

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Forestry and Wildlife
1151 Punchbowl St. Rm 325, Honolulu HI 96813

December 13, 2013

Chairperson and Members
Board of Land and Natural Resources
State of Hawai'i
Honolulu, Hawai'i

Kaua'i

SUBJECT:

Approval of Final Environmental Assessment; Mānā Plain Wetland Restoration Project; Mānā Plain Forest Reserve, Island of Kaua'i, Tax Map Key (4) 1-2-2: portion 1

APPLICANT:

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

LEGAL REFERENCE:

Chapters 26-15, 124-1, 183, 195D Hawai'i Revised Statutes.

LOCATION:

Portion of Government lands designated as Mānā Plains Forest Reserve, situated at Waimea, Kaua'i identified by Tax Map Key (4) 1-2-002: portion 001, as shown on the attached map labeled **Exhibit A**.

AREA:

105 Acres

ZONING:

State Land Use District: Agriculture

TRUST AND LAND STATUS:

Section 5(b) lands of the Hawai'i Admission Act.

DHHL 30% entitlement lands pursuant to the Hawai'i State Constitution: Yes

CURRENT USE STATUS:

Encumbered by Governor's Executive Order No. 4209 dated November 14, 2007, setting aside to the Division of Forestry and Wildlife lands that comprise the Mānā Plains Forest Reserve, for the purpose of habitat restoration and creation of a wildlife sanctuary.

CHARACTER OF USE:

Restoration of wetland habitat, in order to enhance DOFAWs conservation and recovery efforts for the four species of endangered Hawaiian waterbirds.

CONSIDERATION:

Gratis.

BACKGROUND:

The project site was formerly leased from the State of Hawai'i to 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. After sugarcane cultivation ended and prior to the transfer of management jurisdiction to DOFAW, the status of the land was vacant and unencumbered. The restoration of 313 acres of wetlands on the Mānā Plain was proposed by DOFAW during 2001. Following discussions held in 2002 with the U.S. Navy, the originally proposed 313 acres was reduced to 105 acres to accommodate the Navy's request to set back the project 2,000 feet from the Pacific Missile Range Facility runway to reduce the potential for bird-aircraft strike hazards.

On November 5, 2003 the Board of Land and Natural Resources (BLNR) approved of and recommended to the Governor the transfer of 131 acres from the State Land Division to DOFAW as an addition to the Kawai'ele Waterbird Sanctuary, see **Exhibit B**.

Restoration planning for the area was initiated during 2004. 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, soil characteristics, and paleo-ecological information. Additional funding for restoration activities have been provided by the US Fish and Wildlife Service's National Coastal Wetland Conservation Grant Program (NCWCG). 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 within the Mānā Plains Forest Reserve.

DOFAW, with input from multiple project 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.

Established 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 ecotourism activities that contribute to the local economy and educate visitors on conservation and sustainable natural resources in Hawai'i.

DOFAW's 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 plans to implement habitat restoration actions for the purpose of restoring, within the project site boundaries, habitat suitable for the four endemic and endangered Hawaiian waterbirds including the Hawaiian duck, (koloa maoli, *Anas wyvilliana*), Hawaiian stilt (ae'o, *Himantopus mexicanus knudseni*), Hawaiian moorhen ('alae 'ula, *Gallinula galeata sandvicensis*), and Hawaiian coot ('alae ke'oke'o, *Fulica alai*). This restoration plan also includes re-establishing a variety of native aquatic and terrestrial plants, including, but not limited to, 'ohai (*Sesbania tomentosa*), 'ilima (*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.

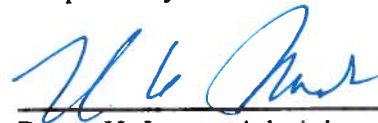
The Mānā Plain was designated as a core wetland area in the Revised Recovery Plan for Hawaiian Waterbirds (USFWS 2011); this proposed action will play an integral role in the recovery of endangered Hawaiian waterbirds. The proposed project will restore diverse habitats in the area for these waterbirds 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 down listed and eventually removed from the Federal List of Endangered and Threatened Wildlife and Plants.

RECOMMENTATIONS:

That the Board of Land and Natural Resources:

1. Declare that, after considering the potential effects of the proposed project as provided by Chapter 343, Hawaii Revised Statutes (HRS), and Chapter 11-200, Hawai'i Administrative Rules (HAR), the disposition will probably have minimal or no significant negative effect on the environment and is therefore exempt from the preparation of an environmental impact statement.
2. Approve the Final Environmental Assessment so that it may be submitted to the Office of Environmental Quality Control (OEQC), for the 30 day public review period.

Respectfully Submitted,



Roger H. Imoto, Administrator
Division of Forestry and Wildlife

APPROVED FOR SUBMITTAL:



William J. Aila, Jr., Chairperson
Board of Land and Natural Resources

EXHIBIT A

Mana Plains Forest Reserve

State of Hawaii DLNR Division of Forestry and Wildlife

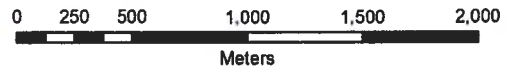
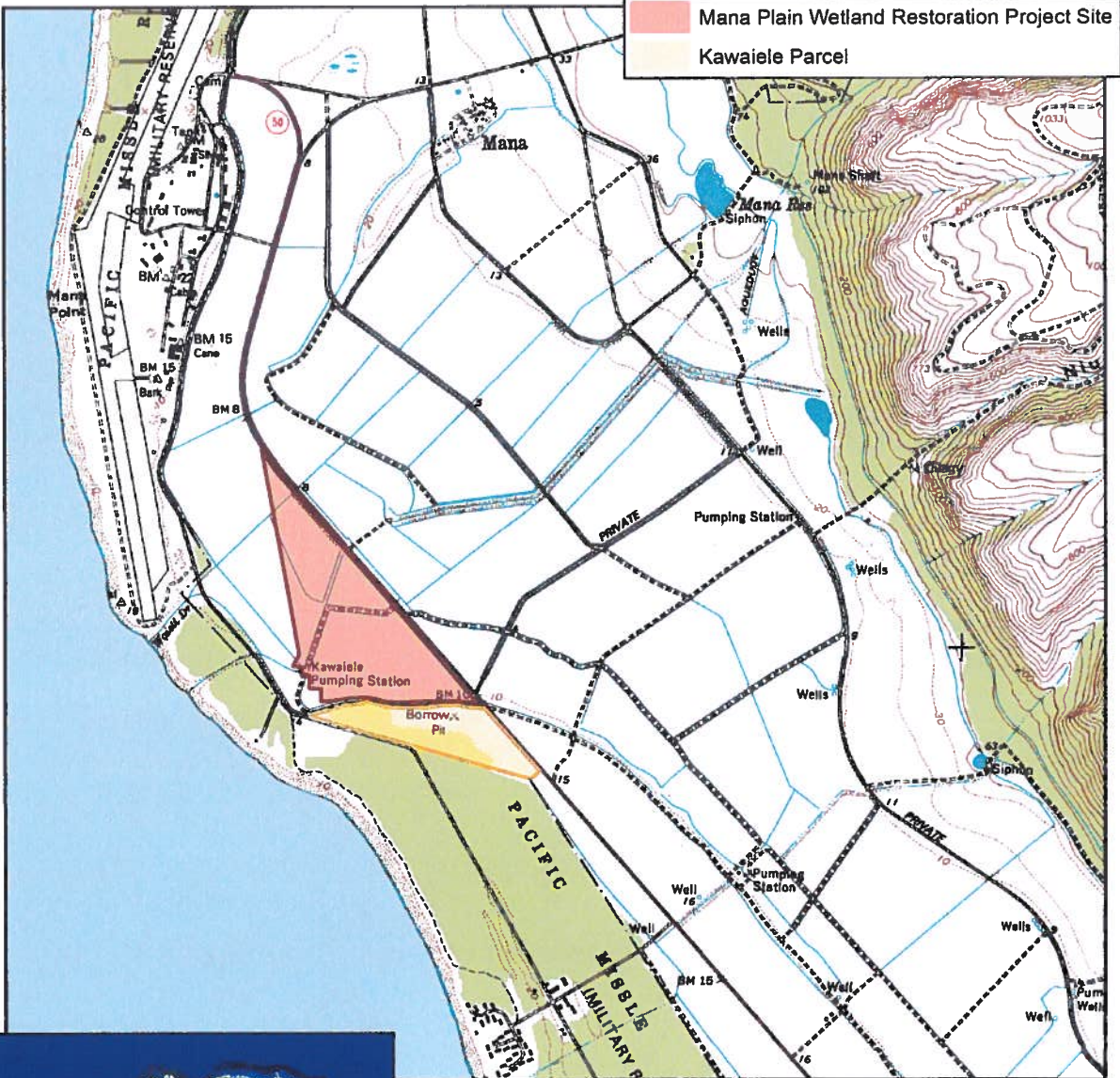


EXHIBIT B

P-1

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
Land Division
Honolulu, Hawaii 96813

November 5, 2003

Board of Land and Natural Resources
State of Hawaii
Honolulu, Hawaii

PSF No.: 01KD-340

KAUAI

Set Aside to Department of Land and Natural Resources,
Division of Forestry and Wildlife for Addition to Kawaieale
Wildlife Sanctuary, Kekaha, Kauai, Tax Map Key: (4) 1-2-
2:portion 1.

APPLICANT:

Department of Land and Natural Resources, Division of Forestry
and Wildlife

LEGAL REFERENCE:

Section 171-11, Hawaii Revised Statutes (HRS), as amended.

LOCATION:

Portion of Government lands of Kekaha situated at Waimea, Kauai,
identified by Tax Map Key: (4) 1-2-2:portion 1, as shown on the
attached map labeled Exhibit A.

AREA:

131 acres, more or less.

ZONING:

State Land Use District: Agriculture
County of Kauai CZO: Agriculture

TRUST LAND STATUS:

Section 5(b) lands of the Hawaii Admission Act

DHHL 30% entitlement lands pursuant to the Hawaii State

APPROVED BY THE BOARD OF
LAND AND NATURAL RESOURCES
AT ITS MEETING HELD ON *11/5/03*

ITEM D-14

Constitution: YES ___x___ NO ___

CURRENT USE STATUS:

Vacant and unencumbered.

PURPOSE:

Addition to Kawaiiele Wildlife Sanctuary purposes.

CHAPTER 343 - ENVIRONMENTAL ASSESSMENT:

This action before the Board is merely a transfer of management jurisdiction and does not constitute a use of State lands or funds, and therefore, this action is exempt from the provisions of Chapter 343, HRS, relating to environmental impact statements.

Inasmuch as the Chapter 343 environmental requirements apply to Applicant's use of the lands, the Applicant shall be responsible for compliance with Chapter 343, HRS, as amended.

APPLICANT REQUIREMENTS:

Applicant shall be required to:

- 1) Process and obtain subdivision at Applicant's own cost; and
- 2) Provide survey maps and descriptions according to State DAGS standards and at Applicant's own cost.

REMARKS:

The subject lands are part of the 28,000 acres formerly leased to Kekaha Sugar Co., Ltd. under General Lease No. S-4222. (We note that half of the lands are owned by DHHL which we no longer manage.) In anticipation of the impending termination of the Kekaha Sugar Co. operations, on October 27, 2000, the Board approved the issuance of 5 revocable permits to a coalition of farming entities to provide a seamless transfer of users primarily to ensure continued management of the vast and complex irrigation and drainage systems for these prime agriculture lands. The plantation contained important infrastructure that, without continued operation, would essentially return the Mana Plain to a wetland and cause flooding around the Pacific Missile Range Facility (PMRF) and Kekaha town. As the transition took place, areas of concern were examined more closely on an actual operations level and the Department began to work with the Agribusiness Development Corporation (ADC). On July 11, 2003, the Board approved the set aside of 12,592.133 acres to ADC for management of the Kekaha lands. On September 16, 2003, the Governor signed Executive Order No. 4007.

Excluded from Executive Order No. 4007, were unencumbered lands located makai of Kaunualii Highway adjacent to the Kawaiiele Waterbird Sanctuary (approximately 131 acres) and PMRF (approximately 415 acres). This was to allow DOFAW and the U.S. Department of Navy sufficient time to submit their proposals to the Department, and agree on the location of the boundaries.

DOFAW's presence at Kekaha dates back to November 6, 1981, when the Board approved DOFAW's request to renew a cooperative agreement with Kekaha Sugar Co. for public hunting and wildlife sanctuary management purposes. The term of the agreement was to be co-terminous with General Lease #S-4222 which expired on December 31, 1993. The subject area was first studied and identified in the Department of Land & Natural Resources Hawaii Wildlife Plan approved on February 11, 1983 as a West Kauai habitat for endangered birds. Executive Order No. 3437 was signed by the Governor on November 24, 1989 setting aside 18.785 acres for wild bird sanctuary purposes, followed by Executive Order No. 3685 on March 29, 1996 for 18.995 acres as an addition to the wild bird sanctuary. The Board on March 23, 2001, granted DOFAW a management right-of-entry over lands formerly covered by General Lease #S-4222 for public hunting purposes. This was an interim measure to allow DOFAW to continue in the same fashion until a permanent land use disposition could be developed. Recently, DOFAW examined the potential to expand the existing Kawaiiele Waterbird Sanctuary. The 131 acre subject parcel has exceptional potential for restoration and meeting recovery plan objectives. It is located within a flood prone area, includes portions of the former natural Mana Swamp, and is adjacent to the Kawaiiele Waterbird Sanctuary. There is an urgent need for the acquisition and restoration of suitable wetlands for endangered waterbirds to replace those areas lost as a result of the closure of several sugar plantations on Kauai. DOFAW has gained access to a variety of federal, private, and state development and management partnership funds for wetland habitat reclamation and restoration projects.

There are no alternative highest and best uses. During the period Kekaha Sugar Co. leased the State's Kekaha properties, the subject lands were classified as wasteland and was not in sugar cane cultivation. The existing bird sanctuary has not been completed and despite DOFAW's inability to complete it, the additional lands should be set aside to DOFAW to preserve the area for future expansion.

Comments were solicited from:

Conservation and Coastal Lands	Consider use of mined sand for beach restoration.
County of Kauai, Planning Department	No comments

County of Kauai, Department of Public Works	No comments
Department of Navy	The Navy and State can work cooperatively on land use decisions that have the potential to impact both parties. Although Navy generally opposes any action that has the potential to increase bird air strike hazards (BASH) at naval airfields, in this case we believe that the proposed sanctuary addition can be designed and managed in a manner that addresses the Navy's concerns with respect to BASH hazards at the PMRF airfield.
Historic Preservation	Inadvertent burials have been found in the shoreline area in Kawaiele. Other burials could be present. Prior to construction, a monitoring plan shall be submitted to Historic Preservation for review and approval.
Office of Hawaiian Affairs	No comments
Agribusiness Development Corporation	ADC's involvement in contracts with the Navy and other private entities, it is important that the expansion request have no affect on ADC's ability to maintain the Kekaha irrigation and drainage system.
DHHL	No response

DOFAW anticipates conducting an environmental assessment upon the completion of the sanctuary design parameters, in consultation with the above referenced agencies and Natural Resource Conservation Service, U.S. Fish and Wildlife Service, and cooperating private wildlife conservation groups. The request does not include the Kawaiele drainage pump and related ditches. DOFAW recognizes the need to work with those responsible for managing the irrigation, electrical and drainage systems.

There are no existing permits, leases, or other encumbrances on the property. There are no other pertinent issues or concerns.

RECOMMENDATION:

That the Board, subject to Applicant fulfilling the Applicant Requirements above:

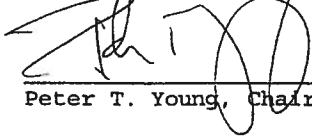
1. Approve of and recommend to the Governor the issuance of an executive order setting aside the subject lands to Department of Land and Natural Resources, Division of Forestry and Wildlife under the terms and conditions cited above, which are by this reference incorporated herein and subject further to the following:
 - A. The standard terms and conditions of the most current executive order form, as may be amended from time to time;
 - B. Disapproval by the Legislature by two-thirds vote of either the House of Representatives or the Senate or by a majority vote by both in any regular or special session next following the date of the setting aside;
 - C. Review and approval by the Department of the Attorney General; and
 - D. Such other terms and conditions as may be prescribed by the Chairperson to best serve the interests of the State.

Respectfully Submitted,



Charlene E. Unoki
Acting Assistant Administrator

APPROVED FOR SUBMITTAL:



Peter T. Young, Chairperson



LINDA LINGLE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

*MAB => Paul G
=> Alvin*

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

ERNEST Y.W. LAU
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

November 7, 2003

Ref. No.: 01KD-340

MEMORANDUM

TO: Michael Buck, Administrator
Division of Forestry and Wildlife

FROM: Charlene Unoki, Acting Assistant Administrator *Charlene Unoki*
Land Division

SUBJECT: Set Aside to Department of Land and Natural Resources, Division of Forestry and Wildlife for Addition to Kawaiele Wildlife Sanctuary, Kekaha, Kauai, Tax Map Key: (4) 1-2-2:portion 1

We are pleased to inform you that at its meeting of November 5, 2003, under agenda item D-14 (copy enclosed), the Board of Land and Natural Resources approved your request for a set aside for Addition to Kawaiele Wildlife Sanctuary purposes.

Please furnish us with a copy of the final subdivision map approved by the County of Kauai when available. Upon subdivision approval, please provide us with a CAD map, together with metes and bounds description, of the area to be set aside in accordance with the enclosed DAGS Survey Division CAD Mapping Standards.

If your staff has questions regarding the preparation of the survey map, please contact DAGS Survey Division at (808) 586-0390. If there are any other questions, please feel free to call my office at 587-0456. Thank you.

