pumps have keep flooding at bay. To just look at the limited 105 acres and say let just turn this back into its original state it will have an effect on the entire Mānā to Kekaha plain.

Bob W.

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
3060 Eiwa Street, Room 306
Lihue, Kauai, HI 96766

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

12 March 2012

To: Mr. Robert Westerman

Response to Environmental Assessment Scoping Period Comments

Thank you for your comments and concerns regarding the content of the draft Environmental Assessment for the Mana Plain Forest Reserve Wetland Restoration Project. Your concerns regarding the geological and archeological facts about the project site will be addressed in the published draft Environmental Assessment. This document is in final stages of development, and will be released in the spring of this year. It will be available on the DLNR Division of Forestry and Wildlife website for viewing.

Sincerely,

Jason Vercelli
DOFAW Wildlife Biologist

From: Mike DeMotta [redacted]
To: Jason.A.Vercelli@Hawaii.gov
Date: 01/05/2012 02:12 PM
Subject: comments

Aloha Jason,
I would like to submit my strong support for the the Mana Plain wetland restoration project. The Mana Plain was drastically altered by big agriculture, namely the sugar industry, and good habitat for many Mana Plain species is sorely lacking. The creation of a protected safe haven for common and rare native plants, birds and insects would be a help mitigate the problems of off road vehicles and the subsequent take of rare and common species in other parts of the plain.

I would suggest the use of predator proof fencing if feasible to ensure safe nesting conditions for the many rare Hawaiian birds that will use this site once the restoration is complete.

Sincerely,

Michael J. DeMotta

Michael J. De Motta
Assistant Director
Living Collections & Horticulture
NATIONAL TROPICAL BOTANICAL GARDEN
3530 Papalina Road
Kalaheo, HI 96741 USA

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
3060 Eiwa Street, Room 306
Lihue, Kauai, HI 96766

12 March 2012

To: Mr. Mike DeMotta

Response to Environmental Assessment Scoping Period Comments

Thank you for your comments and concerns regarding the content of the draft Environmental Assessment for the Mana Plain Forest Reserve Wetland Restoration Project. Your comments regarding predator control will be addressed in the published draft Environmental Assessment. This document is in final stages of development, and will be released in the spring of this year. It will be available on the DLNR Division of Forestry and Wildlife website for viewing.

Sincerely,

Jason Vercelli

Jason Vercelli
DOFAW Wildlife Biologist

From: "Eric VanderWerf" <[redacted]
To: <Jason.A.Vercelli@Hawaii.gov>
Date: 01/06/2012 08:58 AM
Subject: comments on Mana Plain wetland restoration

Dear Mr. Vercelli and Hawaii Department of Land and Natural Resources,

I am writing to express my support of the proposed plan to restore 105 acres of wetland habitat on the Mana Plain of Kauai. The Mana Plain was once one of the largest wetlands in the Hawaiian Islands and supported large numbers of Hawaii's endemic waterbirds and numerous other wetland species. The area still supports important populations of four species of endangered wetland birds, and I applaud the state's intention to restore and improve habitat for these and other species. The Mana Plain is considered a core wetland habitat in the U.S. Fish and Wildlife Service's recovery plan for endangered Hawaiian waterbirds, so this should be considered a high priority action.

Eric VanderWerf
Honolulu, Hawaii

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GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
3060 Eiwa Street, Room 306
Lihue, Kauai, HI 96766

12 March 2012

To: Mr. Eric VanderWerf

Response to Environmental Assessment Scoping Period Comments

Thank you for your comments and concerns regarding the content of the draft Environmental Assessment for the Mana Plain Forest Reserve Wetland Restoration Project. Your comments regarding the priority of the project will be addressed in the published draft Environmental Assessment. This document is in final stages of development, and will be released in the spring of this year. It will be available on the DLNR Division of Forestry and Wildlife website for viewing.

Sincerely,

Jason Vercelli

Jason Vercelli
DOFAW Wildlife Biologist

NEIL ABERCROMBIE
GOVERNOR
STATE OF HAWAI'I

ALBERT "ALAPAKI" NAHALE-A
CHAIRMAN
HAWAIIAN HOMES COMMISSION

MICHELLE K. KAUHANE
DEPUTY TO THE CHAIRMAN

M. WAIALEALE SARSONA
EXECUTIVE ASSISTANT

STATE OF HAWAI'I
DEPARTMENT OF HAWAIIAN HOME LANDS
P. O. BOX 1879
HONOLULU, HAWAI'I 96805

January 11, 2012

DLNR-DOFAW
3060 'Eiwa St. Room 306
Lihu'e, HI 96766
Attn: DEA - Mana Plain Forest Reserve Wetland Restoration Project

RE: PRE-ENVIROMENTAL ASSESSMENT PUBLIC COMMENT ON WETLAND RESTORATION PLAN FOR THE MĀNĀ PLAIN FOREST RESERVE MĀNĀ, KAUA'I, HAWAI'I

Aloha mai,

Mahalo for the opportunity to provide information and/or comments prior to the Draft Environmental Assessment (DEA) for the proposed project by DLNR-DOFAW Kaua'i Branch to develop a restoration plan that identifies sustainable management tools to restore approximately 105 acres of the historical Mānā wetlands.