Enclosures

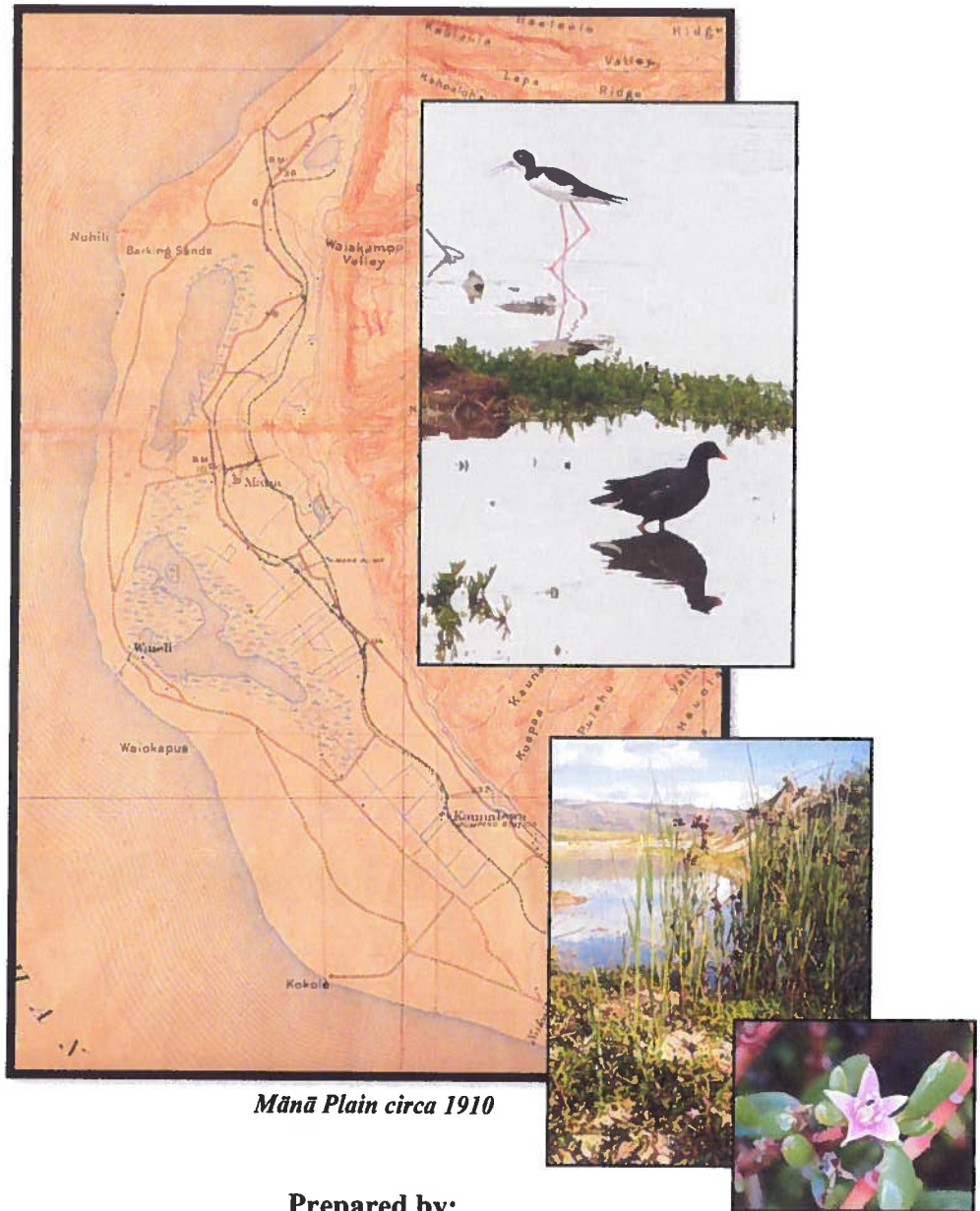
cc: Land Board Member
Central Files
District Files

DIV. OF FORESTRY & WILDLIFE-KAUAI

DATE RECD	FILE REFERENCE
NOV 7 2003	
TRAIKAPU	
KAWAKAMI	INFO
KOGA	COM & RECOM
KOIZUMI	APP ACTION
KYONO	DRAFT REPLY
NISHIHARA	POST ON BULL. BOARD
PETTEYS	SEE ME
RENAUD	FILE
STEVENS	DUE DATE
TELFER	

FINAL ENVIRONMENTAL ASSESSMENT

Mānā Plain Wetland Restoration Project at the Mānā Plains Forest Reserve, Island of Kauaʻi



Mānā Plain circa 1910

Prepared by:

State of Hawaiʻi Department of Land and Natural Resources
Division of Forestry and Wildlife

**This document prepared pursuant to Chapter 343, HRS
November 2013**

This page left intentionally blank.

Finding of No Significant Impact
Mānā Plain Wetland Restoration Project at the Mānā Plains Forest Reserve
Kekaha, Kaua‘i, Hawai‘i

Determination

In accordance with the potential effects discussed in Chapter 3 of the Final Environmental Assessment, the provisions of Chapter 343 Hawai‘i Revised Statutes (HRS), and Hawai‘i Administrative Rules (HAR) §11-200 significance criteria discussed above, the Approving Agency, the Department of Land and Natural Resources, State of Hawai‘i, has made a Finding of No Significant Impact (FONSI). The findings supporting this 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.

William J. Aila
Chairperson
Board of Land and Natural Resources
State of Hawai‘i

DATE

This page left intentionally blank.

TABLE OF CONTENTS

LIST OF FIGURES	viii
LIST OF TABLES	x
CHAPTER 1: PURPOSE AND NEED FOR ACTION.....	1
1.1 Introduction.....	1
1.2 History of the Project.....	3
1.3 Purpose.....	4
1.4 Need for Action.....	4
1.5 Goals	4
1.6 Authorities for Implementing Action.....	6
1.6.1 County of Kaua‘i.....	6
1.6.2 State of Hawai‘i	6
1.6.3 Federal.....	7
CHAPTER 2: ALTERNATIVES.....	8
2.1 No Action Alternative.....	8
2.2 Preferred Action.....	8
2.2.1 Conceptual Restoration Plan Overview	8
2.2.2 Restoration Activities.....	8
2.2.3 Management and Maintenance	16
2.2.4 Environmental Education.....	17
2.2.5 Project Phasing and Estimated Costs.....	17
2.3 Alternatives Considered But Not Analyzed in Detail.....	18
2.3.1 Waimea Irrigation System as Primary Water Source	19
2.3.2 Surface Water from Drainage Canals as Sole Source.....	19
2.3.3 On-site Ground Water as Sole Source	21
2.3.4 Different Size and Number of Wetland Basins.....	21
2.3.5 Alternate Sites Proposed by U.S. Navy	22
CHAPTER 3: ENVIRONMENTAL ANALYSES.....	24
3.1 Geology and Soils	24
3.1.1 Affected Environment.....	24

3.1.2 Environmental Consequences	30
3.2 Water Resources	32
3.2.1 Affected Environment.....	32
3.2.2 Environmental Consequences	57
3.3 Biological Resources	63
3.3.1 Affected Environment.....	63
3.3.2 Environmental Consequences	71
3.4 Archeological and Cultural Resources.....	73
3.4.1 Affected Environment.....	73
3.4.2 Environmental Consequences	74
3.5 Visual Resources.....	75
3.5.1 Affected Environment.....	75
3.5.2 Environmental Consequences	76
3.6 Air Quality	77
3.6.1 Affected Environment.....	77
3.6.2 Environmental Consequences	78
3.7 Noise	79
3.7.1 Affected Environment.....	79
3.7.2 Environmental Consequences	79
3.8 Transportation	80
3.8.1 Affected Environment.....	80
3.8.2 Environmental Consequences	80
3.9 Socioeconomics	81
3.9.1 Affected Environment.....	81
3.9.2 Environmental Consequences	82
3.10 Military Resources	83
3.10.1 Affected Environment.....	83
3.10.2 Environmental Consequences	86
3.11 Agricultural Resources.....	93
3.11.1 Affected Environment.....	93
3.11.2 Environmental Consequences	94
3.12 Contaminants	96
3.12.1 Affected Environment.....	96
3.12.2 Environmental Consequences	97

CHAPTER 4: INDIRECT AND CUMULATIVE EFFECTS	100
4.1 Indirect and Cumulative Effects Under No Action Alternative.....	100
4.2 Indirect Effects with Proposed Action	100
4.3 Cumulative Effect with the Proposed Action	101
4.3.1 Effects on Physical and Natural Environment	101
4.3.2 Effects on Social and Economic Factors	101
4.3.3 Effects on Infrastructure and Public Facilities.....	102
CHAPTER 5: COMPLIANCE WITH EXISTING LAWS	103
5.1 County.....	103
5.1.1 Grading, Sediment, and Erosion Control Ordinance 808	103
5.1.2 General Plan.....	103
5.1.3 Kaua‘i Economic Development Plan.....	104
5.2 State.....	104
5.2.1 State Land Use District – Agricultural/Open.....	104
5.2.2 Coastal Zone Management	105
5.2.3 State Historic Preservation.....	108
5.2.4 Endangered Species	109
5.2.5 State Environmental Policy.....	109
5.2.6 Water Quality and Water Pollution Control	113
5.2.7 Air Quality	116
5.2.8 Noise	116
5.2.9 Transportation	116
5.3 Federal.....	117
5.3.1 Endangered Species	117
5.3.2 Migratory Birds.....	117
5.3.3 Clean Water Act.....	117
5.3.4 Federal Aviation Administration	118
CHAPTER 6: AGENCY CONSULTATION AND PUBLIC INVOLVEMENT	119
6.1 Contributing Agencies and Organizations	119
6.2 Public Outreach, Environmental Education, and Awareness	121
6.3 Pre-Assessment Consultation.....	122
6.4 Draft Environmental Assessment & Public Informational Meetings	123
6.4.1 Draft Environmental Assessment Review	123

6.4.2 Lihue Public Informational Meeting.....	125
6.4.3 Kekaha Public Informational Meeting.....	125
CHAPTER 7: FINDINGS AND DETERMINATION	127
7.1 Findings Under State Chapter 343, HRS	127
7.1.1 Determination	127
7.1.2 Findings.....	127
CHAPTER 8: LITERATURE CITED	130
APPENDIX A: PLANT SPECIES	141
APPENDIX B: WILDLIFE SPECIES.....	143
APPENDIX C: PRE-ASSESSMENT CONSULTATION COMMENT LETTERS AND RESPONSES	145
APPENDIX D: DRAFT ENVIRONMENTAL ASSESSMENT COMMENT LETTERS AND RESPONSES.....	169

LIST OF FIGURES

Figure 1.1 - 1. General location of the project site on the west side of the island of Kaua'i.....	2
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.....	9
Figure 2.2 - 2. Schematic cross-sectional profile through the southern wetland basins of the proposed project site.....	10
Figure 2.2 - 3. Proposed project water levels and flooding durations for seven wetland basins within the project site.....	12
Figure 2.2 - 4. Predicted monthly wetland basin water demands for the proposed project.....	15
Figure 2.2 - 5. Estimated maximum average monthly wetland basin salinity concentrations for the proposed project.....	15
Figure 2.3 - 1. Measured average annual pump rates at the Kawai'ele Pump Station from 2002 to 2009.....	20
Figure 2.3 - 2. Alternate site (labeled borrow pit) proposed by the U.S. Navy during 2011 for the Mānā Plain Wetland Restoration Project. Map prepared by the U.S. Navy.....	23
Figure 3.1 - 1. Regional geology of the Mānā Plain, island of Kaua'i. Twn=Nā Pali formation lava; Ql=Mānā Plain lagoon deposits; Qa=unconsolidated alluvium; Qdo=calcareous sand dunes; Qb=beach sands; Qd=sand dune (from MacDonald et al. 1960).....	26
Figure 3.1 - 2. Map of soil types underlying the project site, location of infiltrometer tests, and locations of infiltration test (percolation) ponds.....	28
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 tsunami are ranked high.....	29
Figure 3.1 - 4. Tsunami hazard map of Mānā Plain (County of Kaua'i 2012). The project site for the Mānā Plain Wetland Restoration Project, is entirely within the Tsunami Evacuation Zone for the County of Kaua'i.....	30
Figure 3.2 - 1. Average monthly precipitation totals (at Mānā) and average monthly pan evaporation rates for the Mānā Plain.....	33
Figure 3.2 - 2. Annual rainfall totals for Mānā (Western US COOP Station, Mānā 1026, station number 516082) from 1905 to 2009.....	33
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.....	36

Figure 3.2 - 4. Estimated average groundwater withdrawal rates for Kekaha-Mānā Plain basal aquifer system from 1880 to 2010.	38
Figure 3.2 - 5. Surface water monitoring and groundwater well locations.....	40
Figure 3.2 - 6. Kekaha Ditch Irrigation System circa 2004.....	41
Figure 3.2 - 7. Annotated historical U.S. Geological Survey topographic map (circa 1910) of the Mānā Plain.	43
Figure 3.2 - 8. Local area surface water drainage system and pump stations on the Mānā Plain.	44
Figure 3.2 - 9. Well levels and groundwater chloride concentrations for well S13 in Kekaha (USGS well no. 215937159434201, Local no. 2-5943-01).	46
Figure 3.2 - 10. Well levels and groundwater chloride concentrations for well in Kaunalewa (USGS well no. 220019159444801, Local no. 2-0044-14).	46
Figure 3.2 - 11. Water quality (salinity) sampling sites at the project site.	49
Figure 3.2 - 12. Mapped 100-year flood zone.	54
Figure 3.2 - 13. Tracks of recent major tropical storms and hurricanes that have affected Kaua‘i.	55
Figure 3.5 - 1. Existing viewplane looking north from the southern boundary of the project site.	75
Figure 3.9 - 1. Annual total visitor arrivals to the County of Kaua‘i from 1990 to 2011. Data from UHERO–Kaua‘i Interactive Database (2012).....	81
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 (from PMRF 2010:3-24).	84
Figure 3.10 - 2. Distribution of 130 acres of wetland habitat located at the Marine Corps Base Hawai‘i, at Kāne‘ohe on the island of O‘ahu (USACE 2009:11).....	88
Figure 3.10 - 3. Sag Harbor Wetland at Marine Corps Base Hawai‘i at Kāne‘ohe on the island of O‘ahu in relation to runway 04/22.	89
Figure 3.10 - 4. Nine acre coastal wetland adjacent to Āhua Reef at Joint Base Pearl Harbor-Hickam.	90
Figure 6.1 - 1. Photos of field data collection and restoration planning activities for the Mānā Plain Wetland Restoration Project.	119

LIST OF TABLES

Table 2.2 - 1. Preferred water depths for foraging (solid) and nesting (diagonal lines) by endangered Hawaiian waterbirds.	12
Table 2.2 - 2. Proposed project wetland basin water levels and estimated maximum flooding areas.	14
Table 2.2 - 3. Predicted monthly and total wetland basin water demands for the proposed project.	14
Table 3.2 - 1. Average monthly and maximum water quality concentrations at the Kawai‘ele Pump Station as reported in the NPDES Discharge Monitoring Reports for the period January 1999 through December 2009 (ADC 1999-2009).....	50
Table 3.2 - 2. Summary of ditch water quality from discrete samples feeding the downstream Kawai‘ele outfall pump #002 from 2005 to 2008 (ADC 1999-2009).	50
Table 3.2 - 3. Estimates of inflow and outflow of water in the Highland Area and the coastal Kekaha-Mānā Plain area.	53
Table 3.10 - 1. Bird aircraft strikes reported at the Pacific Missile Firing Range from 2004 – January 2012 (PMRF 2012).....	85
Table 3.10 - 2. Average mass of four species of endangered Hawaiian waterbirds.	87
Table 3.12 - 1. Half-life, mobility, and comparative oral toxicity of pesticides used for agricultural production on the Mānā Plain. Data compiled from sources listed below. Note these pesticides are not currently used at, or immediately adjacent to the project site.	97
Table 5.2 - 1. Basic water quality criteria from the State of Hawai‘i applicable to all Hawai‘i waters, including those classified as “low wetlands” or “coastal wetlands.”	115
Table 6.1 - 1. Partners consulted by DLNR DOFAW for the development of the restoration design and the Environmental Assessment.....	120

ABBREVIATIONS USED

AAVs	Assault Amphibian Vehicles
ADC	Agribusiness Development Corporation
API	Agricultural Preservation Initiative
ATFP	Anti-terrorism/Force Protection
BASH	Bird Aircraft Strike Hazard
BMPs	Best Management Practices
CNPCP	Coastal Nonpoint Pollution Control Program
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
DEA	Draft Environmental Assessment
DLNR	State of Hawai‘i, Department of Land and Natural Resources
DOFAW	State of Hawai‘i, Division of Forestry and Wildlife
DOH	State of Hawai‘i Department of Health
DPW	Department of Public Works
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEA	Final Environmental Assessment
FEMA	Federal Emergency Management Agency
HEER	Hazard Evaluation and Emergency Response Office
HRS	Hawai‘i Revised Statutes
IPCC	Intergovernmental Panel on Climate Change
JBPHH	Joint Base Pearl Harbor-Hickam
KEDP	Kaua‘i Economic Development Program
KISC	Kaua‘i Invasive Species Committee
KEDIS	Kekaha Ditch Irrigation System
KOHA	Kaua‘i Online Hazard Assessment Tool
MBTA	Migratory Bird Treaty Act
MCBH	Marine Corps Base Hawai‘i
MOA	Memorandum of Agreement
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PMRF	Pacific Missile Range Facility
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service

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 terrestrial habitat within the Mānā Plains Forest Reserve, on the west 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 or unit (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 within historical wetland areas to support endangered Hawaiian waterbirds and native wetland plants.

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 (PMRF), 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, at least 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 currently exist on the Mānā Plain. 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 has been provided by the U.S. Fish and Wildlife Service (USFWS), 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 (HRS), Chapter 343, Environmental Impact Statements. This Final Environmental Assessment (FEA) discusses alternatives for the proposed action, including the no-action alternative. These alternatives were considered to determine which is most responsive to the proposed project’s purpose and need. Subsequent chapters of the FEA evaluate the environmental effects and consequences of implementing these alternatives as well as mitigation measures that will be taken to reduce environmental impacts.

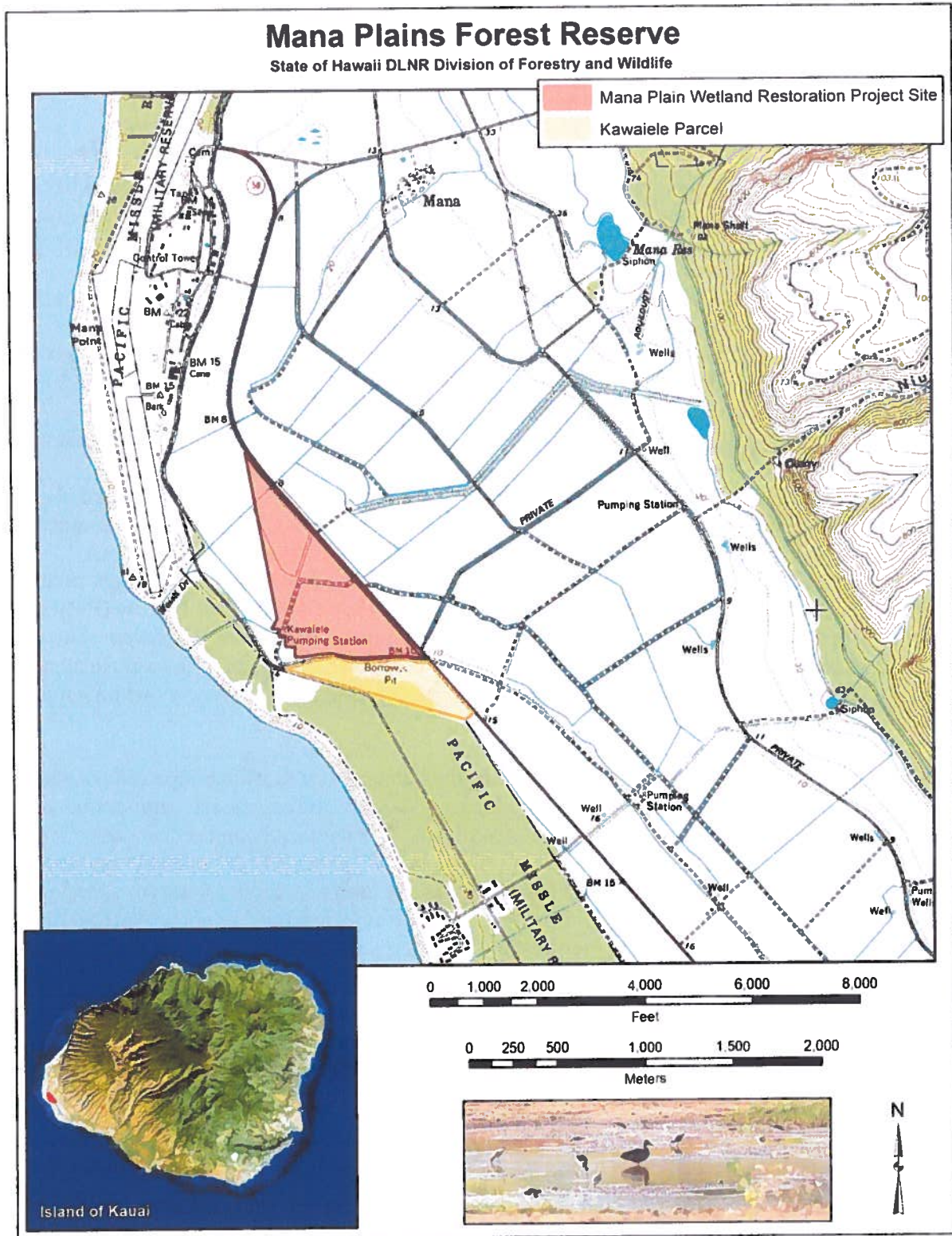


Figure 1.1 - 1. General location of the project site on the west side of the island of Kaua‘i.

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 during 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 PMRF 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 project site for this Environmental Assessment.

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, USFWS 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 Project 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 the USFWS National Coastal Wetland Conservation Grant Program. 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. Additional grant funding will be pursued as needed following approval of the FEA.

1.3 PURPOSE

DOFAW's mission is to “responsibly manage and protect watersheds, native ecosystems, and cultural resources and provide outdoor recreation and sustainable forest products opportunities, while facilitating partnerships, community involvement and education.” 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 (ae‘o, *Himantopus mexicanus knudseni*), Hawaiian moorhen (‘alae ‘ula, *Gallinula galeata sandvicensis*), and Hawaiian coot (‘alae ke‘oke‘o, *Fulica alai*). This restoration plan also includes re-establishing a variety of native aquatic and terrestrial plants, including, but not limited to, ‘ohai (*Sesbania tomentosa*), ‘ilima (*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). 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 Hawai‘i 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 Hawai‘i 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.

This proposed restoration project at the Mānā Plains Forest Reserve will provide additional habitat to enhance DOFAW's conservation and recovery efforts for the four species of 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 it is one step closer for these species eventually being downlisted and removed from the Federal List of Endangered and Threatened Wildlife and Plants.

This project 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 DLNR 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 DLNR 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 DLNR.

§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 USFWS 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 Plain Wetland Restoration Project, within the Mānā Plains Forest Reserve, 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 and abiotic conditions within and surrounding 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 Kawai‘ele parcel, an area of created habitat, abandoned irrigation ditches, and drainage canals. Drainage canals will continue to be leased and maintained by the U.S. Navy. The 105-acre project site would not contribute to the recovery of endangered Hawaiian waterbirds because no additional suitable habitat would be available.

2.2 PREFERRED ACTION

2.2.1 CONCEPTUAL RESTORATION PLAN OVERVIEW

The preferred action will restore managed native wetland habitats on the 105-acre project site within the Mānā Plains Forest Reserve in an area of historical wetland habitats. Restored wetland basins will be designed to meet the life-history requirements of four species of endangered Hawaiian waterbirds. Goals of the project are listed in section 1.5.

2.2.2 RESTORATION ACTIVITIES

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, submerged, and mudflat associated native plant species.

During construction of the wetland basins, grading of the current surface soils will be done so as to 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. Maintenance of these two main drainage canals on the Mānā Plain is currently contracted by the U.S. Navy, who leases them from the State of Hawai'i. This maintenance will continue under all alternatives.

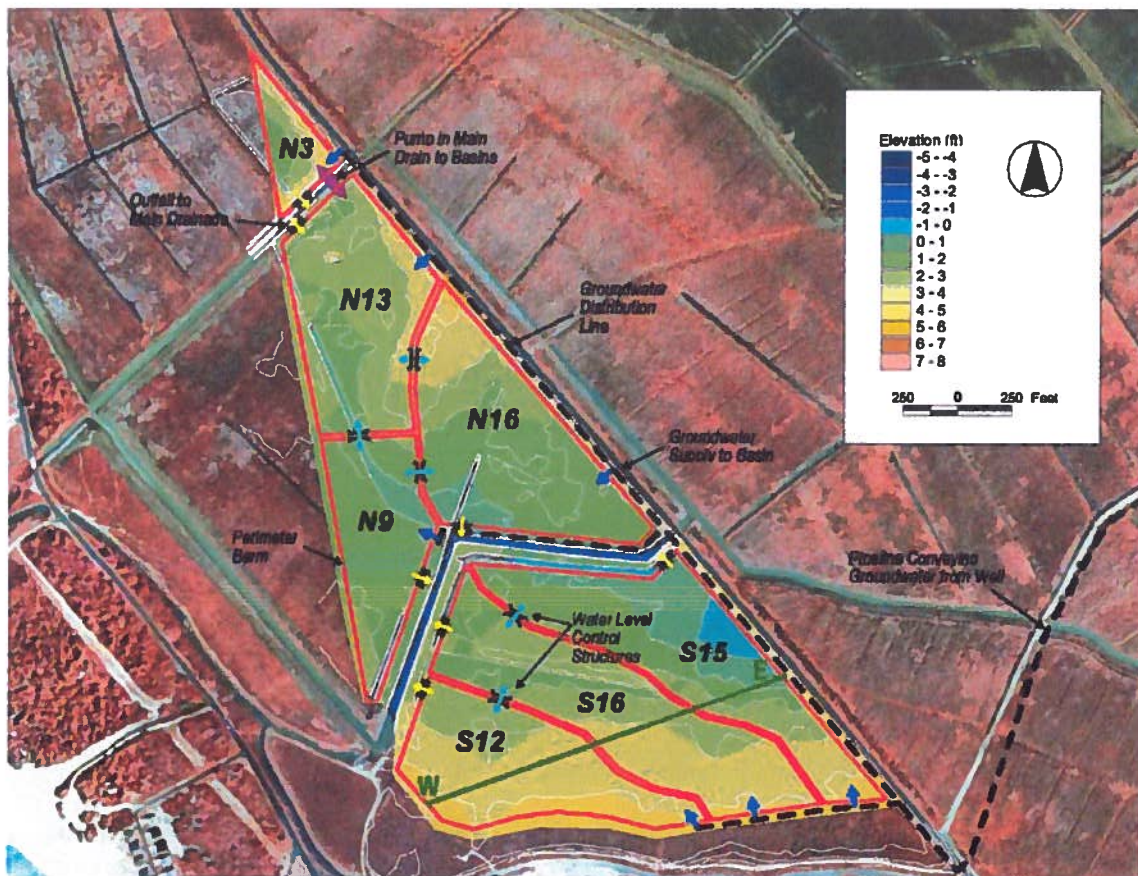


Figure 2.2 - 1. Shaded relief map of the project site existing conditions topographic map from Ducks Unlimited (2008) showing proposed wetland basins, water control structures, and water delivery system.

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.

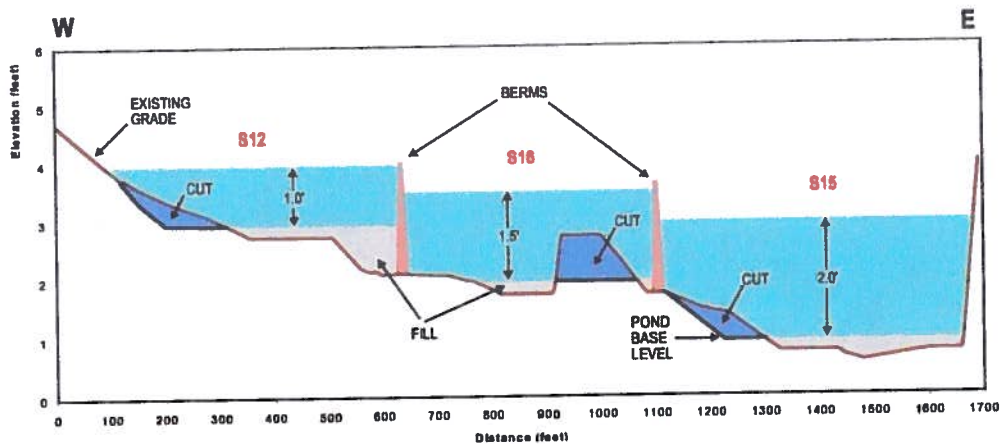


Figure 2.2 - 2. Schematic cross-sectional profile through the southern wetland basins of the proposed project site.

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 off-site 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 potential 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 from the off-site well. 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 flows¹ will be provided to all basins to mimic natural conditions and maintain turnover. The manipulation of all water levels will also be timed so as not to flood or dewater nests of endangered 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.

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

Target Waterbird Species	Depth of Water (inches)																
	Upland	Mud Flat	1	2	3	4	5	6	7	8	9	10	11	12	13-24	25-36	37-48
Hawaiian duck	Diagonal		Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid			
Hawaiian stilt		Diagonal	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid
Hawaiian coot									Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal
Hawaiian moorhen									Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal	Diagonal

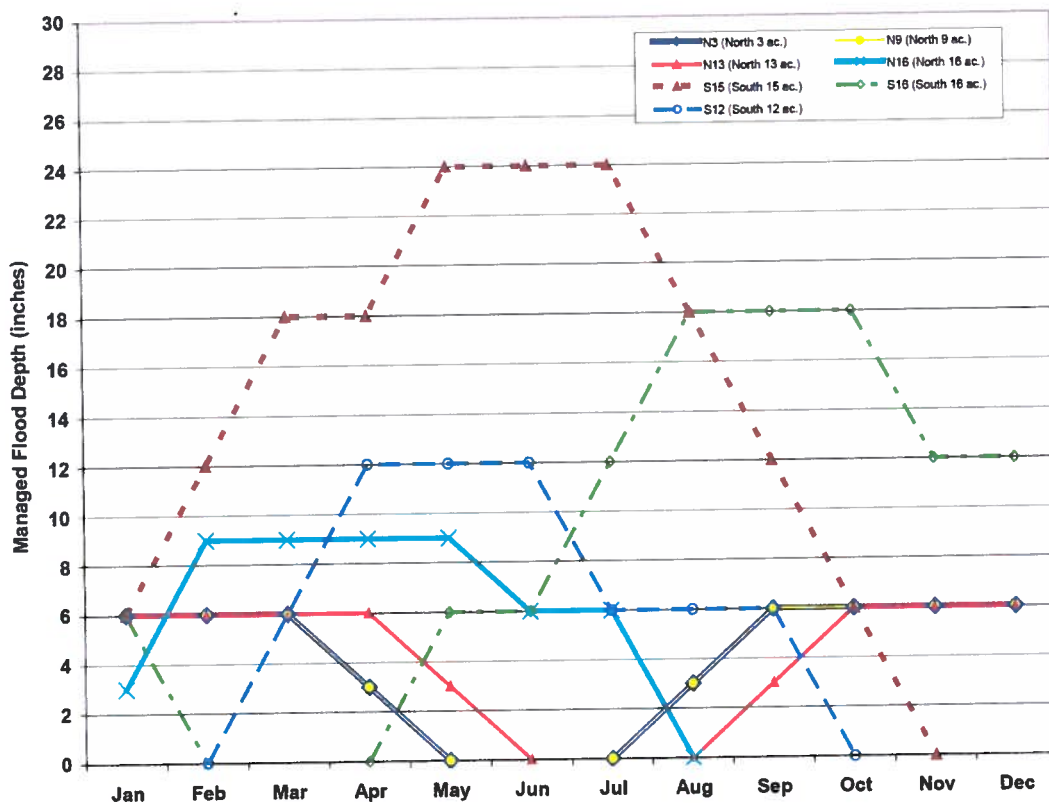


Figure 2.2 - 3. Proposed project water levels and flooding durations for seven wetland basins within the project site.

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 from the off-site well 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 will be installed where needed to a recommended depth around the edges of wetland basins.

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)	Seasonally 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
TOTAL				84

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

	N3	N13	N9	N16	S12	S16	S15	Monthly Subtotal
	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)	(AF)	(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

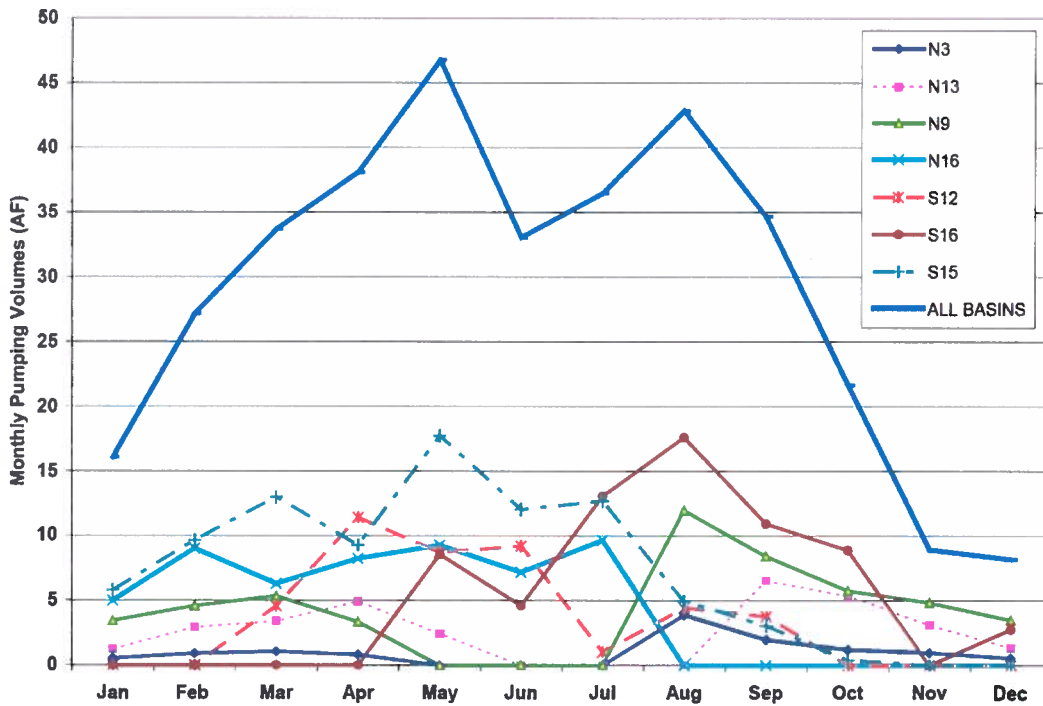


Figure 2.2 - 4. Predicted monthly wetland basin water demands for the proposed project.

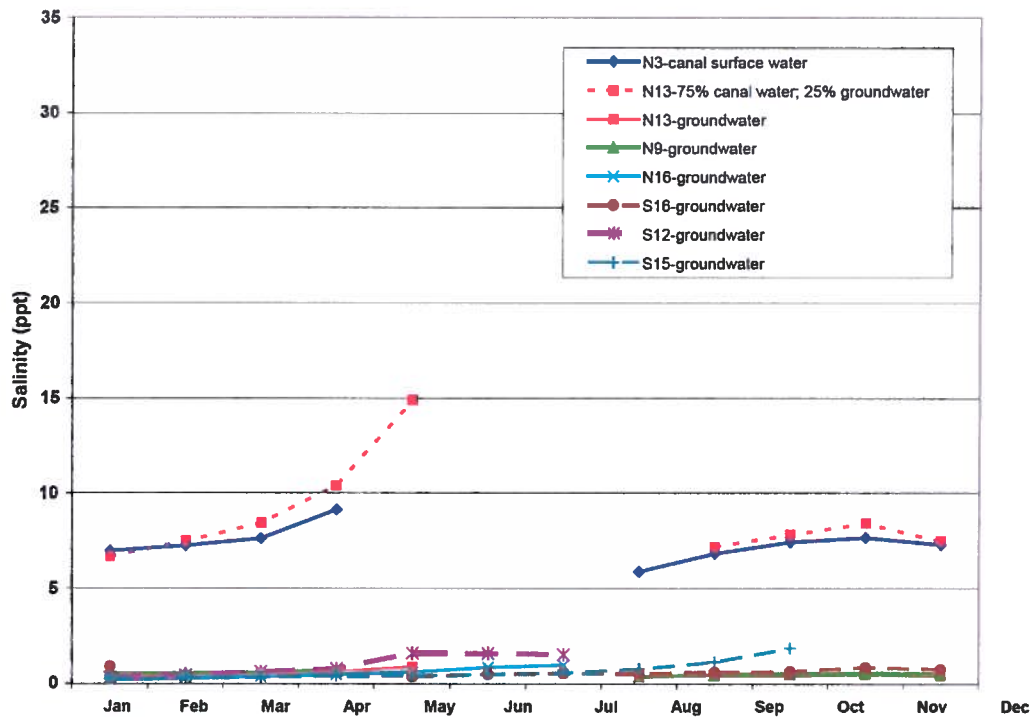


Figure 2.2 - 5. Estimated maximum average monthly wetland basin salinity concentrations for the proposed project.

2.2.3 MANAGEMENT AND MAINTENANCE

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. Soil disturbance as a result of mechanical control measures will be implemented accorded to State and County regulations. 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 of wetland basins is anticipated. Dependent on available funding, a small baseyard will be constructed at an approved upland site, west of the visitor center away from the view plane of the Kaumuali'i Highway and public access areas.

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, cats, rats, and mongoose. DOFAW staff will employ regular predator control activities for species that are not excluded by the fence. To reduce the risk of predation by rodents, DOFAW staff will deploy bait stations within the perimeter of the project area according to pesticide registration regulations. Bait stations will only utilize attractants approved for use in areas within close proximity to wetlands. Cats within the project site will be live-trapped using humane box traps during the peak breeding season. Cats that are trapped will be transported to the Kaua'i Humane Society. As of December 2012, two mongoose have been trapped on the island of Kaua'i. DOFAW is collaborating with the Kaua'i Invasive Species Committee (KISC) to remove mongoose from the island. If mongooses are detected in the Mānā Plain area, the live-trap method used for cats can be used congruently for mongoose. As part of predator control management, DOFAW staff will cooperate with KISC to monitor tracks of potential predators in the project area.

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. The adaptive management plan will include, but is not limited to, water level manipulation and management, response of native and non-native species to habitat management actions, and habitat use by endangered waterbirds.

2.2.4 ENVIRONMENTAL EDUCATION

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, and parking. 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. 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.