The Department of Hawaiian Home Lands (DHHL) owns approximately 15,113 acres of land in West Kaua'i that is adjacent to the proposed project. In Kekaha, DHHL owns 52 acres, 39 acres of which 117 residential lessees reside. Above the Mānā plain DHHL own 15,061 acres of land, most of which is currently being licensed to DLNR-DOFAW for road maintenance in exchange for public hunting.

As adjacent landowners, engaging in our own planning process, it is our responsibility to participate and plan appropriately for the larger region. In addition, it is our priority to ensure that DHHL's plans are as consistent as possible with other plans in the area.

While DHHL supports the intent of the project to restore the historical Mānā Plain Wetland and protect endangered Hawaiian water birds, please consider the following comments on your proposed project:

1. Can you provide more information (i.e. TMK) on the exact location of the 105 acres identified for wetland restoration?

2. Please refer to the West Kaua'i Regional Plan (www.hawaiianhomelands.org) that was approved by the Hawaiian Homes Commission in February 2011 for information, consistency, and to also ensure that your project does not impact DHHL's future plans or priority projects in the region.

3. Any wetland restoration project, especially the need of water must assess the impacts on DHHL's first right of refusal for water, both ground and surface, for the purposes of administering the Hawaiian Homes Commission Act.

4. Please consult with our beneficiaries and the Kekaha Hawaiian Homestead Association who may have programs or projects that will be directly affected by the proposed project.

Please keep us informed and involved in the development of this DEA. If there are any questions, please contact Kaleo Manuel in our Planning Office at (808)620-9485 or Kaleo.L.Manuel@hawaii.gov.

Me ke aloha,

Albert "Alapaki" Nahale'a, Chairman
Hawaiian Homes Commission

Cc: Kekaha Hawaiian Homestead Association
Imaikalani Aiu, Kaua'i Commissioner
DHHL Kaua'i District Office

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
3060 Eiwa Street, Room 306
Lihue, Kauai, HI 96766

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

12 March 2012

To: Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, HI, 96805

Attn: Mr. Albert Nahale'a
Chairman
Hawaiian Homes Commission

Response to Environmental Assessment Scoping Period Comments

Thank you for your comments and concerns regarding the content of the draft Environmental Assessment for the Mana Plain Forest Reserve Wetland Restoration Project. Your concerns regarding the exact location of the project site, the impacts of the project on DHHL's future plans, as well as, impacts of water per Hawaiian Homes Commission Act, will be addressed in the published draft Environmental Assessment. This document is in final stages of development, and will be released in the spring of this year.

Sincerely,

Jason Vercelli

Jason Vercelli
DOFAW Wildlife Biologist

DEPARTMENT OF THE NAVY
PACIFIC MISSILE RANGE FACILITY
P.O. BOX 128
KEKAHA, HAWAII 96752-0128

IN REPLY REFER TO:

11010
Ser N4F/0050
24 JAN 2012

Division of Forestry and Wildlife, Kauai Branch
Department of Land and Natural Resources
3060 Eiwa Street, Room 306
Lihue, HI 96766

SUBJECT: SCOPING COMMENTS ON ENVIRONMENTAL ASSESSMENT FOR MANA PLAIN FOREST RESERVE WETLAND RESTORATION

This letter is in response to your request for comments in anticipation of the development of an Environmental Assessment for the Mana Plain Forest Reserve Wetland Restoration Project, located on State lands adjacent to the Pacific Missile Range Facility (PMRF). Please consider this letter as our formal input to the "Scoping" process. We request the ability to provide further comments as the project elements become better defined and we receive more information.

PMRF has established an international reputation for innovation and exceptional stewardship for natural and cultural resources. We fully support the concept to develop and restore additional wetlands on the Mana Plain to enhance the habitat for our island's native waterfowl population. However, we have a major concern with the specific location of the proposed wetlands project due to its close proximity to our runway and aviation bird hazard condition it generates. Current Federal Aviation Administration (FAA) flight safety guidelines stipulate that projects such as wetlands development should not be located within 10,000 feet of an active runway that services turbine-powered jet aircraft.

In our letter to the Division of Fish and Wildlife (DOFAW) dated 05 Dec 2011, we requested that the State consider alternative sites in the vicinity that held greater wetland qualities than the area currently proposed, and would simultaneously alleviate our concerns regarding bird air strike hazards to aircraft. In discussions with DOFAW staff, we are of the understanding that the proposed wetlands site is located approximately only 2000 feet from our active runway, placing it in direct conflict with current FAA guidelines.

To that end, we propose two alternate sites for consideration, identified as Alternatives A and B as depicted on the enclosed "Wetland Delineation Map." Both alternatives are located adjacent to the northern PMRF boundary. From a sustainable habitat standpoint, Alternative A is part of the Ancient Nohili Ponds and Wetlands which naturally collects surface water runoff, requiring much less effort to operate. Site characteristics for Alternative B are similar. The Alternative B footprint is smaller than Alternative A, however, it contains a large sand resource available for reuse by the State. Either of these two options or combination thereof are welcomed alternatives to the currently proposed site. They both provide excellent potential for wetland habitat, and are in compliance with the FAA criteria of being at least 10,000 feet away from our runway.