2.2.5 PROJECT PHASING AND ESTIMATED COSTS

The preliminary annual operating cost for resource personnel is estimated to be approximately \$220,000 and the annual operating cost for materials and supplies is estimated to be \$25,000 for a total annual operating cost of \$245,000. Personnel required to manage include one wildlife biologist, two wildlife technicians, and one equipment operator. Funding for resource personnel is provided through the Federal Aid in Wildlife Restoration Act, (16 U.S.C. 669-669i; 50 Stat. 917), as amended, commonly called the Pittman-Robinson Act. This act provides federal aid to states for the management and restoration of wildlife through an excise tax on the purchase of sporting arms and ammunition. Certain management and maintenance activities can also involve participation of community organizations or volunteer efforts as have been conducted at Kawai‘ele.

The cost for equipment and restoration actions is estimated at \$4,000,000. Funding obtained by grants to DOFAW and funding from sand mining revenues at Kawai‘ele is available to implement wetland and associated coastal upland restoration activities. Grants to DOFAW for restoration actions include funding from USFWS National Coastal Wetland Grant. Grants to DOFAW for environmental education and outreach include funding from Hawai‘i Tourism Authority, PAHIO Development, Inc., and the Kaua‘i Children’s Environmental Education Trust. Additional funding will need to be acquired for construction of a visitor center, base yard facilities, and upgraded installation of a predator proof fence. DOFAW will pursue additional funding from Federal, State, and private sources. Due to this utilization of grants and federal aid, the general public will not incur any additional taxes as a result of this project.

Restoration actions can be implemented once this environmental review process is completed and necessary permits are obtained. Restoration improvements will be implemented over time, and will be subject to the availability of funding. Restoration actions will be implemented by DOFAW staff, continuing cooperative work agreements with USFWS, and contractors hired to implement certain work tasks.

2.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

The following alternatives were considered but 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 subsections 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 Plain 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 Kawai‘ele parcel significantly reduced the growth of *Ruppia maritima* (Peyton 2009) and likely negatively affected 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. In 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 Kawai‘ele 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 Plain 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.

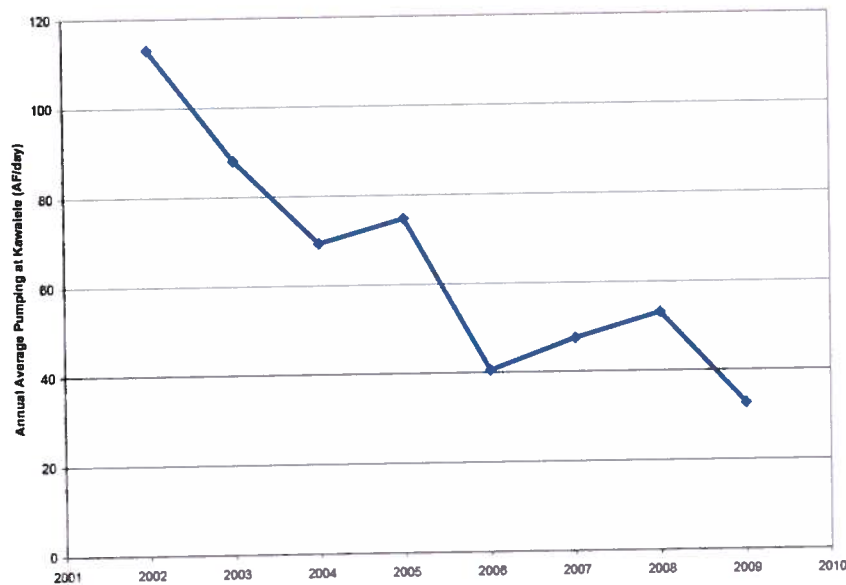


Figure 2.3 - 1. Measured average annual pump rates at the Kawai'ele Pump Station from 2002 to 2009.

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 Kawai'ele 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 Project. The proposed alternate site is a borrow pit located outside of the Mānā Plains Forest Reserve near the north end of the PMRF (Figure 2.3 - 2). DOFAW staff and wetland restoration experts visited the alternate proposed site on December 14, 2011. This alternate site is smaller than the existing project site, has sandy soils classified as Jaucas 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 Jaucas sand and supports upland habitats. Jaucas sand is not classified as a hydric soil (those formed under conditions of saturation) and has a high permeability (e.g., low water holding capability) (Foote et al. 1972) and would be a significant constraint to wetland 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.

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 (BASH). 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. A subsequent feasibility study by the U.S. Army Corps of Engineers (USACE) Research and Development Center (Klimas et al. 2012) also eliminated this site as an alternative to the proposed Mānā Plain Wetland Restoration Project site. Alternate 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 was also evaluated by the USACE Research and Development Center (Klimas et al. 2012). Based on field investigations they reported that soils at Alternate Site A had a relatively thin surface layer of loamy or clay soils and abundant sand beneath the surface layer. Salinity of groundwater was between 23 and 34 ppt and unsuitable for three of the four target endangered waterbirds (Klimas et al. 2012). Due to soil and groundwater conditions, they concluded that Alternate Site A “appears to have a very limited ability to hold water and to support a complex of managed wetlands” (Klimas et al. 2012:27). In addition, “wetland development at Alternative Site A based on deep excavation is unlikely to serve as a reasonable alternative to the [proposed Mana Plain Wetland Restoration Project]” (Klimas et al. 2012:24).

Additionally, the alternate sites proposed by the U.S. Navy are not being considered 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 BASH. 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 organizations, and local corporations to collaboratively develop an ecologically sound and cost-effective restoration design at this location.
5. BASH 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.

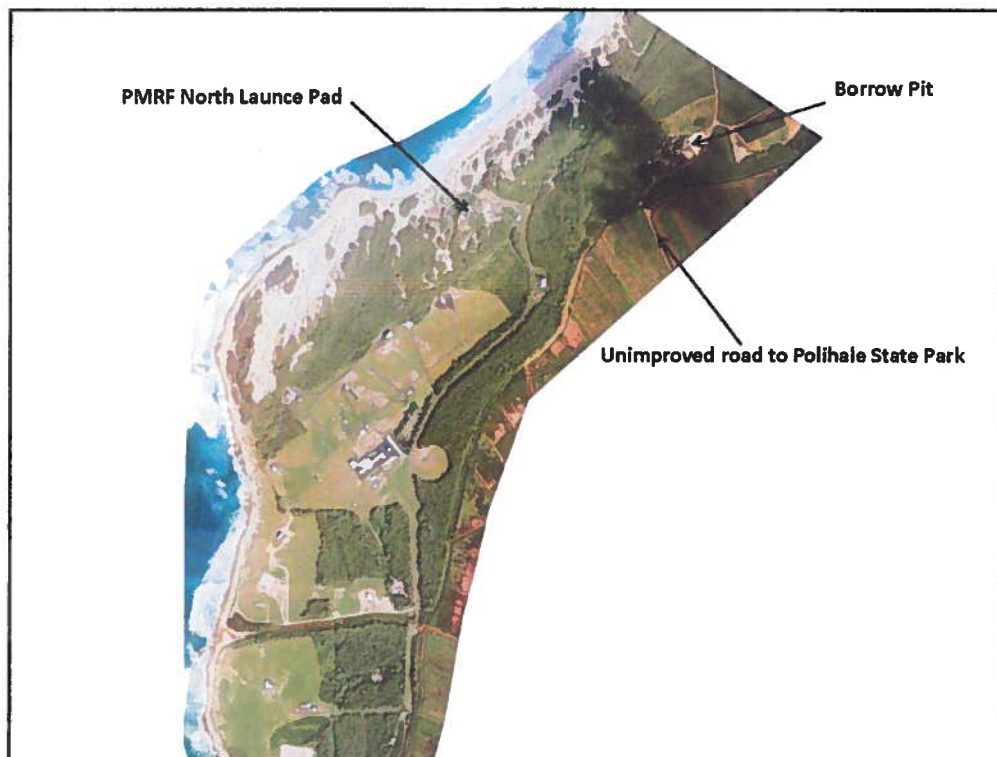


Figure 2.3 - 2. Alternate site (labeled borrow pit) proposed by the U.S. Navy during 2011 for the Mānā Plain Wetland Restoration Project. Map prepared by the U.S. Navy.

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 Kauaʻi (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 Kaumualiʻi Highway 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 Mānā 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 Kauaʻi. Tw=nā Pali formation lava; Ql=Mānā Plain lagoon deposits; Qa=unconsolidated alluvium; Qd=calcareous sand dunes; Qb=beach sands; Qc=sand dune (from MacDonald et al. 1960).

PROJECT SITE SOILS

Pursuant to the Natural Resource Conservation Service (NRCS) Soil Resource Report (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 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 capacity³ (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 infiltrometer 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.

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. Therefore, 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.

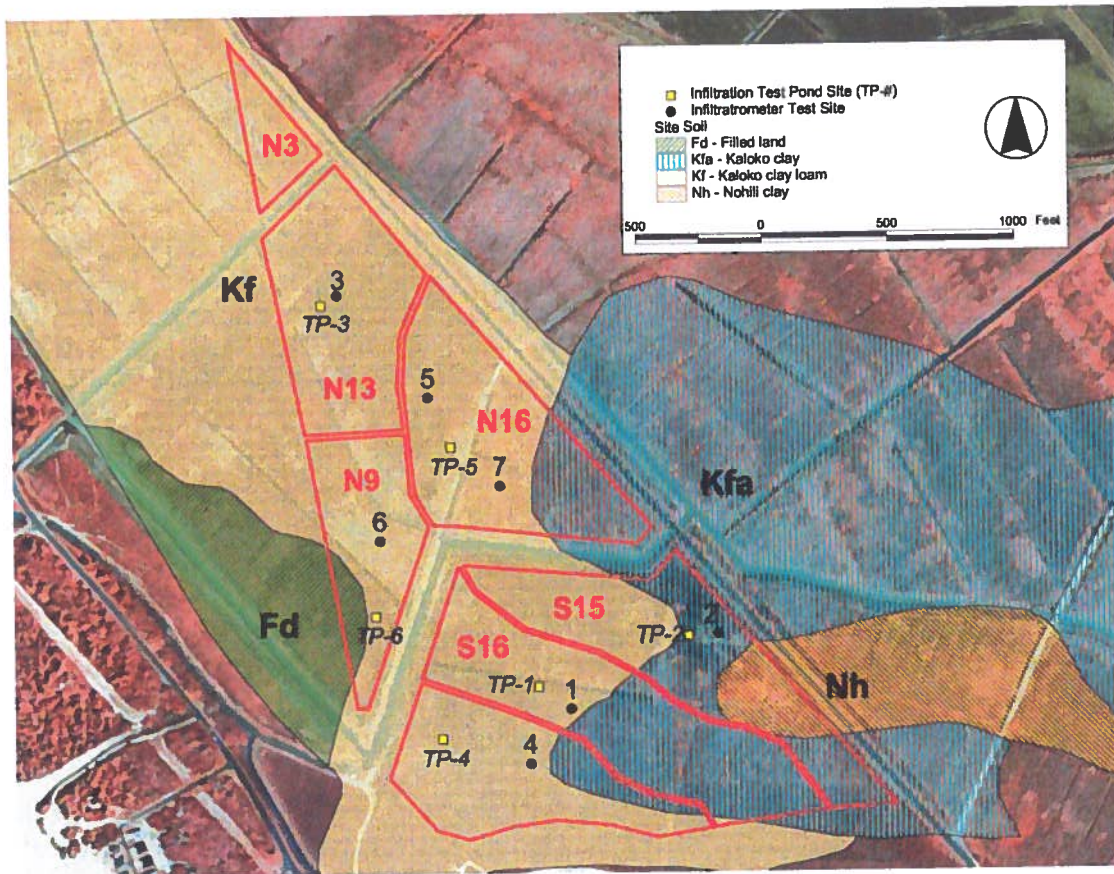


Figure 3.1 - 2. Map of soil types underlying the project site, location of infiltratometer tests, and locations of infiltration test (percolation) ponds.

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 (KOHA) (County of Kaua'i 2012) and the Atlas of Natural Hazards in the Hawaiian Coastal Zone (Fletcher et al. 2002). KOHA was developed by the County of Kaua'i in partnership with the National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center and Pacific Services Center 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 U.S. Geological Survey (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.

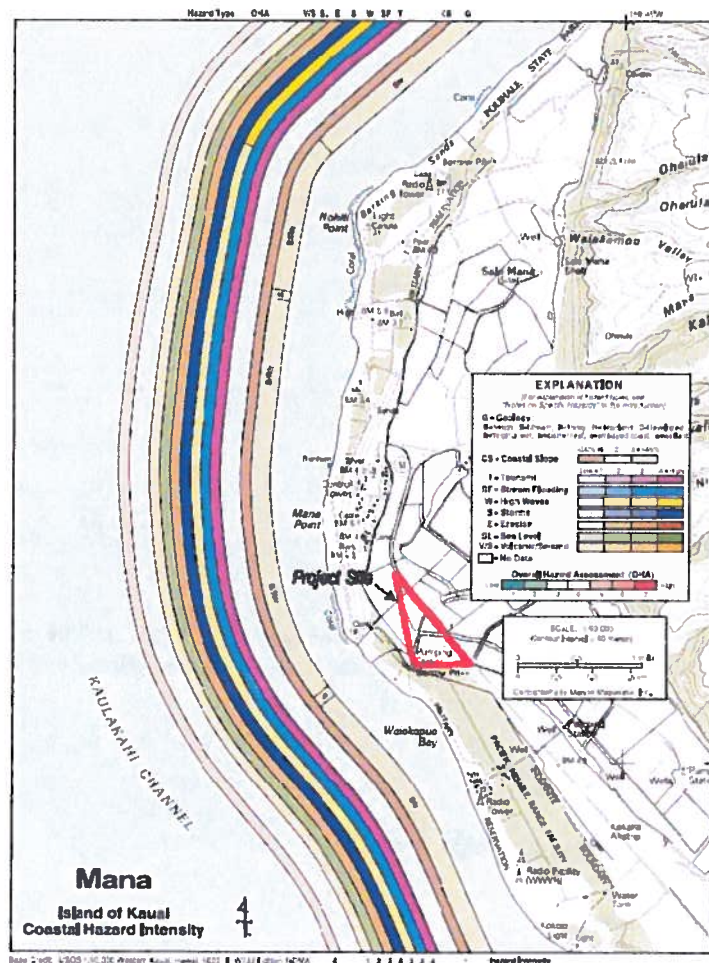


Figure 3.1 - 3. Technical Hazard Map for the vicinity of the Mānā Plain (from Fletcher et al. 2002). Geologic hazards of the volcanic/seismic activity are ranked low. Geologic hazards for tsunami are ranked high.

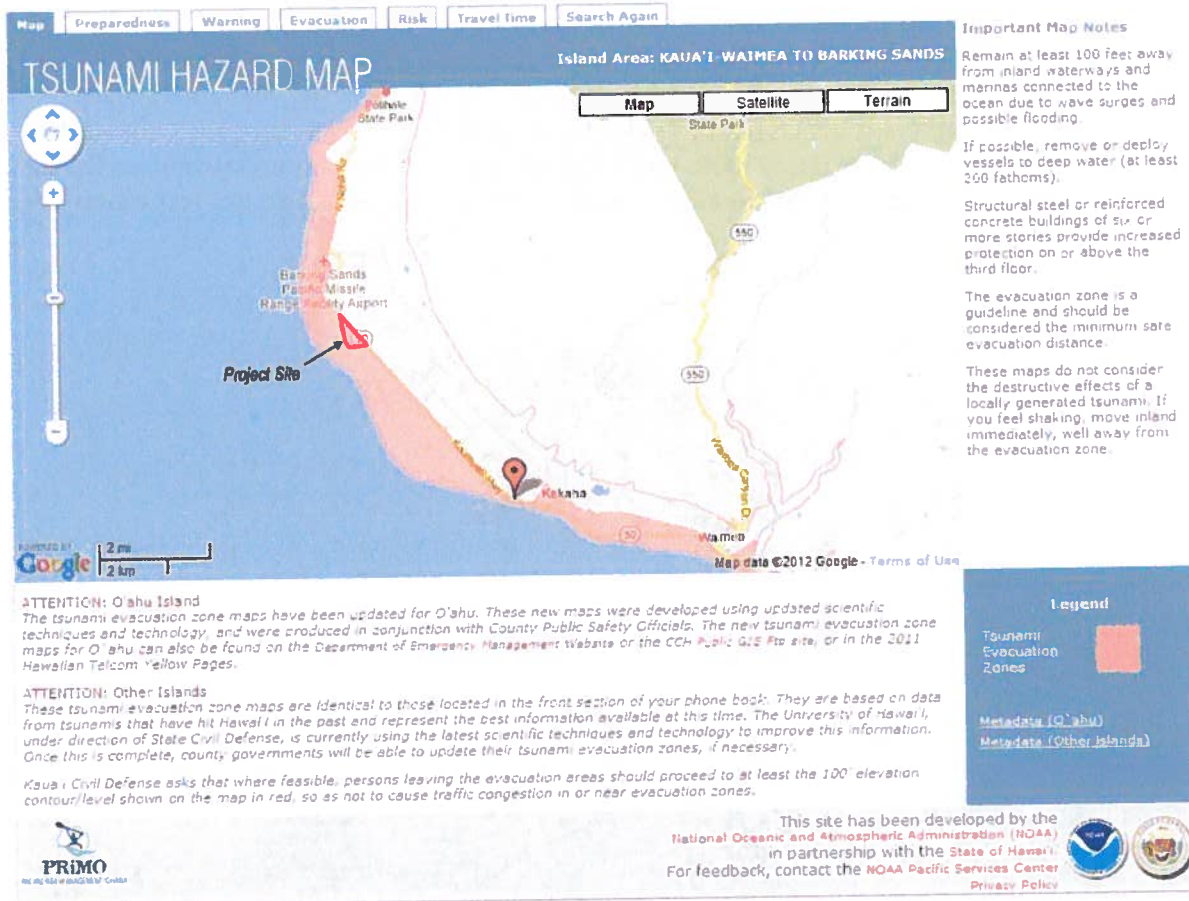


Figure 3.1 - 4. Tsunami hazard map of Mānā Plain (County of Kaua‘i 2012). The project site for the Mānā Plain Wetland Restoration Project, is entirely within the Tsunami Evacuation Zone for the County of Kaua‘i.

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-free 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 (County of Kaua'i 2004). 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 at 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 Hawai'i. Tsunami warning and evacuation is administered through the Hawai'i 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 rain shadow 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 Corporation 1990).

Rainfall

Daily rainfall data from climate stations near the project site has been recorded since 1905 (Western Regional Climate Center 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.