SUBJECT: SCOPING COMMENTS ON ENVIRONMENTAL ASSESSMENT FOR MANA PLAIN FOREST RESERVE WETLAND RESTORATION

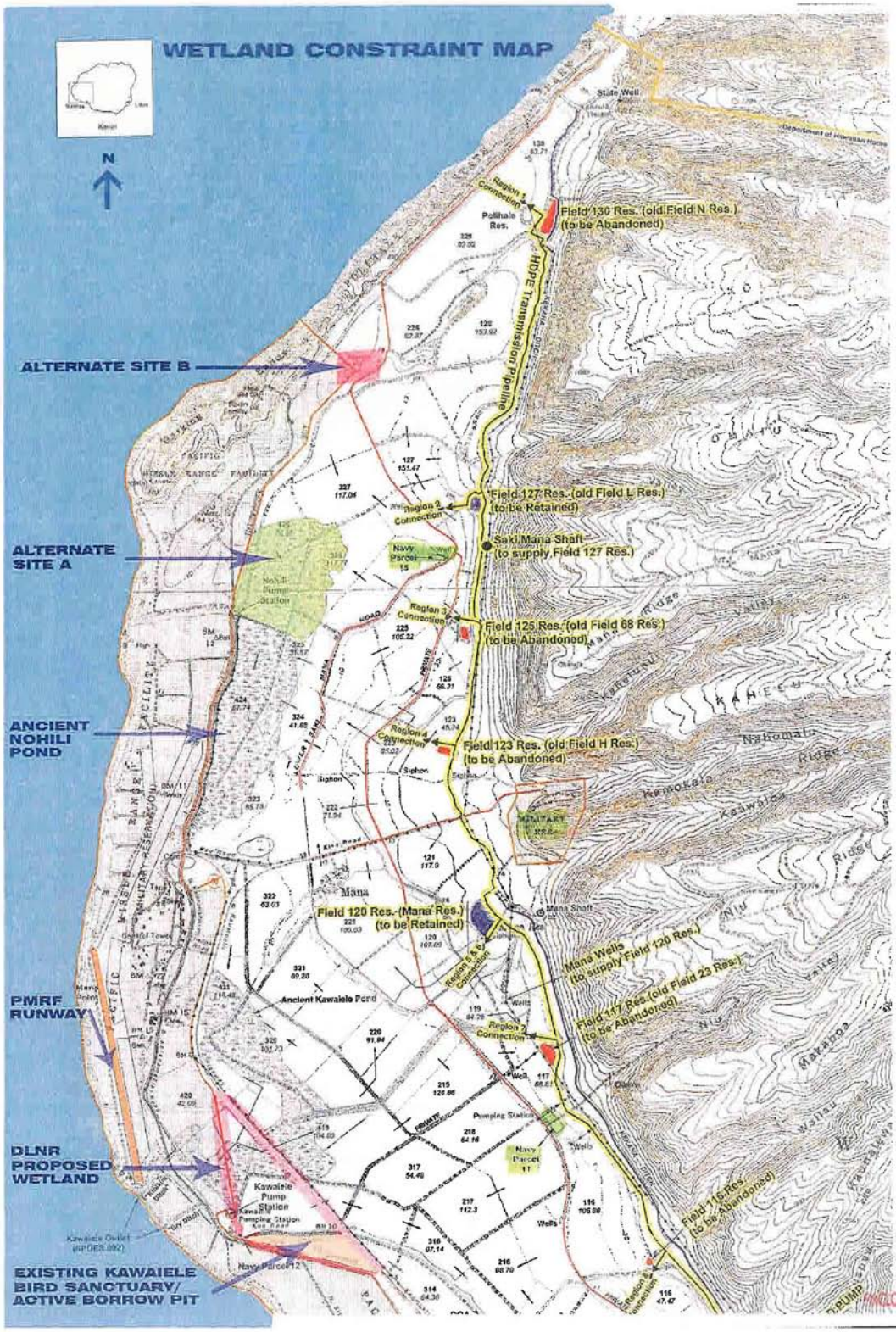
PMRF proposes a joint solution to this issue, one that meets the State's desire for wetland restoration, and one that meets FAA flight safety requirements that does not create hazards to flight operations at the base. As part of the joint solution, PMRF will seek federal funds through the Readiness Environmental Protection Initiative to assist with this project provided FAA flight safety requirements are met.

We sincerely request your consideration of our comments and the proposed alternatives we have suggested. Should you have any questions regarding this matter, please contact Mr. Roland Sagum of my staff at (808) 335-7828.

Sincerely,

NICHOLAS MONGILLO
Captain, U. S. Navy
Commanding Officer

Enclosure:
Wetland Delineation Map


WETLAND CONSTRAINT MAP
N
ALTERNATE SITE B
ALTERNATE SITE A
ANCIENT NOHILI POND
PMRF RUNWAY
DLNR PROPOSED WETLAND
EXISTING KAWAIELE BIRD SANCTUARY/ ACTIVE BORROW PIT
Field 130 Res. (old Field N Res.) (to be Abandoned)
Field 127 Res.-(old Field L Res.) (to be Retained)
Saki Mana Shaft (to supply Field 127 Res.)
Field 125 Res. (old Field 68 Res.) (to be Abandoned)
Field 123 Res. (old Field H Res.) (to be Abandoned)
Field 120 Res.-(Mana Res.) (to be Retained)
Mana Wells (to supply Field 120 Res.)
Field 117 Res.(old Field 23 Res.) (to be Abandoned)
Field 116 Res. (to be Abandoned)
HDPE Transmission Pipeline
Ancient Kawaiele Pond
Kawaiele Pump Station
Mana
Polihale Res.
Navy Parcel 15
Navy Parcel 11
Navy Parcel 12
Region 1 Connection
Region 2 Connection
Region 3 Connection
Region 4 Connection
Region 5 & 6 Connection
Mana Shaft
Pumping Station
Wells
Siphon
Kawaiele Outlet (NPDES 002)
ENCLOSURE (1)

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GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
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WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
3060 Eiwa Street, Room 306
Lihue, Kauai, HI 96766

12 March, 2012

To: Department of the Navy
Pacific Missile Range Facility
P.O. Box 128
Kekaha, Hawaii, 96752-0128

Attn: Cpt. Nicholas Mongillo
Captain, U.S. Navy
Commanding Officer

Response to Environmental Assessment Scoping Period Comments

Thank you for your comments and concerns regarding the content of the draft Environmental Assessment for the Mana Plain Forest Reserve Wetland Restoration Project. Your concerns regarding the proximity of the project site to your runway will be addressed in the published draft Environmental Assessment. This document is in final stages of development, and will be released in the spring of this year.

Sincerely,

Jason Vercelli

Jason Vercelli
DOFAW Wildlife Biologist

From: Carl Berg [redacted]
To: Jason.A.Vercelli@hawaii.gov
Date: 01/26/2012 06:30 PM
Subject: Re: Mana Plain Restoration Scoping Period

Aloha Jason,

Here are some comments on the Mana wetlands development project. With Climate Change and land re-shaping I don't think you can in a true sense "restore" to a climate/landscape that is forever lost.

Recently the DLNR announced that they will be spending over a million dollars to relocate Nene from a constructed wetland area (Mariott Resort) which also has 3 other endangered species of waterfowl.
All of the species are a danger to air traffic.
.
Now you are proposing developing a wetland bird refuge right next to PMRF with its air strip and history of killing birds and relocating them to avoid air strikes. This seems to be a major problem.
Solutions? Get rid of planes, helicopters, rockets, hyper-sonic vehicles et al. at PMRF? Train the birds to not cross the highway on to PMRF property? Only develop wetlands way mauka in Mana?

What is the bird "removal" count for PMRF airstrip? Do they already have someone out there chasing all the birds away when some machine is in the air? Do they have an incidental take permit for the listed species? That should all be in the EA.

Please email me a copy of the draft EA when it is available.

Mahalo for the opportunity to comment during the scoping period.

Carl

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
3060 Eiwa Street, Room 306
Lihue, Kauai, HI 96766

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ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

12 March 2012

To: Mr. Carl Berg

Response to Environmental Assessment Scoping Period Comments

Thank you for your comments and concerns regarding the content of the draft Environmental Assessment for the Mana Plain Forest Reserve Wetland Restoration Project. Your concerns regarding the proximity of the project site to Pacific Missile Range Facility, as well as water bird behavior, will be addressed in the published draft Environmental Assessment. This document is in final stages of development, and will be released in the spring of this year. It will be available on the DLNR Division of Forestry and Wildlife website for viewing.

Sincerely,

Jason Vercelli

Jason Vercelli
DOFAW Wildlife Biologist

KEKAHA AGRICULTURE ASSOCIATION
P.O.BOX 940
WAIMEA, HAWAII, 96796

January 31, 2012

To: DOFAW Kauai Branch
DLNR-DOFAW, 3060, Eiwa St.
Room 306, Lihue, Kauai, 96766

Comments Sought On Environmental Assessment For Mana Plain Forrest Reserve Wetland Restoration

Aloha

The Kekaha Agriculture Association (KAA) welcomes the opportunity to provide comments during the scoping period for the draft EA on the Mana Plain Forrest Reserve Wetland Restoration.

The KAA along with its members, farm a great majority of the lands on the Mana plain. It comes as no secret that birds have and continues to be a very concerning and alarming problem on the Mana plain, seriously affecting the agricultural community. Bird problems have a direct impact on the economics of the areas agricultural and aquaculture activities. Birds feed on seeds, seedlings, post-larvae, fish and shrimp. Birds destroy crops, possibly spreading bacteria, viruses, and most recently was the responsible vector for an outbreak of white spot syndrome virus or WSSV on one of our member's facility. In fact, there is strong convincing evidence that the source or vector for the two most recent WSSV out breaks on Kauai, came from bird populations using the existing Mana Plain habitat. Birds have the potential to significantly and adversely impact the areas agricultural and aquacultural industries.

In the debate on conflicts with birds and agriculture, it is vital to realize that these are not one-way clashes, since not only can agriculture have adverse effects on birds but, as we have seen, the reverse is also true. The expansion of the wetland will definitely attract and increase the areas bird populations. Inevitably, this will also lead to an increase demand on crop protection efforts as well.

Unfortunately, the objectives of conservation and pest control often conflict. Expanding the Mana plains wetland will nevertheless impose greater restrictions on the areas bird control measures over time. Thus, in the future our members will find it even more difficult than at the present to protect our crops, secure our businesses, and the livelihoods of hundreds of employee's.