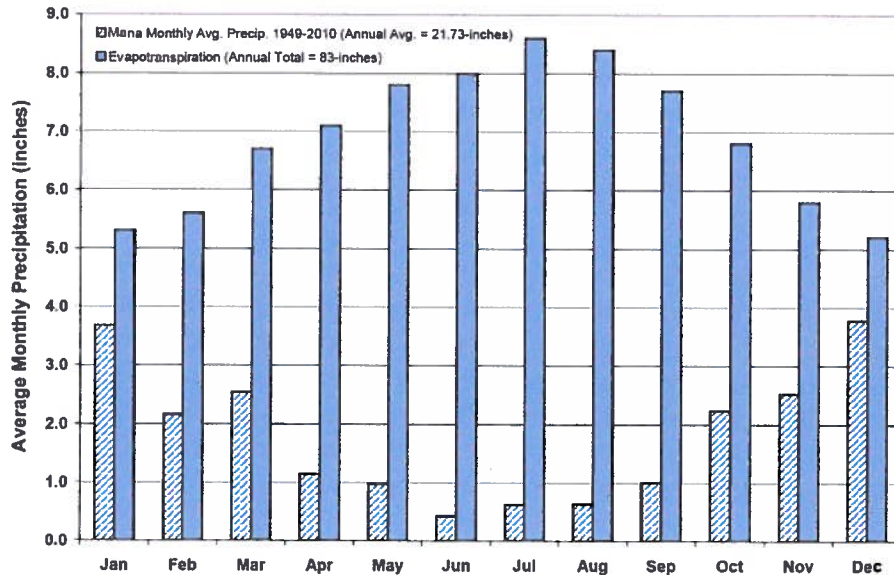


Figure 3.2 - 1. Average monthly precipitation totals (at Mānā) and average monthly pan evaporation rates for the Mānā Plain.

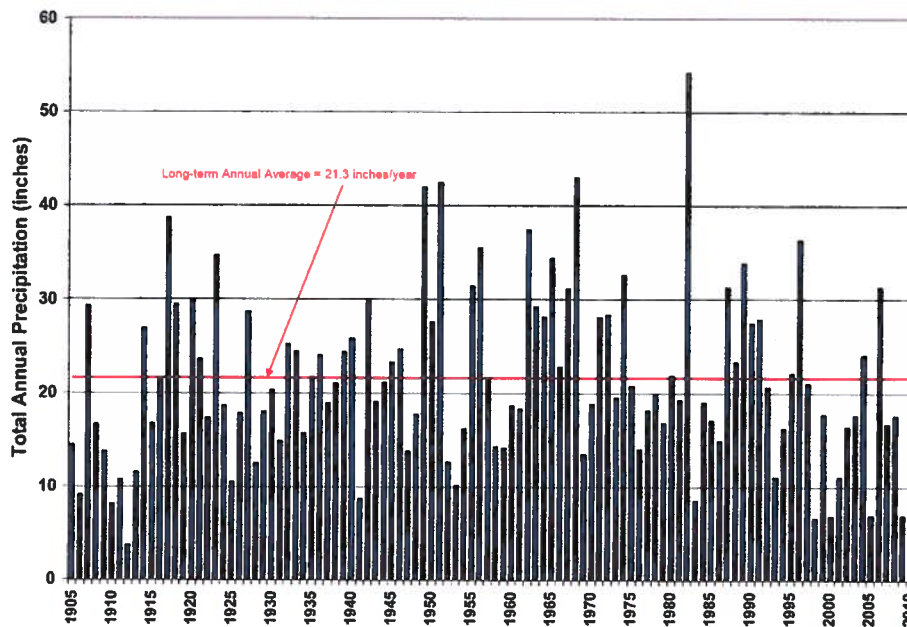


Figure 3.2 - 2. Annual rainfall totals for Mānā (Western US COOP Station, Mānā 1026, station number 516082) from 1905 to 2009.

Evapotranspiration

The quantity of water evaporated from soil and water surfaces and transpired by plants is termed actual evapotranspiration. Estimated values of actual evapotranspiration are quantified through pan-evaporation data from class-A evaporating pans. Twenty-five sugarcane production locations in Kauaʻi 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 Kauaʻi. 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 conductivities⁵ 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 Kauaʻi, 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 showing hypothetical potentiometric surfaces⁶ and transition zone positions in the confined

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

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

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.

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 Hawai'i Department of Health (DOH) 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.

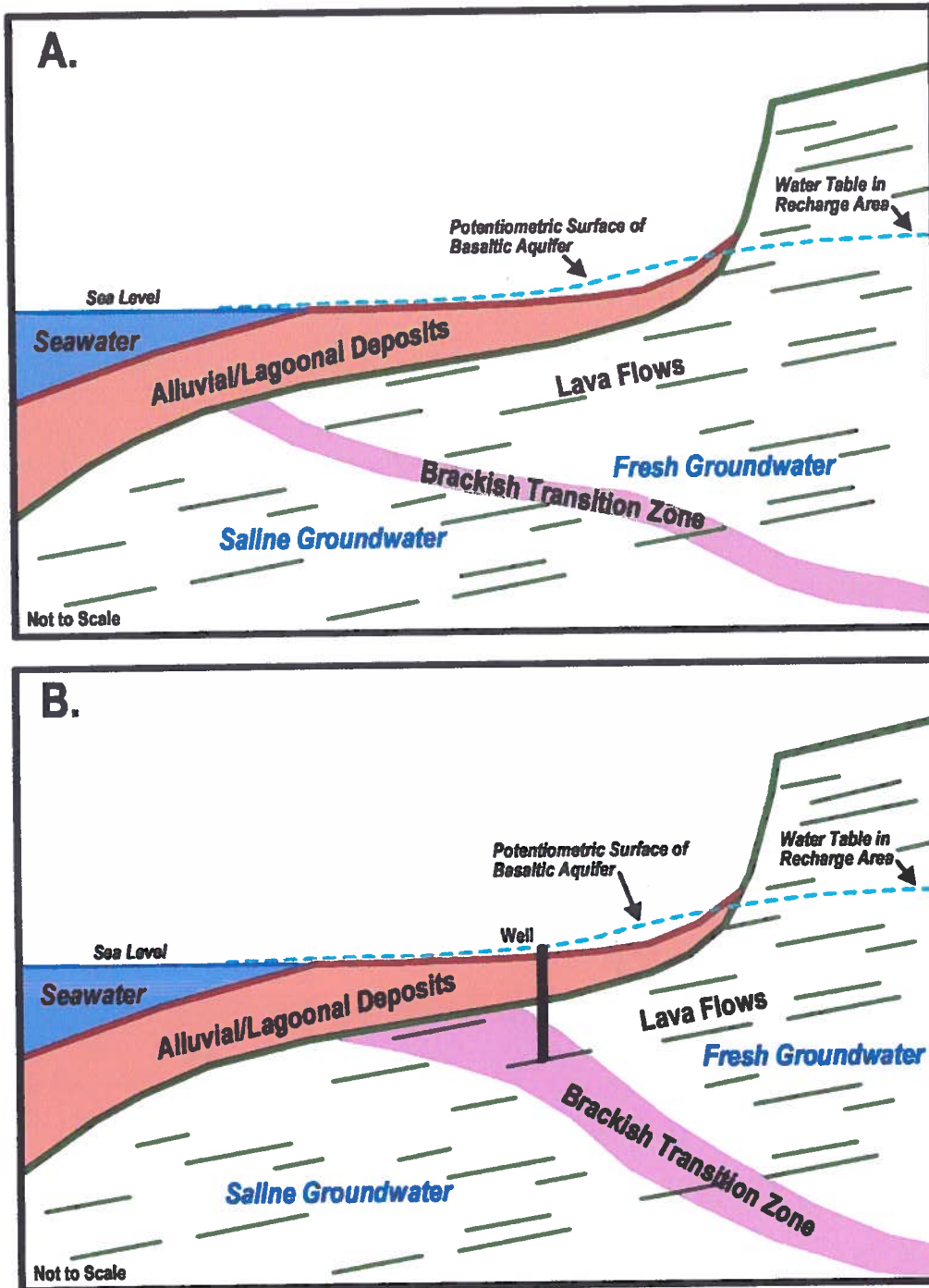


Figure 3.2 - 3. Schematic of groundwater conditions beneath the Mānā Plain under predevelopment equilibrium conditions and after development of wells for irrigation of sugarcane.

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 caprock aquifer is classified as having a high vulnerability to contamination⁸. 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.

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.

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.

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 million gallons per day (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 increased to about 24 MGD and up to 42 MGD between 1969 and 1973 (Burt 1979). However, between 1974 and 1978, groundwater pumping rates declined to about 30 MGD (Burt 1979). 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).

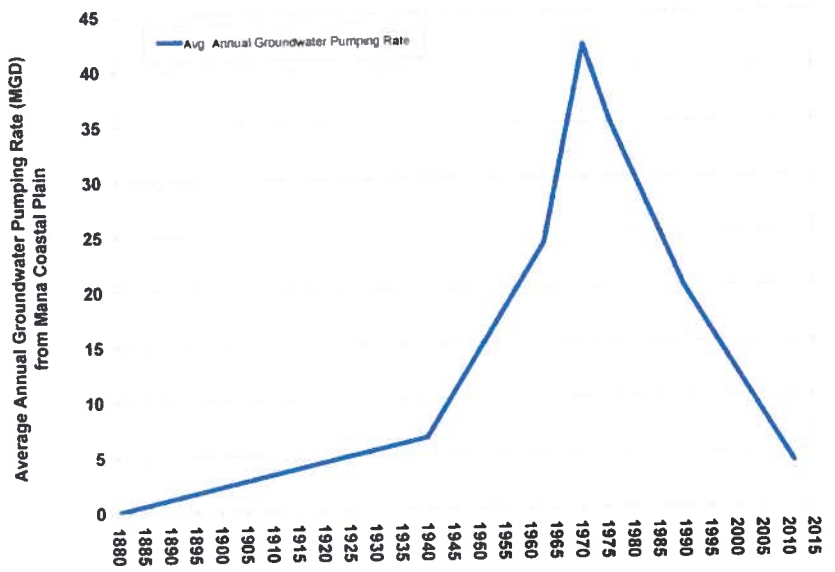


Figure 3.2 - 4. Estimated average groundwater withdrawal rates for Kekaha-Mānā Plain basal aquifer system from 1880 to 2010.

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 is 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.

As part of the development of the sugarcane industry around the turn the 20th century (Water Resource Associates 2004), 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 of Hawai‘i 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 HRS Chapter 163D (Water Resource Associates 2004). The KEDIS is also critical to the safety of the PMRF because it maintains the drainage system that prevents flooding of the low-lying agricultural lands surrounding PMRF.

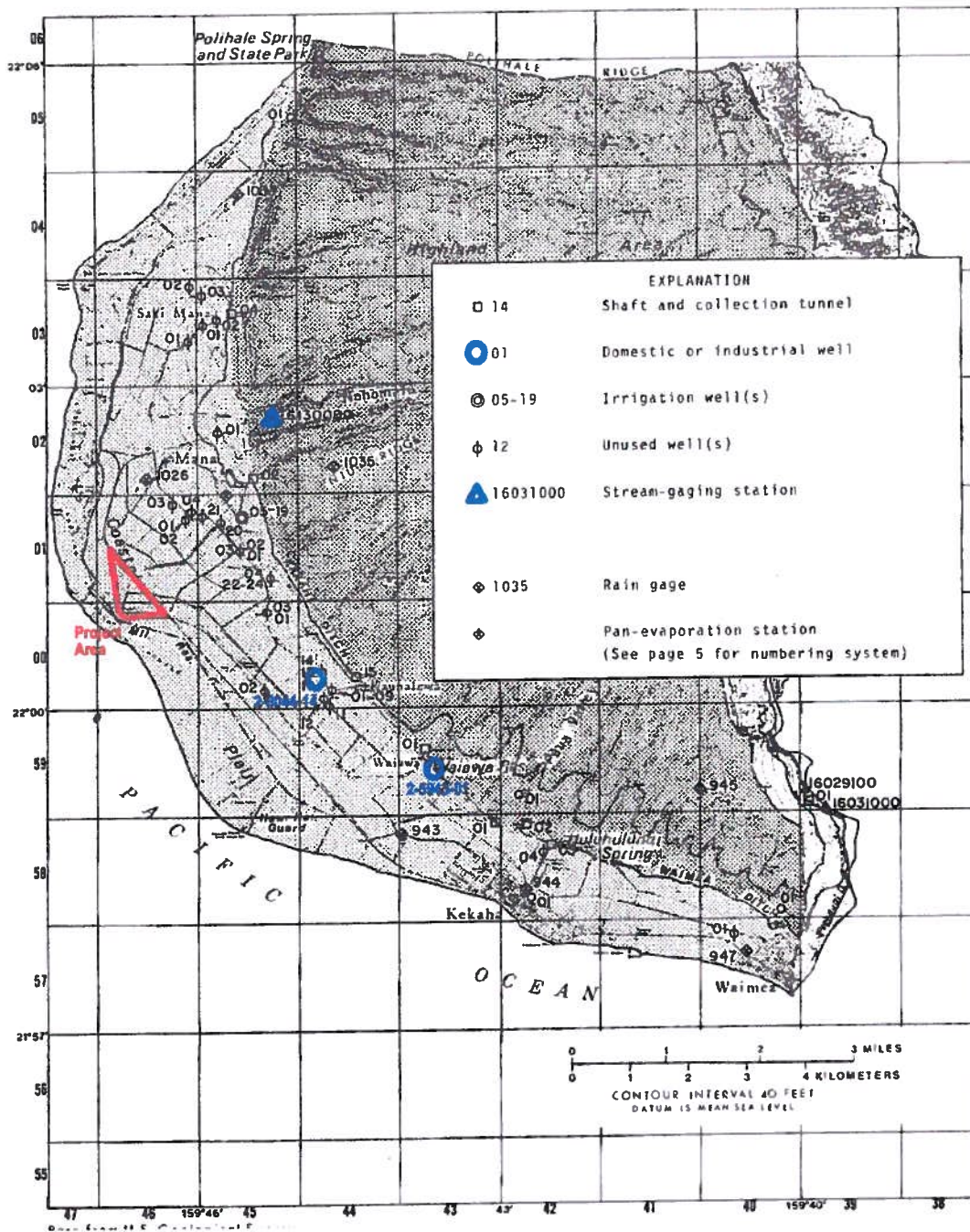


Figure 3.2 - 5. Surface water monitoring and groundwater well locations.



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

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 groundwater 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 Kawai‘ele pump stations.

The pump stations and drainage canal system are operated and maintained by the State of Hawai‘i ADC under National Pollutant Discharge Elimination System (NPDES) Permit No. 000086. The Kawai‘ele 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 Kawai‘ele 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 Kawai‘ele 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 - 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 1985).

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 levels⁹ 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 pumping (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.

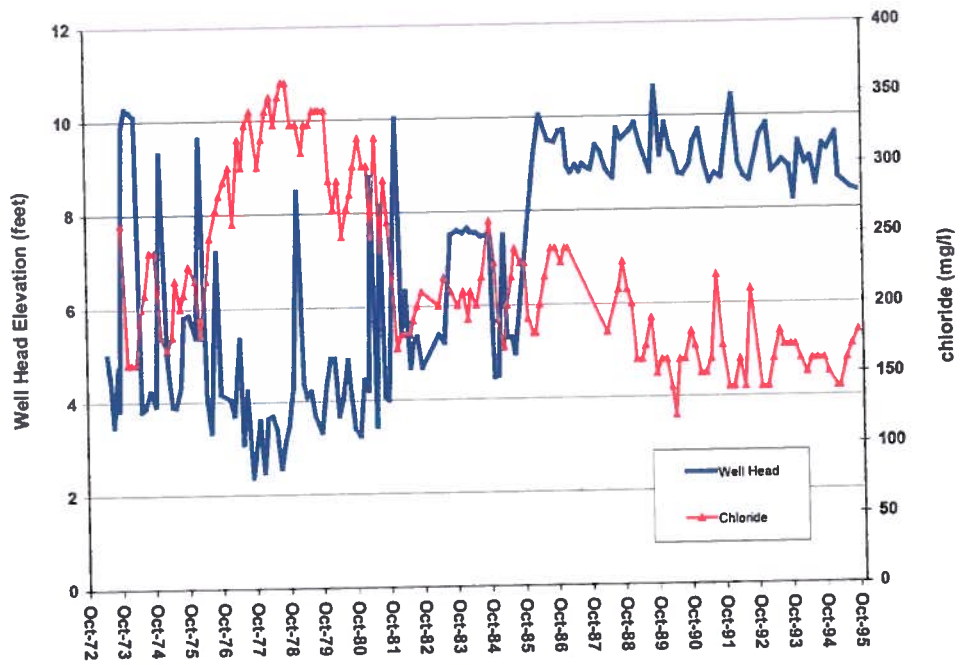


Figure 3.2 - 9. Well levels and groundwater chloride concentrations for well S13 in Kekaha (USGS well no. 215937159434201, Local no. 2-5943-01).

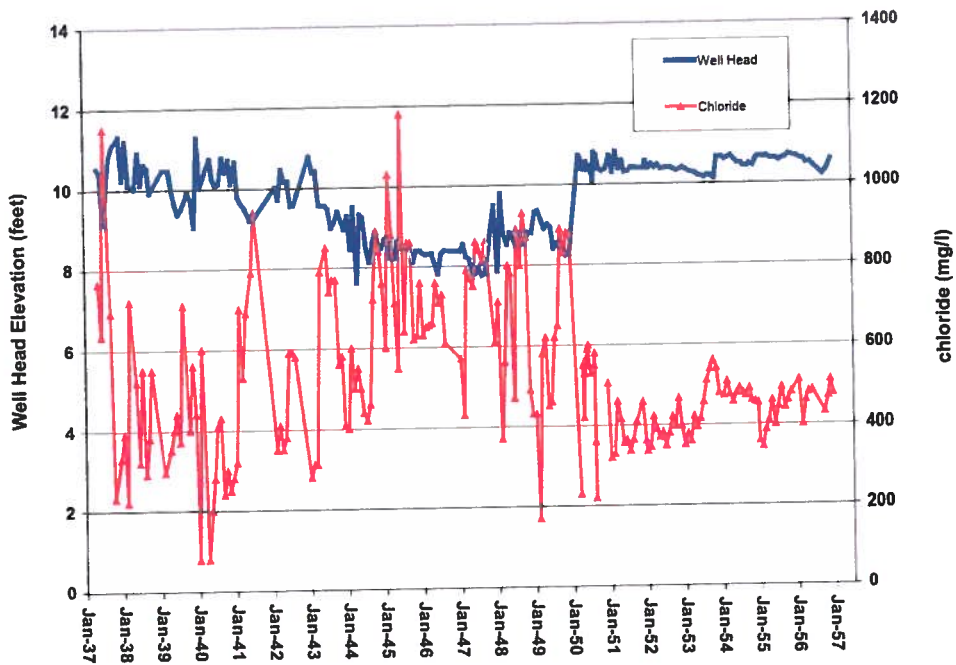


Figure 3.2 - 10. Well levels and groundwater chloride concentrations for well in Kaunalewa (USGS well no. 220019159444801, Local no. 2-0044-14).