No program for the management of bird damage has been totally successful. The KAA is not objecting to wetland restorations and expansions, but would like to know how the DLNR-DOFAW intends to mitigate, prevent, and or reduce bird damage and threats to the areas agricultural and aquacultural crops, without imposing additional restrictions on an already burdened industry.

We thank you for this opportunity to comment on your drat EA for the Mana Plain Forrest Reserve Wetland Restoration and look forward to your response.

Sincerely,

Steven J. Lupkes
President KAA

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
3060 Eiwa Street, Room 306
Lihue, Kauai, HI 96766

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

12 March 2012

To: Kekaha Agriculture Association
P.O. Box 940
Waimea, HI, 96796

Attn: Mr. Steven J. Lupkes
President KAA

Response to Environmental Assessment Scoping Period Comments

Thank you for your comments and concerns regarding the content of the draft Environmental Assessment for the Mana Plain Forest Reserve Wetland Restoration Project. Your concerns regarding the proximity of the project site to the surrounding agricultural businesses, as well as mitigation measures will be addressed in the published draft Environmental Assessment. This document is in final stages of development, and will be released in the spring of this year.

Sincerely,

Jason Vercelli

Jason Vercelli
DOFAW Wildlife Biologist

PIONEER.
A DuPont Company

DuPont Agriculture & Nutrition
Pioneer Supply Management
Parent Seed
7431 Kaumualii Highway
Kekaha, HI 96752
(808) 337 1413 Tel
(808) 337 9266 Fax

Department of Land and Natural Resources
Division of Forestry and Wildlife
3060, Eiwa St. Room 306
Lihue, Kauai, 96766

February 2, 2012

Pioneer Hi-Bred International supports the goal of the Mana Plain Forest Reserve Wetland Restoration Plan to restore historical Mana wetlands and maintain native wetland habitat for waterbirds. We recognize the importance of removing invasive vegetation and creating suitable habitat for native animals and plants.

Pioneer has a strong commitment to the enhancement of science, technology, and environmental education and we carry out many community outreach activities to educate students and local community members. We strongly support the inclusion of community outreach and environmental education objectives as part of the Mana Plain Forest Reserve Wetland Plan and would look forward to opportunities to be a community partner for environmental science education.

We understand the objectives and intent to restore the Mana wetlands, but do have concerns about the impacts on existing agriculture operations, and on the ability for any new agriculture to locate in this area. As a member of the Kekaha Agriculture Association, we are in agreement with the comments submitted by KAA about this project. As a company producing seed crops within close proximity to the proposed restoration and management area, we are aware of potential impacts arising from expansion of wildlife populations. As successful breeding populations are established and populations grow, birds and other wetland species may begin to establish breeding populations in new areas and increase or broaden their feeding behaviors, including feeding on seed crops. We encounter bird species that present a challenge to seed production, with demonstrated feeding on seeds, seedlings, immature ears, and mature seed. We have observed bird species identifying seed crops as a new food source, significantly impacting establishment of new plantings, seed crop yields, and seed quality.

significantly impacting establishment of new plantings, seed crop yields, and seed quality.

Pioneer appreciates the opportunity to provide comments as part of the process to restore and manage a sustainable wetland habitat in the Mana Plain Forest Reserve.

Sincerely,

Jon D. Petersen

Jon Petersen, Manager, Pioneer Kekaha Parent Seed

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
3060 Eiwa Street, Room 306
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

12 March 2012

To: DuPont Agriculture & Nutrition
Pioneer Supply Management
7431 Kaumualii Hwy
Kekaha, HI, 96752

Attn: Mr. Jon Peterson
Manager
Pioneer Kekaha Parent Seed

Response to Environmental Assessment Scoping Period Comments

Thank you for your comments and concerns regarding the content of the draft Environmental Assessment for the Mana Plain Forest Reserve Wetland Restoration Project. Your concerns regarding the proximity of the project site to your agricultural operations, as well as impacts from expanding wildlife, will be addressed in the published draft Environmental Assessment. This document is in final stages of development, and will be released in the spring of this year.

Sincerely,

Jason Vercelli

Jason Vercelli
DOFAW Wildlife Biologist

SYNGENTA HAWAII, LLC
7050 KAUMUALII HIGHWAY
KEKAHA, HI 96752

February 2, 2012

To: DOFAW Kauai Branch
DLNR-DOFAW, 3060, Eiwa St.
Room 306, Lihue, Kauai, 96766

Comments for the Environmental Assessment Being Conducted on the Mana Plain Forrest Reserve Wetland Restoration

Aloha Mai Kakou,

Syngenta is a property owner in Kekaha, Kauai. Syngenta farms this property for the purpose of developing seed varieties that improve crop yields and resist drought and insect damage, thereby contributing to greater food security in the United States and around the world.

We are opposed to an expansion of the Mana Plain Forest Reserve Wetland. Syngenta management and its employees support the protection of wildlife and ,especially, endangered species. We have an ongoing volunteer effort to help maintain the Mana Bird Sanctuary by removing invasive plant species.

However, we believe that the land set aside for the reserve should be selected to avoid conflicts with existing farming activities. Syngenta already employs crop protectors whose primary job is shooing away birds that eat the seeds and plants we are growing.

By expanding the reserve to areas in proximity to lands under cultivation, all species would be more likely to use farm lands for forage and nesting activities. Such a situation would effectively preclude farming activities by Syngenta and other farming businesses. A wildlife biologist would be in a better position to address the habitat birds prefer, natural or an easy food source (corn fields), but our experience has been they prefer the latter.

If an expansion of the reserve must take place, we would recommend that the land set aside for this purpose be situated further *makai* and as far away as possible from any farming operations.

Thank you for the opportunity to submit comments on this matter.

Mark Phillipson
Syngenta Hawaii LLC
Lead, Corporate/External Affairs

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY H. KAULUKUKUI
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
3060 Eiwa Street, Room 306
Lihue, Kauai, HI 96766

12 March 12, 2012

To: Syngenta Hawaii, LLC
7050 Kaumualii Hwy
Kekaha, HI, 96752

Attn: Mr. Mark Phillipson
Lead, Corporate/External Affairs

Response to Environmental Assessment Scoping Period Comments

Thank you for your comments and concerns regarding the content of the draft Environmental Assessment for the Mana Plain Forest Reserve Wetland Restoration Project. Your concerns regarding the proximity of the project site to the location of your existing farming activities will be addressed in the published draft Environmental Assessment. This document is in final stages of development, and will be released in the spring of this year.

Sincerely,

Jason Vercelli

Jason Vercelli
DOFAW Wildlife Biologist

CHAPTER 7: FINDINGS & ANTICIPATED DETERMINATION

To determine whether a proposed action may have a significant effect on the environment, the agency needs to consider every phase of the action, the expected and consequences, cumulative effects, and the short and long term effects. The agency's review and evaluation of the proposed action's effect on the environment would result in a determination of whether: 1) the action would have a significant effect on the environment, and an Environmental Impact Statement Preparation Notice should be issued, or 2) the action would not have a significant effect warranting a Finding of No Significant Impact (FONSI).

This chapter addresses the anticipated determination based upon the evaluation criteria prescribed for the State Approving Agency and Federal Lead Agency. A Finding of No Significant Impact (FONSI) determination is presently anticipated for this wetland restoration project.

7.1 FINDINGS UNDER STATE CHAPTER 343, HRS

7.1.1 ANTICIPATED DETERMINATION

A FONSI determination should be warranted for the Mānā Plains Forest Reserve Wetland Restoration Project based upon the assessment results and information provided in this document. The findings supporting this anticipated determination are based upon discussion of the project's effect on the environment in relation to the 13 Significant Criteria prescribed under the State Department of Health's Administrative Rules Title 11, Chapter 200.

7.1.2 FINDINGS

1. Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;

The proposed wetland restoration project will not result in irrevocable commitment to loss or destruction to any natural or cultural resource. This restoration project will improve natural resources by removing non-native, invasive plants and restoring wetland habitat for four endemic species of endangered waterbirds. Restoration activities will increase opportunities for environmental education on the natural and cultural resources of the area. Project improvements should not have a significant negative impact on cultural resources and appropriate mitigative measures will be implemented as discussed in this document.

2. Curtails the range of beneficial uses of the environment;

The project will not curtail the range of beneficial uses associated with this property. The proposed project site is under the jurisdiction of DOFAW and public access is currently restricted. This project will increase the range of beneficial uses of the environment by restoring the wetlands, providing passive outdoor recreational opportunities for the public, and increasing environmental educational resources. The implementation of pedestrian trails and interpretive information, designed to ADA standards, will facilitate

these recreational opportunities.

3. Conflicts with State's long term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders;

The restoration will not conflict with the state's long term environmental policies or goals and guidelines, as expressed in Chapter 344 HRS. A discussion of the project's consistency with the ten guidelines was provided in Chapter 5 of this document.

4. Substantially affects the economic welfare, social welfare and cultural practices of the community or state;

The project will provide minor short-term economic benefits in the form of construction jobs, income, and additional tax revenue to State. Additional revenues could be generated in the future with construction of a visitors and education center. Community revenue may increase in Kauai's western towns, as tourism and local visitors would likely increase. This project will improve the landscape of Mānā Plain through removal of invasive plant species, and re-establishing of native flora and fauna. These changes would have beneficial impact within the project area, but will not change the overall surrounding environment. This project is not expected to significantly affect traditional native Hawaiian cultural practices or other traditional cultural practices occurring in the surrounding area. In the unlikely event that any archaeological remains were discovered during restoration activities, mitigative measures described in Chapter 3 would be followed. Planned improvements would increase opportunities for conducting educational and cultural activities within the project area.

5. Substantially affects public health;

The project would not substantially affect public health as discussed in various sections of this document. Best management practices will also be implemented as part of construction activities.

6. Involves substantial secondary impacts such as population changes or effects on public facilities;

The project should not have any substantial secondary impacts on the social environment, as adding residential housing or visitor accommodation units is not planned. This project may minimally contribute to in-migration of residents to the island, as the State would need to hire up to three employees to work at the restored wetland. It is possible that these employees would be hired from off-island.