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 indicated 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 ADC discharge monitoring reports (DMRs) submitted to the State of Hawai'i DOH as a condition of the NPDES Permit No. 000086 (ADC 1999-2009);
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. (2010).

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 DOH 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 KEDIS 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 Kaumuali‘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 project site for the Mānā Plain Wetland Restoration Project. Water at Kawai‘ele is supplied by local groundwater and exposed to evaporation, which tends to

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.

concentrate salinity 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 NPDES Discharge Monitoring Reports for the period January 1999 through December 2009 (ADC 1999-2009).

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 (°F)	76.8	80.0	73.0	5
TEMP (°C)	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 (ADC 1999-2009).

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 coastal Mānā 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 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 down to 33,600 AF/yr as opposed to 61,000 AF/yr during 1958-68. The reduction in irrigation has also led 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 1958-68. 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 the coastal Kekaha-Mānā 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.

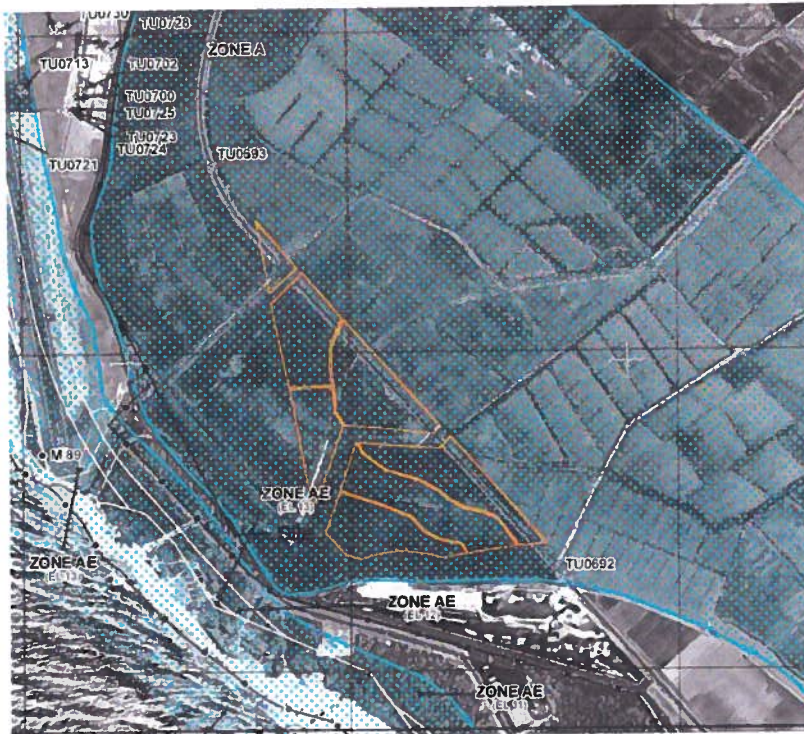


Figure 3.2 - 12. Mapped 100-year flood zone.

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).

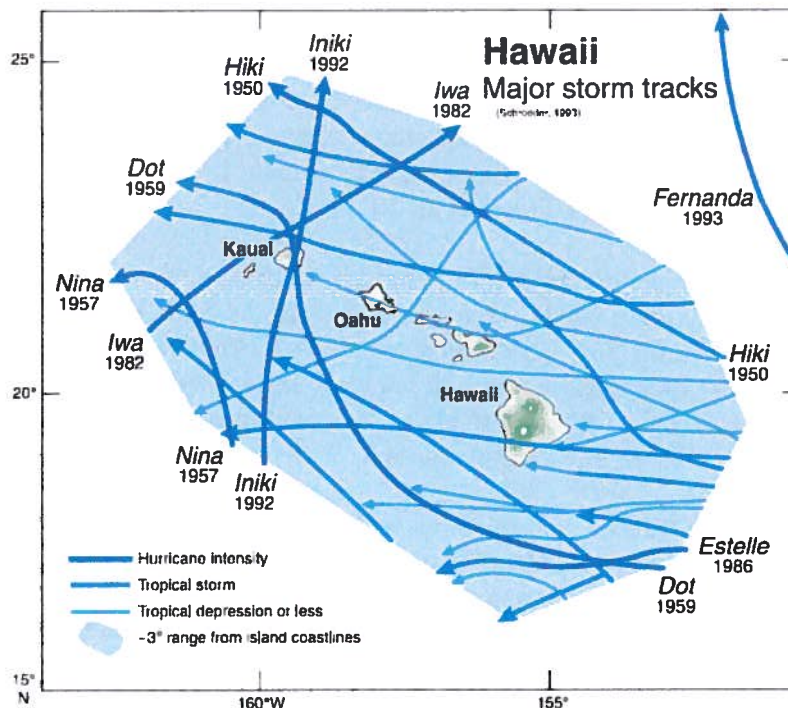


Figure 3.2 - 13. Tracks of recent major tropical storms and hurricanes that have affected Kaua'i.

FUTURE PREDICTED CLIMATE CHANGE

Recent trends in Hawaii's climate are consistent with the influence of global warming and include increasing air temperatures, decreasing rainfall and stream flow with an increase in rain intensity, increasing sea level and sea surface temperatures, and acidification of the ocean (Fletcher 2010). Other effects of climate change may also include changes in the trade wind regime, ocean current oscillations (El Nino and La Nina), and the increased intensity and frequency of storm events and dry periods (Wallsgrove and Penn 2012).

Based on the analysis of 21 climate stations, Giambelluca et al. (2008) show a relatively rapid rise in air temperatures in Hawai'i over the past 30 years. Despite the cooling associated with the Pacific decadal oscillation, surface temperatures have remained elevated, especially at higher elevations (Giambelluca et al. 2008). Rainfall shows a downward trend during the 20th century (Chu and Chen 2005). If climate change predictions of decreased rainfall during the winter (Timm and Diaz 2009) are correct, and air temperatures continues to increase, streamflow within Hawaiian watersheds may be reduced by 6.7 to 17.2% (Safeeq and Fares 2011) and recharge of groundwater aquifers may decrease (Wallsgrove and Penn 2012). Timm and Diaz (2009) modeled a 5% increase in precipitation during the summer, which could lead to an increase in streamflow and/or groundwater recharge, depending on intensity of rainfall.

Climate related changes to groundwater have been relatively small compared to non-climate drivers and typically have a substantial temporal lag to climate change compared to surface water systems (Green et al. 2011). No modeling of confined groundwater aquifers in response to climate change scenario have been conducted in Hawai'i and responses of other aquifers to future climate scenarios has varied (Green et al. 2011). Differences in local climate, soils, vegetation, surface runoff patterns, and interconnected geologic features affect recharge rates of aquifers (Wallsgrove and Penn 2012). These characteristics, as well as topography, spatial patterns in permeability of overlying sediments, may account for different responses of aquifers to future climate change scenarios (Green et al. 2011).

Levels of the fresh groundwater lens are influenced by daily and seasonal tide changes and other variations in sea level (Tribble 2008). Based on data from the NOAA tide station at Nawiliwili, Hawai'i, sea level has risen 1.53 ± 0.59 mm/yr over the past century (Fletcher et al. 2012). Models of sea level rise predict an increase in sea level up to 3 feet by 2100 (IPCC 2007). Rising sea levels in Hawai'i is expected to alter the transition zone between fresh and salt water, increasing salt water intrusion into coastal aquifers (Wallsgrove and Penn 2012).

Morphologic changes in Hawaii's shoreline result from seasonal variability of the wave cycle, extreme events (e.g., tsunamis), and long-term sea level changes and sediment budgets. Long-term shoreline change rates during the past century in the vicinity of Barking Sands are stable to erosional averaging -0.04 ± 0.08 m/yr. Short term shoreline change since 1940 has accreted at an average of 0.18 ± 0.11 m/yr (Fletcher et al. 2012).

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 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.

Phosphorus 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 project site for the Mānā Plain Wetland Restoration Project 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 (USACE 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 Kawai‘ele 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.

Future Predicted Climate Change

Hawai‘i has taken preliminary steps to mitigate and adapt to climate change to lessen climate-related risks (Wager 2012). Hawaii’s Clean Energy Initiative was signed during 2008 and a framework for Climate Change Adaptation in Hawai‘i was developed by ICAP and ORMP during 2009. The Climate Change Task Force established during 2009 was never funded; however, climate change adaptation priority guidelines were added to the Hawai‘i State Planning Act by during the 2012 legislative session (Act 286, HRS 226).

The proposed project is consistent with Hawaii’s priority guidelines for climate change adaptation. Specifically the proposed project meets guideline four that “encourage[s] the preservation and restoration of natural landscape features, such as coral reefs, beaches and dunes, forests, streams, floodplains, and wetlands, [which] have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change” (Wager 2012). Although the project site is outside of priority watersheds, the proposed project implements several strategies identified in DLNR’s The Rain Follows the Forest initiative that addresses climate change impacts of freshwater resources. Strategies implemented as part of the proposed project include removing invasive species, controlling non-native predators, restoring of native plants, and educating the public about the importance of watershed conservation.

Predictions of sea level rise and potential changes in climate-related groundwater resources will require that management actions are implemented in an adaptive framework. This will be accomplished through the adaptive management plan for the site. The adaptive management plan will incorporate monitoring of water use, water quality, and habitat response. Evaluation and integration of this information into future management actions at the site is consistent with climate change policy guidelines. In addition, long-term monitoring efforts will contribute to data collection needs that increase our understanding of climate-related spatiotemporal trends in groundwater quantity and quality. Use of solar and energy efficient design specifications in the planned visitor center will contribute to Hawaii's Energy Efficiency Program, part of Hawaii's Clean Energy Initiative that signed by the State of Hawai'i and the U.S Department of Energy during 2008.

The proposed project is set back from the shoreline and will not impact rates of shoreline change. Relatively stable shorelines in the vicinity of Barking Sands will help to protect the project site from direct inundation as a result of sea level rise. The proposed project will not increase flooding risk to surrounding lands and will be designed to reduce negative impacts associated with flooding. Project water demands are also within the sustainable yield of the aquifer.

Although temperature is expected to increase, there is more variability and uncertainty in predictions of changes in precipitation and the associated uncertainty in response of the aquifer. Restoration of wetlands habitats will contribute significantly to recovery of endangered waterbirds before predicted climate change scenarios are estimated to have an effect on restored habitats. Predicted increases in salinity may eventually affect species composition of waterbirds at the site, but all species of endangered waterbirds can use slightly brackish water wetlands. DOFAW supports adaptive climate change policy and planning tools and will collaborate with surrounding landowners, State and Federal agencies, and other organizations interested in climate change adaptation policy to ensure the project continues to be consistent with policy guideline changes based on new science.

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 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 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 columbianus*), 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 (*Poecilia* 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 (MBTA).

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.

Plants

‘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 known 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 (2009b), 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.



Pa'uohi'iaka is a sprawling non-woody vine found on dry sandy and rocky coastal substrates that are well drained. Pa'uohi'iaka 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 Hawai'i. 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.

A'a'li'i 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 A'a'li'i 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.

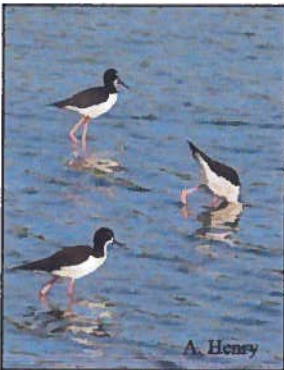
Wildlife

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 Hawai'i. 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 Lāna'i and Kaho'olawe, however most birds found outside of Kaua'i are likely hybrids. Hawai'i 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 a'eo (Mitchell et al. 2005).



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).

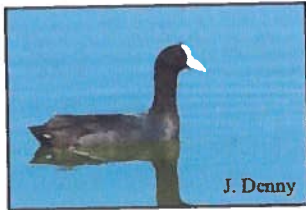
'Alae 'ula (Hawaiian Moorhen, *Gallinula galeata sandvicensis*)

'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 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 Waterbird 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*)

‘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*)

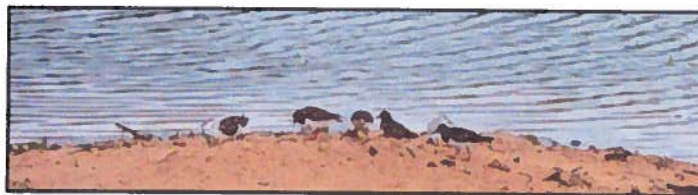
‘Akē‘akē are candidate species for listing under the Federal ESA and state listed as endangered. This species has been heard ground calling from very steep, rocky cliffs along the Na Pali coast and in Waimea Canyon on the island of Kaua‘i. ‘Akē‘akē feed by scooping up prey with their bill at, or just 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 MBTA 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 MBTA 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 MBTA. 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 Statewide 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 widgeon are rare winter migrants in Hawai‘i. State Waterbird Survey counts averaged 20 birds from 1986 to 2003 (Mitchell et al. 2005). American widgeon have not been observed on the Mānā Plain during winter State Waterbird Surveys from 1986 to 2004. American widgeon 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 Hawaii’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 use the Mānā Plain year round and exhibit seasonal movements on west Kaua‘i with higher use of low elevation habitats during the late summer and fall, suggesting the Mānā Plain is an important area for foraging and possibly fall mating bats (Bonaccorso and Pinzari 2011). ‘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. In addition to the non-native mammals that have historically posed a threat to these native bird species, the recent capture of two Indian mongooses (*Herpestes javanicus*) in the proximity of Nawiliwili Harbor, confirms the existence of these extremely detrimental predators on the island of Kaua‘i.

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 submerged 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. Kawaiʻele, 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 Kawaiʻele 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 vicinity of the nests will be postponed so as not to disturb nesting birds. This will continue until eggs hatch and the young fledge.

Surrounding the project site with a fence that excludes at least large non-native mammals will greatly reduce the risk of predation to endangered waterbirds. If funding is available a predator proof fence with a smaller mesh size that excludes small non-native mammals as well as larger mammals will be installed. With the recent confirmation of the existence of mongoose on Kaua‘i, this aspect of the management plan has even greater significance. DOFAW staff will employ regular predator control activities for species that are not excluded by the fence, thus further reducing the risk to endangered waterbirds. These control efforts would result in an overall reduction in the population of non-native mammalian predators in and around the project area. Thus, these actions would not only benefit native waterbirds found within the project area, but would also benefit those inhabiting adjacent areas. To reduce the risk of predation by rodents, DOFAW staff will deploy bait stations within the perimeter of the project area according to pesticide registration regulations and only use attractants approved for use in close proximity to wetland areas.

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 underworld, 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 Kawai‘ele, 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 Kawai‘ele 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 Kawai‘ele 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 PMRF was established during 1958.

An archeological survey of the project site was conducted during 2004 by Hawai‘i State Parks archaeologists Martha Yent, and Alan Carpenter, with assistance from Nancy McMahon, a Kaua‘i 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 diminished. 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) Kaumuali'i Highway, 2) the gravel road to the south of the highway, and 3) the pull off area at Kawai'ele. 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 Kaumuali'i Highway, the Kawai'ele 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 PMRF. 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 Kawai'ele, 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 Kawai'ele which is a public viewing area, as well as the view plane from Kaumuali'i Highway. Locations dominated by low-growing invasive vegetation where ridgelines that dominate the western landscape of Kaua'i 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 plane 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 (PM₁₀). No other air pollutants are monitored at this station. The 2006 annual mean for PM₁₀ at this station was 11 µg/m³ and air quality never exceeded the Federal standard of 150 µg/m³; the highest recorded

value was 34 $\mu\text{g}/\text{m}^3$ (DOH 2007). No air quality data were reported for the island of Kaua'i during 2009 or 2010 (DOH 2010b, 2011b). 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 PMRF 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 PMRF 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

Kaumuali'i 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 Kawai'ele pump station and the southern portion of the project site. Traffic along Kaumuali'i 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 PMRF 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 SOCIOECONOMICS

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.

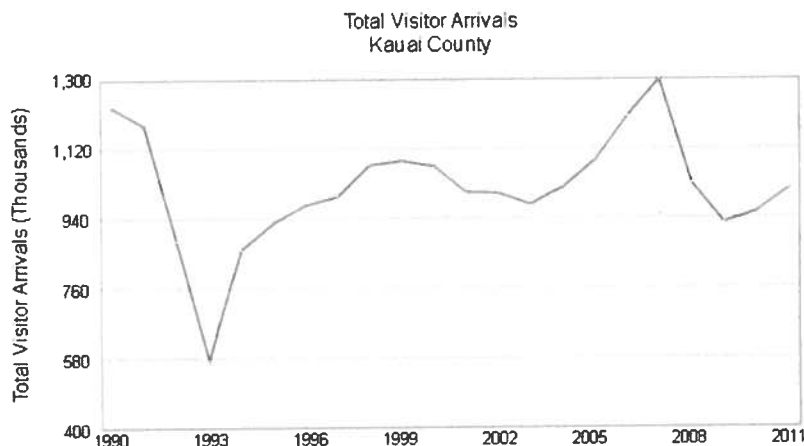


Figure 3.9 - 1. Annual total visitor arrivals to the County of Kaua‘i from 1990 to 2011. Data from UHERO-Kaua‘i Interactive Database (2012).

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 USFWS 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

PMRF, 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 (PMRF 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 (PMRF 2010) shows the location of the proposed projects in relation to the PMRF anti-terrorism/force protection and the restrictive easement.

Although in close proximity to PMRF, the project site is currently State-owned land and is designated as a Forest Reserve. The intent of DOFAW is to develop and manage this site for the benefit of the four endangered Hawaiian waterbirds. PMRF base expansion is not planned, however may be a possibility. Through eminent domain, the U.S. Navy is permitted to claim land for public purpose. However, the Fifth Amendment to the U.S Constitution forbids the confiscation of property "without just compensation", thus requiring the State to receive a fair market value for any land confiscated.