7. Involves a substantial degradation of environmental quality;

This project will not contribute to a substantial degradation to the quality of the surrounding environment. Proposed activities support restoring the wetland and the Mānā Plain area by enhancing habitat for endangered waterbirds. Appropriate mitigative measures will be implemented to address construction related impacts on the environment in coordination with appropriate agencies. This includes implementing best management practices during construction to minimize erosion and other short term impacts.

8. Individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;

This project will not have significant cumulative effect on the environment, as discussed in Chapter 3. Neither does it commit to larger actions.

9. Substantially affect a rare, threatened, or endangered species, or its habitat;

This project will benefit threatened and endangered animals and their native habitats. Therefore, it will not have substantial negative effects on endangered, threatened, or rare species or habitats on or near the project site. Restoration of the area will enhance habitat for more native, endangered, and rare flora and fauna once found in the area.

10. Detrimentally affect air or water quality or ambient noise levels;

This project should not have detrimentally significant impacts on air, water quality, or ambient noise levels as discussed in chapter 3 of this document. Impacts associated with these factors would be short-term construction activities. Such impacts will be minor and monitored by DOFAW staff to minimize nuisance effects. Construction activities will follow all State and County regulations.

11.Affect or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;

This project is not located in an estuary, beach, erosion-prone area, or geologically hazards lands. The project facilities at Mānā, including the visitor center, parking lot and access road will be designed and built in a manner to comply with all State and County building codes and provide egress to the designated tsunami evacuation route. Little if any change to the extent or level of tsunami run-up would occur as a result of project construction. Use of surface water as a partial water supply source will improve the quality of that water which would otherwise be pumped directly to the coastal waters.

12. Substantially affect scenic vistas and view planes identified in county or state plans or studies;

This project is intended to have positive substantial effects on scenic vistas in the Mānā Plains, as identified in the state plan for restoration for the area. As discussed in Chapter 3, these restorations will have a beneficial effect on the visible environment. This will result from the reestablishment of native vegetation and waterbirds, as well as clearing the view plain of invasive vegetation.

13. Require substantial energy consumption;

This project will not require substantial energy consumption or place increased demands on the capacity of supporting electrical facilities because it primarily involves wetland restoration activities. The project will incorporate energy efficient technology and energy requirements to be supplemented by a photovoltaic (solar) system.

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APPENDIX A – PLANT SPECES

NON-NATIVE FLORA		
GRASSES AND SEDGES		
Scientific Name	**Common Name**	**Relative Abundance**
Brachiaria mutica	California grass	Sparse
Cenchrus ciliaris	Buffelgrass	Sparse
Cenchrus echinatus	Sand bur	Uncommon
Chloris divaricata	Star grass	Sparse
Chloris inflata	Swollen finger grass	Uncommon
Chloris radiata	Radiated finger grass	Sparse
Coix lachryma	Job's tears	Uncommon
Cymobopogon refractus	Barbwire grass	Uncommon
Cynodon dactylon	Bermuda grass	Sparse
Cyperus alternfolius	Umbrella sedge	Uncommon
Cyperus brevifolius	Kyllinga	Uncommon
Cyperus esculentus	Yellow nutsedge	Sparse
Cyperus rotundus	Purple nutsedge	Uncommon
Digitaria adscendens	Henry's crabgrass	Uncommon
Digitaria violascens	Smooth crabgrass	Uncommon
Echinocloa colona	Jungle rice	Uncommon
Eragrotis pectinacea	Pectinate lovegrass	Uncommon
Eragrotis tenella	Lovegrass	Uncommon
Eleusine indica	Wire grass	Uncommon
Panicum repens	Tornado grass	Uncommon
Panicum maximum	Guinea grass	Sparse
Panicum sp.	Green panic grass	Sparse
Paspalum conjugatum	Hilo grass	Uncommon
Paspalum distichum	Salt grass	Uncommon
Pennisetum purpureum	Feathery pennisetum	Uncommon
Rhynchelytrum repens	Natal redtop	Uncommon
Seteria verticullata	Bristly foxtail grass	Uncommon
Sporobolus indicus	Smut grass	Uncommon
Trichachne insularis	Sour grass	Sparse
FORBS		
Amaranthus spinosa	Spiny amaranth	Uncommon
Atriplex muelleri	Saltbush	Sparse
Atriplex semibaccata	Austrailian saltbush	Sparse
Bidens pilosa	Spanish needle	Uncommon
Boerhavia diffusa	Boerhavia	Uncommon
Cassia ocidentalis	Coffee senna	Uncommon
Crotolaria incanta	Fuzzy rattlepod	Uncommon
Crotolaria mucronata	Smooth rattlepod	Uncommon
Desmodium uncinatum	Spanish clover	Uncommon
Emilia sonchifolia	Flora's paintbrush	Uncommon
Euphorbia hirta	Garden spurge	Uncommon
Euphorbia prostrata	Prostate spurge	Uncommon
Indigofera suffructicosa	Indigo	Uncommon