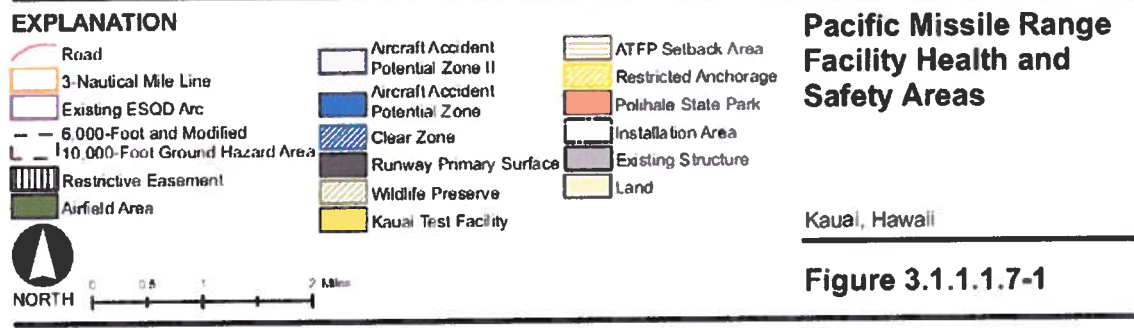
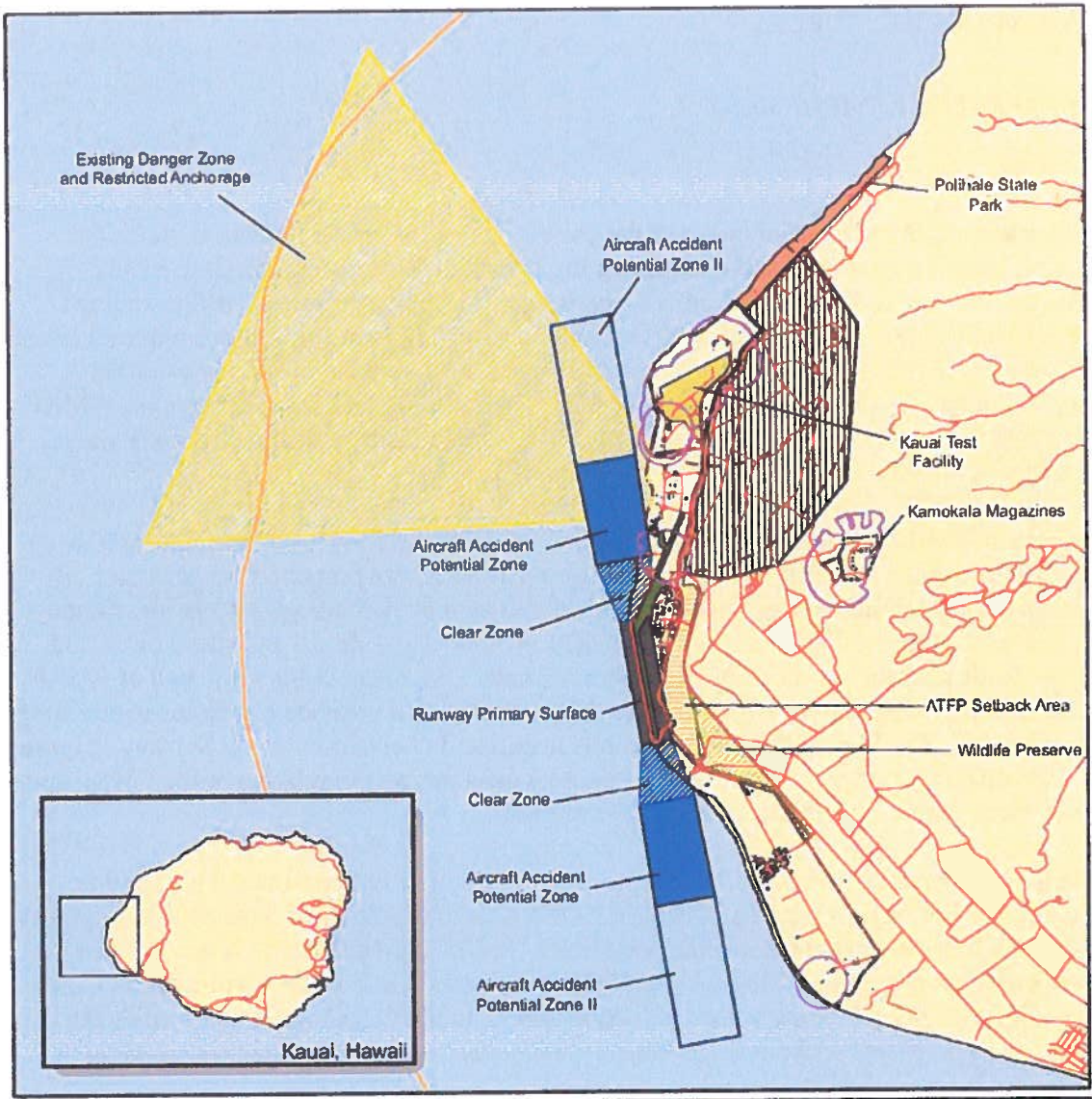


Figure 3.10 - 1. Location of the Mānā Plains Forest Reserve (green hatch marks and labeled Wildlife Preserve) in relation to health and safety areas at the Pacific Missile Range Facility. ATFP is the anti-terrorism/force protection setback; ESQD is the explosive safety quantity distance area (from PMRF 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 military aircraft were geese (*Chen caerulescens*, *Branta canadensis*) (Zakrajsek and Bissonette 2005). 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 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 (PMRF 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 (PMRF 2008). Reported bird aircraft strikes at the PMRF from 2004 through January 2012 (PMRF 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 (PMRF 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 USFWS, 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 (PMRF 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 (PMRF 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 (PMRF 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 a large breeding population of nēnē, as have other open water and wetland areas on Kaua'i. The only documented case of successful nēnē nesting at Kawai'ele occurred during the winters of 2011-2012 and 2012-2013, when a single pair successfully nested each year. 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 is likely due to the limited amount of vegetation and preferred food sources. 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 BLNR during 2004. The API ensures that land on the Mānā Plain owned by the State of Hawai'i and leased to ADC 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 State of Hawai'i BLNR 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-foot 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. The BASH program will continue to be managed through the PMRF BASH Plan (PMRF 2008).

DOFAW will continue to cooperate with the U.S. 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 Hawai‘i, 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 existence of only marginal habitat for the four target species of endangered Hawaiian waterbirds on the makai side of the PMRF runway, along with 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 BASH 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 Hawai‘i is not unique to this project. Marine Corps Base Hawai‘i (MCBH), at Kāne‘ohe Bay on the island of O‘ahu, contains more than 130 acres of wetlands (USACE 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 Wetland Restoration Project has been developed. Of all the Department of Defense services in Hawai‘i, MCBH is the most active in managing its wetlands, recognizing the value and importance of this resource (USACE 2009). Enlargement of the percolation ditch wetlands by grading and planting during 2006 more than doubled the area of the wetland, which “quickly became the home of a family of endangered Hawaiian coots”

(USACE 2009:35). The percolation ditch wetlands are between 7,000 and 8,000 feet from runway 04/22, the principal runway at MCBH. This distance is less than the recommended 10,000 feet that FAA has established for public use runways.

Since the early 1980s, wetland management activities at MCBH have included invasive vegetation control, including deliberate manipulation of invasive plants that appears to benefit Hawaiian stilts (Drigot 2000). One method used to control invasive vegetation is the annual “mud ops” maneuvers by Marine Corps Assault Amphibian Vehicles (AAVs). The AAVs are deployed in supervised plow-like maneuvers prior to the silt nesting season to break open thick mats of pickleweed. This improves nesting and foraging opportunities for stilts and their young by opening up wetland habitats that would otherwise be covered with dense vegetation (Drigot 2000). The soil disturbance mimics succession that occurs in natural wetlands and increases availability of aquatic invertebrates, an important food source for stilts and their young.

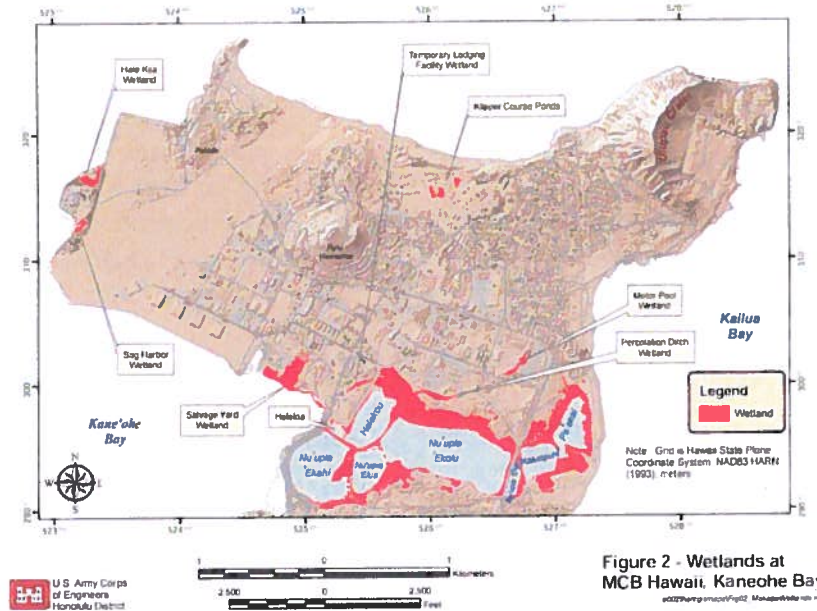


Figure 3.10 - 2. Distribution of 130 acres of wetland habitat located at the Marine Corps Base Hawai'i, at Kāneʻohe on the island of Oʻahu (USACE 2009:11).

In the 1990s more than \$2,000,000 was spent to help remove approximately 20 acres of mangrove forests that were inundating portions of the MCBH 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 MCBH continued their efforts to eradicate invasive mangrove forests by clearing the Sag Harbor wetlands (USACE 2009). At approximately 30,000 square feet, the Sag Harbor wetland is substantially smaller than the proposed project, however, it is located less than 1,500 feet from runway 04/22, the principal runway at MCBH (Figure 3.10 - 3). MCBH wetlands have increased and improved since 2002 and they hope that the upward trend will continue, stating that “stewardship of the environment and natural resources benefits everyone” (USACE 2009:37).



Figure 3.10 - 3. Sag Harbor Wetland at Marine Corps Base Hawai'i at Kaneohe on the island of O'ahu in relation to runway 04/22.

Another example of the coexistence of wetland habitats with military bases is at Joint Base Pearl Harbor-Hickam (JBPHH) in Honolulu. Located approximately 6,000 feet from runways shared by the U.S. Navy, U.S. Air Force, and Honolulu International Airport, is a 9-acre coastal wetland, adjacent to Āhua Reef. Since 2007 JBPHH staff have been organizing volunteer clean up and restoration days at this wetland (Len 2010). These activities are being done to “help restore and preserve [these] habitats for the native plants and shorebirds” (Dasbach and Hetzel 2011). JBPHH currently has a population of shorebird species, including the endangered and endemic Hawaiian stilt and the native Pacific golden plover. Both these species are targeted benefactors of the Mānā Plain Wetland Restoration Project. The stilt and plover utilize the wetland habitats adjacent to Āhua Reef for food resources and shelter. The JBPHH natural resources specialist embraces his role as “caretaker” of Āhua Reef: ‘as the stewards of the natural areas at JBPHH, we work to conserve and rehabilitate this small but unique wetland for its recreational and aesthetic value and for the importance of habitat it provides for Hawaii’s many rare plants and critters’ (Len 2010).

These references to the wetland restoration and management practices that are occurring on MCBH, Kaneohe and JBPHH show that wetlands, which provide habitat for endangered Hawaiian waterbirds, can coexist with military installations that engage in air operations.



Figure 3.10 - 4. Nine acre coastal wetland adjacent to Āhua Reef at Joint Base Pearl Harbor-Hickam.

Nēnē (Hawaiian geese)

Nēnē (*Branta sandvicensis*) use a wide variety of habitats and are attracted to open areas on Kaua‘i, particularly deep, open water areas surrounded by short irrigated grasses. Nēnē have been viewed and documented loafing, molting, and nesting at the existing Kawai‘ele parcel and in various other locations throughout the west side of Kaua‘i, including agricultural ditches, open grassy areas, agricultural fields, and open grassy habitats at PMRF. The nēnē that have been viewed at Kawai‘ele ponds and in agricultural ditches are most often observed in water exceeding a depth of 2 ft. Nēnē have also been observed flying from the surrounding agricultural fields directly to habitats at PMRF, nonstop over the existing Kawai‘ele parcel.

DOFAW acknowledges and understands the U.S. Navy's concern that a breeding population of nēnē in the vicinity of the PMRF runway poses a risk to the safe operation of aircraft. To address this concern, the wetland design and management plan for the Mānā Plain Wetland Restoration Project is designed to provide habitat for obligate wetland species (Hawaiian moorhen, Hawaiian coot, Hawaiian stilt, Hawaiian duck) rather than for nēnē. In addition, the plan incorporates measures to minimize the potential for nēnē to be attracted to the site, such as 1) not mowing, irrigating, or fertilizing grass lawns or other grassy areas; 2) vegetating berms with mesic and xeric plants not known to be a food source for nēnē; and 3) managing restored wetlands as shallow (< 2 ft deep), seasonally flooded habitats. The proposed project differs from the Kawai‘ele parcel because it does not contain deep water ponds. In addition, 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.

Additionally, DOFAW plans to work with the USFWS and the Nēnē Recovery Action Group (NRAG) in an effort to develop an island-wide strategy for the management and conservation of nēnē on Kaua‘i. This plan, once developed, will identify areas where conservation and recovery efforts for nēnē should be focused, areas where nēnē can be managed, and areas unsuitable for nēnē. Unsuitable and managed areas will be determined by assessing potential adverse impacts to the species as well as human conflict issues (i.e., human safety, crop depredation). The strategy will also outline conservation tools available to manage nēnē populations, which may include, but is not limited to: predator control, habitat modification and restoration, and translocation to other sites on Kaua‘i or to neighbor islands. The goal of this island-wide strategy will be to ensure the management of nēnē is consistent with species recovery goals while minimizing the potential for human conflict. The management plan for the Mānā Plain Wetland Restoration Project will be consistent with this island-wide strategy, and will implement such management actions as identified in that strategy.

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 USFWS to keep their permits updated, which will enable the U.S. Navy to legally respond to nēnē 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.

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 Hawai‘i 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 (PMRF 2008). Although once common in the Hawaiian Islands, the number of migratory waterfowl in Hawai‘i 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 statewide 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 Hawai‘i 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” (PMRF 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 sandwicensis*) are native to Hawai‘i 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.

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 (*Geopelia 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 three species will likely decrease due to the removal of upland grasslands and shrubs; therefore, known BASH 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 Kauaʻi and throughout Hawaiʻi 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 Kauaʻi was planted during 1878 near Kekaha by Valdemar Knudsen and Captain Han L'Orange (Hawaiian Sugar Planters' 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. 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” (ADC 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 (ADC 2008). The agricultural lands on the Mānā Plain have been identified as important agricultural lands (IAL) in the County of Kauaʻi (University of Hawaiʻi 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 Hawaiʻi, and Dow AgroScience mainly produce corn, sunflower, soybean, and cotton. They employ between 490 and 635 individuals from the County of Kauaʻi, 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 statewide (Koopman and Pitt 2007). Cardinals (*Cardinal cardinalis*) 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 planned restoration project. However, if this behavioral adaptation should occur DOFAW would work in cooperation with the agricultural community, USFWS, and the Natural Resources Conservation Service to develop strategies to minimize the potential for crop damage. In addition DOFAW will collaborate with the aforementioned 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.

3.12 CONTAMINANTS

3.12.1 AFFECTED ENVIRONMENT

The project site includes historical fields used for sugarcane cultivation from approximately the early 1920s through the mid-1990s. Since sugarcane production ceased, the project site has been fallow, dominated by non-native vegetation. Diversified agriculture practices, including the cultivation of corn, soybean, and sunflower, are implemented in other areas of the Mānā Plain that were also historically used for sugarcane production. Currently, there is no direct application of pesticides at the project site. Herbicides are periodically used in terrestrial habitats at the Kawaiʻele Waterbird Sanctuary when mechanical control of non-native invasive species is not effective.

The DOH has no records of hazardous substances being released, or sugarcane operations involving chemical mixing within the project site. Antimony, barium, beryllium, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc concentrations in soils sampled near the project site were all below the Environmental Action Level (EAL) guidelines for residential use. These guidelines were established by the State of Hawaiʻi (AECOM Technical Services, Inc. 2012, DOH 2011a).

Herbicides account for the majority of pesticide use in Hawaiʻi sugarcane production. Herbicides commonly used for sugarcane cultivation include atrazine, diuron, pendimethalin, glyphosate, ametryn, triflurin, 2-4-D, and hexazinone (Santo et al. 2000). Since the 1890s, control of insect pests on sugarcane fields was primarily done with the use of biological control methods (Santo et al. 2000). Therefore, the overall use of insecticides in sugarcane production was very low.

The DOH, Hazard Evaluation and Emergency Response (HEER) Office has evaluated multiple data sets of chemicals with high persistence in sugarcane fields. This includes some recent data for fields operated by the former Kekaha Sugar Company. Dioxin levels (from historical use of pentachlorophenol or PCP) in all fields investigated, were well below the unrestricted EAL of 240 ng/kg considered safe for residential use. Atrazine and ametryn degrade relatively rapidly and are not significantly persistent in the soil (DOH and Tetra Tech EM, Inc. 2011).

Elevated levels of arsenic found in some areas of Hawaiʻi are likely due to the use of sodium arsenite and other arsenic-based pesticides used for sugarcane production (DOH 2010a). Highest concentrations of arsenic are associated with historical pesticide mixing areas. Arsenic levels in soils sampled on the Mānā Plain ranged from 1 to 14.7 mg/kg (AECOM Technical Services, Inc. 2012), well below the EAL of 24 mg/kg (DOH 2012). However, soils from the PMRF show some elevated levels of arsenic up to about 95 mg/kg total arsenic, that do not appear to be associated with military operations (DOH, unpublished data).

In response to comments received during the Draft Environmental Assessment, HEER provided recommendations for testing soil at the project site for residual arsenic to ensure that it would be suitable for the planned restoration efforts. During April 2013 DOFAW assisted an independent consulting firm with the collection of 100 soil samples. The samples were evenly distributed across the 105 acre project site. Total arsenic levels from soils collected at the project site ranged

from 16.4 to 18.5 mg/kg, below the EAL of 24 mg/kg (Integral Consulting, Inc. 2013). Based on State of Hawai'i DOH guidance, soils with total arsenic less than 24 mg/kg are considered representative of represent natural background concentrations (DOH 2011c). Based on the findings of the report, the DOH HEER determined "that the site does not pose a threat to human health and the environment, and therefore warrants a No Further Action Determination" (DOH 2013).

Currently, pesticides are used on agricultural fields throughout the Mānā Plain to control insects and weeds that reduce crop yields. Some of the common pesticides used include the herbicides s-ethyl dipropylthiocarbamate (the active ingredient in eradicane), glyphosate N (phosphonemethyl), and atrazine, as well as the insecticides chlorpyrifos and fipronil (Pesticide Action Network 2012). These pesticides are not currently applied to, or immediately adjacent to the project site. The persistence, mobility, and toxicity of commonly used pesticides for agricultural production on the Mānā Plain are summarized in Table 3.12 - 1.

Table 3.12 - 1. Half-life, mobility, and comparative oral toxicity of pesticides used for agricultural production on the Mānā Plain. Data compiled from sources listed below. Note these pesticides are not currently used at, or immediately adjacent to the project site.

Pesticide	Half-life ^a (days)	Mobility in Soil	Toxicity to Birds ^b	Toxicity to Fish	Source(s) ^c
<i>Herbicides</i>					
S-ethyl dipropylthiocarbamate	14-30	Moderate			
Glyphosate	2-174	Nearly Immobile	Practically non-toxic	Practically non-toxic ^d	1,6
Atrazine	90-120		Slightly toxic	Slightly toxic	1,2
<i>Insecticides</i>					
Chlorpyrifos	11-141	Nearly Immobile	Moderately toxic	Highly toxic	4,7
Fipronil	124-129		Practically non-toxic		3,5

^a Half-lives reported from literature vary depending on soil characteristics and environmental conditions.