Ipomoea sp.	Morning glory	Uncommon
Leonotis nepetaefolia	Lion's ear	Uncommon
Lipochaeta sp.	Lipochaeta	Uncommon
Malva parviflora	Cheese weed	Uncommon
Oxalis corniculata	Yellow wood sorrel	Sparse
Portulaca oleracea	Pigweed	Uncommon
Silene gallica	Small flower catchfly	Uncommon
Solanum nigrum	Popolo	Uncommon
Sobchus oleraceus	Sow thistle	Uncommon
Verbasina enceliodes	Verbasina	Uncommon
Walteria americana	Walteria	Uncommon
SHRUBS		
Acacia farnesiana	Klu	Uncommon
Lantana camara	Lantana	Uncommon
Leucaena leucocephala	Koa haole	Abundant
Pluchea indica	Indian pluchea	Abundant
Pluchea ordorata	Sour bush	Moderately Abundant
Pluchea ordorata-indica	Pluchea	Moderately Abundant
Ricinus communis	Castor bean	Uncommon
TREES		
Melia azedarach	Pride of India	Uncommon
Pithecellobium dulce	Opiuma	Uncommon
Prosobis palida	Mesquite-Kiawe	Sparse
Samanea saman	Monkeypod tree	Uncommon
Syzigium cumini	Java plum	Uncommon
NATIVE FLORA		
Argemone glauca	Pua kala	Uncommon
Dodonea eriocarpa	Aalii	Sparse
Jacquemontia ovalifolia	Pauohiiaka	Sparse
Lipochaeta sp.	Nehe	Uncommon
Pandanus odoratissimus	Pandanus	Uncommon
Sesbania tomentosa	Ohai	Uncommon-endangered
Sesuvium portulacastrum	Akulikuli kai	Uncommon
Sida fallax	Ilima	Sparse

APPENDIX B – WILDLIFE SPECIES

BIRDS (non-native)		
Scientific Name	**Common name**	**Notes**
Mimus polyglottos	Northern mockingbird	Feed/nest
Acrdotheres tristis	Common mynah	Feed
Copsychus malabaricus	Shama thrush	Feed/nest
Zosterops japonica	Japanese white-eye	Feed/nest
Garrulax pectoralis	Hwamei	Feed/nest
Lonchura punctulata	Nutmeg mannikin	Feed/nest
Lonchura malacca	Chestnug mannikin	Feed/nest
Carpodacus mexicanus	House finch	Feed
Passer domesticus	House sparrow	Feed/nest
Padda oryzivora	Java sparrow	Feed
Cardinalis cardinalis	Northern cardinal	Feed/nest
Paroaria coronata	Brazilian cardinal	Feed/nest
Sturnella neglecta	Western meadowlark	Feed
Phasianus colchicus	Ring-necked pheasant	Feed/nest
Francolinus francolinus	Black francolin	Feed/nest
Francolinus erckellii	Ereckel's francolin	Feed/nest
Francolinus pondicerianus	Grey francolin	Feed/nest
Geopelia striata	Barred dove	Feed/nest
Streptopelia chinensis	Spotted dove	Feed
Tyto alba	Barn owl	Feed
Bulbulcus ibis	Cattle egret	Feed
BIRDS (native, migratory)		
Anas wyvilliana	Koloa moali	Feed-endangered
Fulica americana	Alae keokeo	Feed-endangered
Gallinula chloropus	Alae ula	Feed/nest-endangered
Himantopus mexicanus	Hawaiian stilt	Feed/nest-endangered
Nycticorax nycticorax	Aukuu	Feed
Asio flammeus	Pueo	Feed
Arenaria interpes	Akekeke	Feed
Heteroscelus incanus	Ulili	Feed
Calidris alba	Hunakai	Feed
Pluvialis dominica	Kolea	Feed;migratory
Calidris minultilla	Least sandpiper	Feed;migratory
Anas acuta	Northern pintail	Historical; migratory
Anas clypeata	Northern shoveler	Historical; migratory
Anas platyrhynchos	Mallard	Historical; migratory
Aythya fuligula	Lesser Scaup	Historical; migratory
Aythya valisineria	Canvasback	Historical; migratory
Phaethon lepturus	White-tailed tropicbird	Overflight only
Puffinus pacificus	Wedge-tailed shearwater	Overflight only
Puffinus newellii	Newell's shearwater	Overflight only-threatened
Pterodroma phaeopygia	Hawaiian petrel	Overflight only-

		endangered
Fregata minor	Iwa	Overflight only
Diomedea nigripes	Laysan albatross	Overflight only
Oceanodroma leucorhoa	Band-rumped storm petrel	Overflight only
MAMMALS		
Scientific Name	**Common name**	**Notes**
Canis familiaris	Feral dog	
Felis catus	Feral cat	
Mus musculus	House mouse	
Rattus exulans	Polynesian rat	
Rattus rattus	Roof rat	
Rattus norvegicus	Norway rat	
Odocoileus hemionus	Black-tailed deer	recent occurrence
Sus scrofa	Feral pig	recent occurrence
REPTILES and AMPHIBIANS		
Rana catesbeiana	Bull frog	
Bufo marinus	Neotropical toad	
Lepidodactylus lugubris	Mourning gecko	possible occurrence
Hemiphyllodactylus typus	Tree gecko	
Hemidactylus garnoti	Common gecko	
Leiolopisma metallicum	Metallic skink	
Cryptoblepharus boutoni	Snake-eyed skink	possible occurrence
Lipinia noctua	Moth skink	possible occurrence
Typhlina bramina	Phillipine blind snake	possible occurrence