^b Based on reported LD₅₀ values. Data for mallard ducks included when available.

^c 1 = Capinera (2011); 2 = EPA (2006); 3 = Jackson et al. (2009); 4 = Extension Toxicology Network (1993); 5 = Gunasekara and Troung (2007); 6 = Extension Toxicology Network (1994), 7 = Oregon State University (2010).

^d Some surfactants used in glyphosate herbicides are moderately to highly toxic to fish.

3.12.2 ENVIRONMENTAL CONSEQUENCES

NO ACTION ALTERNATIVE

Under this alternative no wetland restoration or habitat management activities will occur at the project site. The four species of endangered Hawaiian waterbirds will continue to be restricted to existing and limited aquatic habitats on the Mānā Plain. These species do not forage in agricultural crops cultivated on the Mānā Plain and therefore would not be directly exposed to pesticides used in agricultural fields. Herbicides will continue to be periodically used in

terrestrial habitats at the Kawai‘ele Waterbird Sanctuary when mechanical control of non-native invasive species is not effective.

PREFERRED ALTERNATIVE

Under the preferred alternative, wetlands will be restored in the project site. The project site was taken out of agricultural production during the late 1990s and no agricultural pesticides have been applied at the project since sugarcane cultivation ceased. In order to achieve the goals of the restoration project, habitat management activities may require limited application of pesticides in terrestrial habitats and/or application of pesticides approved for use over wetland habitats. An example of this would be to control non-native, invasive plant species if mechanical means were not effective. All chemical treatments for invasive species control will be applied according to State and Federal laws and label instructions, observing all safety precautions.

The proposed project will result in an increase of endangered endemic waterbirds at the project site. In addition, environmental education and recreation opportunities will increase public use at the project site. Because the use of pesticides for agricultural purposes no longer occurs at or immediately adjacent to the project site, there is no direct exposure of wildlife or humans to agricultural pesticide use at the project site. As summarized below, residual pesticides at the project site are minimal and are not expected to pose risks to wildlife or humans.

Pesticides of potential concern in fields historically used for sugarcane include dioxins/furans, organochlorine pesticides, arsenic, and lead (DOH and Tetra Tech EM, Inc. 2011). The organochlorine pesticide, pentachlorophenol (PCP) degrades over time and therefore is of relatively low risk. However, PCP pesticides contains dioxin, which can persist in the soil longer than PCP (DOH and Tetra Tech EM, Inc. 2011). However, because dioxin levels in sugarcane fields tested by the DOH are well below the EAL for residential use, they are not expected to be a risk to wildlife or humans at the project site.

Lead and arsenic reported from soils tested near and at the project site were below the EAL established for each metal, (AECOM Technical Services, Inc. 2012, Integral Consulting, Inc. 2013) and therefore are not expected to be a risk to wildlife or humans at the project site. Arsenic can be accumulated from the water by a variety of organisms, however, there is no evidence of magnification along the aquatic food chain (Eisler 1998). Bird species that have been tested for arsenic have had relatively low levels, even in areas of smelters and heavy use of arsenical herbicides (Eisler 1998). Given the low levels present at the project site and other historical sugarcane fields near the project site and the low risk of arsenic to birds, no negative impacts to the endangered waterbirds are anticipated.

Atrazine is classified as slightly toxic to birds (Capinera 2011), but because it is not used at or directly adjacent to the project site, it is not expected to be a risk to endangered waterbirds. In addition, atrazine degrades relatively rapidly, and therefore any historical application of atrazine at the project site during sugarcane production is not likely to persist and therefore is not expected to be a risk to endangered waterbirds. Other chemicals, such as ametryn and glyphosate either degrade relatively quickly or have low toxicity to birds and therefore no negative impacts to endangered waterbirds are anticipated.

Fipronil and its metabolites have been detected in several water bodies in urban and agricultural areas throughout the United States, but at low concentrations (Gunasekara and Troung 2007). No concentrations were reported for waters in agricultural areas in Hawai'i. The basal groundwater aquifer below the Mānā Plain is classified as having a low vulnerability to contamination based on environmental conditions of the aquifer (Mink and Lau 1992). In addition, several pesticides currently used are immobile or have relatively low mobility in soils and are therefore not expected to leach into the basal groundwater.

Chlorpyrifos is moderately toxic to mallards (Oregon State University 2010) but because it is not used at or directly adjacent to the project site, it is not expected to be a risk to endangered waterbirds. Chlorpyrifos binds strongly to soil particles and therefore does not easily move into the groundwater (Oregon State University 2010). By-products of chlorpyrifos that do not bind to soils can more easily move into groundwater (Oregon State University 2010), but the basal groundwater aquifer below the Mānā Plain is classified as having a low vulnerability to contamination based on environmental conditions of the aquifer (Mink and Lau 1992). To minimize potential ecological risks of chlorpyrifos, "the technical registrants have agreed to label amendments which include the use of buffer zones to protect water quality, fish and wildlife, reductions in application rates, number of applications per season, seasonal maximum amounts applied, and increases in the minimum intervals for retreatment" (EPA 2002).

DOFAW will test surface water that will be used for management of wetland habitats at the project site. These tests will evaluate if residual pesticides currently being used in agricultural fields on the Mānā Plain are entering surface water in the northern main drainage canal that crosses the project site and is proposed as a potential water source for some of the restored basins. DOFAW will report all test results to DOH, the agency responsible for regulating water quality in Hawai'i. If these tests show high levels of residual pesticides that are detrimental to waterbirds, surface water will not be used as a water source for the restored wetland habitats.

Because some pesticides used in agricultural fields are known to be toxic to fish and other organisms, DOFAW encourages surrounding landowners to use pesticides according to EPA registration and label requirements to minimize the effects of pesticide use on the Mānā Plain. For example, the EPA established a framework for developing an aquatic ecosystem level of concern that ensures atrazine concentrations in watersheds will not cause significant change in aquatic plant community structure, function, and productivity (EPA 2012). DOFAW will monitor water quality at the project site as an adaptive management practice while managing the restored wetlands.

CHAPTER 4: INDIRECT AND CUMULATIVE EFFECTS

The return of wetland habitat and the associated native plant and animal species 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. It is also a place 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 remain under current conditions and would not have the potential for being improved, as no new wetland habitats would be created to filter excess nutrients. Similarly, irrigation waste (e.g., plastic tubing) would not be removed from the site. 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 BLNR 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 KEDIS 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 (County of Kaua'i 2004). 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 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), 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

HRS 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 project 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 BLNR 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

HRS 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.

The State of Hawai‘i is one of thirty four states that have approved coastal management programs under the National Coastal Zone Management Act (CZMA), an innovative voluntary Federal-State partnership. Under the CZMA, the State of Hawai‘i Coastal Zone Management Program (CZMP) was developed in order to protect and preserve land and water issues in coastal zones. In the Coastal Zone Act Reauthorization Amendments of 1990, Congress added Section 6217, which calls upon states/tribes with federally approved coastal zone management programs to develop and implement coastal nonpoint pollution control programs. Hawaii’s Coastal Nonpoint Pollution Control Program (CNPCP) includes management measures and practices for the protection and restoration of wetlands. Preliminary inventories of wetlands in Hawai‘i have included assessments of water quality, but their polluted runoff control potential on a watershed or landscape scale has not been assessed (Hawai‘i CZMP 1996). DOFAW will follow best management practices and get the necessary permits required for construction activities that are designed to control and minimize polluted runoff. Best management practices will be implemented throughout construction and management of the project site, with an emphasis on maintaining water quality parameters established for wetlands by DOH. The proposed project may also improve water quality of water within the restored wetlands and increase flood attenuation in the local area. However, as required for the CNPCP, this project will not likely service as “a significant nonpoint source pollution abatement function” because of its location with respect to other land uses within the watershed.

The proposed project is within the CZMA defined by HRS Chapter 205A-1. The proposed project is consistent with the policies and objectives of the CZMP described in HRS Chapter 205A-2 and outlined below. Restoration activities to be undertaken by DOFAW during this project will remain in compliance with the objectives and policies put forth in this chapter.

HRS 205A-2b and 205-2c Coastal Zone Management Program – Objectives and Policies

(1) Recreational resources

The proposed project is consistent with the objectives and policies for recreational resources because the project will provide increased recreational and educational opportunities accessible to the public. Trails and observation overlooks will provide pathways for the public to walk along and observe and photograph native Hawaiian plants and animals. A visitor’s center will also be built that will provide more activities in the area. This project restores a portion of the unique historical “Mānā Swamp” that was a significant natural and cultural resource on the Mānā Plain. All public access will be consistent with the conservation of natural resources. The recreational opportunities in the project area will be unique and complement existing recreational opportunities accessible to the public on the west side of Kaua‘i, while also protecting this portion of the coastal area on the Mānā Plain.

(2) *Historic resources*

The goals of the proposed project objective are to protect and restore natural historical wetland resources on the Mānā Plain within the Mānā Plains Forest Reserve. Expansive wetland habitats totaling approximately 1,700 acres occurred on the Mānā Plain prior to conversion to agriculture. Native endemic waterbirds and plants will be restored to the area, preserving the natural history of the historical “Mānā Swamp.” An archeological assessment of the project site was completed and identified cultural and historical resources of the area. This area is significant in Hawaiian and American history and culture. The history, culture, and use of natural resources on the Mānā Plain will be included in interpretive materials.

(3) *Scenic and open space resources*

The proposed project will improve the quality of coastal scenic and open space resources by restoring native habitats on 105 acres that are currently dominated by non-native invasive vegetation. The proposed project will be a valued scenic resource and will be maintained and protected to uphold the quality of scenic space. Following restoration, non-native invasive species will decrease and native plants and animals will increase, creating a more natural and scenic view.

(4) *Coastal ecosystems*

The proposed project will increase coastal wetland habitats. The coastal wetland ecosystem in Hawai‘i has substantially declined due to development and agricultural activities. Coastal wetlands can play a healthy role in helping manage coastal areas by filtering out pollution before watershed systems empty into the ocean. Wetlands also retain nutrients for the growth of aquatic life within the wetland. Wetlands can also act as a barrier to coral reefs, and provide significant protection to the land against coastal storms. Design of the restored wetlands has included a sound conservation ethic. Adaptive management and monitoring will improve the technical basis for wetland management throughout Hawai‘i as well as maintain or enhance water quality.

(5) *Economic uses*

The proposed project will contribute to the State’s economy by creating a point of interest for residents and visitors interested in birds and natural resources. Increased visitor opportunities on the west side of Kaua‘i will benefit local towns as visitors and residents pass through the west side towns for fuel, food, or tourism. The restoration will provide job opportunities as it is anticipated that contractors will be used to implement restoration actions. In addition, DOFAW is planning to hire at least one biological technician for the project.

(6) *Coastal hazards*

The proposed project will restore coastal wetlands that can increase the capacity of the project area to store and filter storm runoff, thereby reducing non-point source pollution. The proposed project will not result in an increase in coastal hazards. Results of the flood study indicate that the simulated proposed project conditions do not appreciably differ from existing conditions and therefore will not increase flooding risk. All structures will be built in conformance with existing building codes designed to increase the ability of a structure to withstand damage from coastal hazards. The visitor center will be accessible to Highway 50, the tsunami evacuation route.

(7) *Managing development*

The State of Hawai'i DLNR DOFAW has collaborated with multiple partners in the design and review of the proposed project. In addition, DOFAW has developed a "Friends of Mānā" group and partnered with educational institutions to increase public participation and hands-on-training in the management of coastal wetland resources.

(8) *Public participation*

DOFAW has organized regular volunteer work days at the Kawai'ele Unit where the public has assisted with removal of invasive species and planting native vegetation. During these volunteer work days, DOFAW provides educational information for the public to learn about the importance of coastal wetlands. DOFAW has also led school field trips for interested classes. DOFAW plans to continue volunteer days and school field trips at the proposed project and will encourage public participation in assisting and protecting wetland and coastal areas on the island. With the collaboration of project partners, DOFAW has designed an informational brochure available on-line and at the local DOFAW office. The Hawai'i Wetland Joint Venture organized an on-site wetland restoration workshop to discuss management and restoration of coastal wetland resources. The proposed visitor center, trails, and information kiosks will further disseminate information to the public.

(9) *Beach protection*

The proposed project is not located at a beach or along the shoreline and will not interfere with public use or recreation activities along the Mānā Plain shoreline. The proposed visitor center and baseyard are inland from the shoreline setback and will be designed to minimize interference with the natural view plane.

(10) *Marine resources*

The goal and objectives of the proposed project are to protect and restore native coastal resources in an ecologically and environmentally sound manner using cost-effective techniques. The proposed project does not include ocean resources within the United States exclusive economic zone. However, the restoration of coastal wetlands could benefit

ocean resources. DOFAW has and will continue to coordinate with other coastal resource managers on the island of Kaua'i as well as researchers from other agencies and universities.

Section 5.3.4 Coastal Zone Management Act

The CZMA of 1972, administered by the NOAA Office of Ocean and Coastal Resources Management, encourage coastal States, Great Lake States, and United States territories and commonwealths (collectively referred to as coastal states) to develop comprehensive programs to manage and balance competing uses of and impacts to coastal resources. The National CZMP is an innovative voluntary Federal-State partnership. Hawai'i is one of 34 states that have approved coastal management programs that address a wide range of issues, including coastal development, public access, habitat protection, and water quality. Under the CZMA, the State of Hawai'i CZMP was developed in order to protect and preserve land and water issues in coastal zones.

In the reauthorization of the CZMA in 1990, Congress identified nonpoint source pollution as a major factor in the continuing degradation of coastal waters. Congress also recognized that effective solutions to nonpoint source pollution could be implemented at the State, Tribe and local levels. Therefore, in the Coastal Zone Act Reauthorization Amendments of 1990, Congress added Section 6217, which calls upon States and Tribes with federally approved coastal zone management programs to develop and implement coastal nonpoint pollution control programs. The Section 6217 program is administered at the federal level jointly by the Environmental Protection Agency (EPA) and NOAA. The protection and restoration of wetlands are two management measures identified in Section 6217 of the CZMA.

The proposed project will be in compliance with the objectives and policies of the Hawai'i CZMP, approved by NOAA OCRM and outlined in the State of Hawai'i Revised Statutes Chapter 205A. The proposed project removes 105 acres from agricultural production and restores and protects native wetland habitats that could protect coastal waters from nonpoint source pollution.

5.2.3 STATE HISTORIC PRESERVATION

HRS 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 supported by a Federal grant from the USFWS, which supports the policy to encourage 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 be 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 Hawai'i'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 Hawai'i. No wetlands currently exist within the project site, so the use of both water sources is compatible with Hawai'i'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 Kawai'ele pump station.

Surface water from the main canal water which feeds the Kawai'ele 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, Hawai'i 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 Hawai'i Administrative Rules Chapter 11-55 Water Pollution Control state that Hawaii'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 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, including those classified as "low wetlands" or "coastal wetlands."

Basic water quality criteria applicable to all waters
<p>All waters shall be free of substances attributable to domestic, industrial, or other controllable sources of pollutants, including:</p> <ul style="list-style-type: none"> (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.
<p>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.</p> <ul style="list-style-type: none"> (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.
<p>Narrative toxicity and human health standards.</p> <ul style="list-style-type: none"> (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).
<p>Numeric standards for toxic pollutants applicable to all waters.</p> <p>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.</p>
<p>Requirements applicable to discharges to state waters.</p> <p>See §11-54-4 for these standards which shall be enforced through effluent limitations or other conditions in discharge permits.</p>

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 USFWS as required by Section 7 of the Endangered Species Act.

5.3.2 MIGRATORY BIRDS

MBTA 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 USACE for the discharge of dredged or fill material into a wetland, navigable water, or jurisdictional waters of the United States.

DOFAW collaborated with the NRCS 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 USACE 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. EPA, the USFWS, 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.

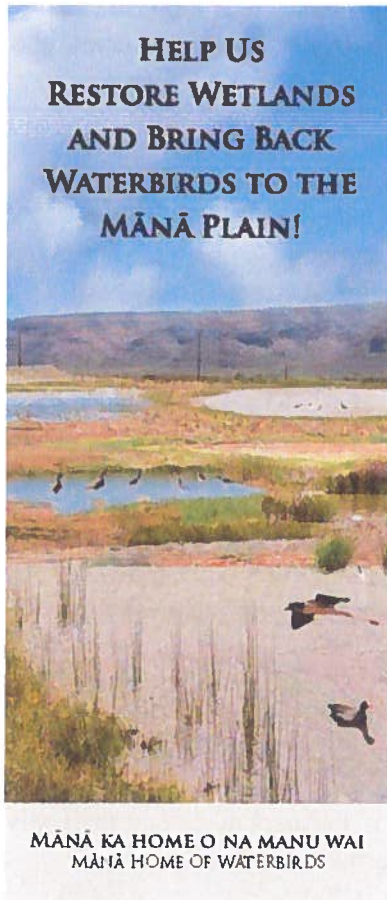


Figure 6.1 - 1. Photos of field data collection and restoration planning activities for the Mānā Plain Wetland Restoration Project.

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	Līhu'e, HI
DLNR Historic Preservation Office	Honolulu, HI
Ducks Unlimited, Inc.	Honolulu, HI; Vancouver, WA
Hawai'i 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 Hawai'i	Honolulu, HI
USFWS, Pacific Islands Fish and Wildlife Office	Honolulu, HI
USFWS, Kaua'i 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 two 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 about Hawaiian wetlands, native plants and animals, cultural and historical aspects of the Mānā wetlands, and Forest Reserve rules and regulations. Funding for the kiosks has been provided by the Hawai‘i Tourism Authority (HTA).

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 the Draft Environmental Assessment (DEA) was announced in a press release by the State of Hawai‘i DLNR DOFAW on January 3, 2012. This notice was also posted on DOFAW’s 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 at <http://thegardenisland.com/>. 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:

Federal Agencies

- 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

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

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

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 Appendix C 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 inquiries by phone and email regarding project location and project goals were also received and responded to by email or phone and were addressed in the DEA.

6.4 DRAFT ENVIRONMENTAL ASSESSMENT & PUBLIC INFORMATIONAL

MEETINGS

Consultation with agencies and the public was conducted to obtain input and comments on the published DEA document. This consultation consisted of: 1) a 30-day comment period under Hawaii’s environmental review process; 2) a public informational meeting in Lihue, Hawai‘i; and 3) a public informational meeting in Kekaha, Hawai‘i. Information from the review of the DEA was incorporated into this Final Environmental Assessment (FEA)

6.4.1 DRAFT ENVIRONMENTAL ASSESSMENT REVIEW

Notice of the availability of the DEA for this Mānā Plain Wetland Restoration Project was published in the May 23, 2012 issue of the State of Hawai‘i, DOH, Office of Environmental Quality Control’s *The Environmental Notice*, initiating a 30-day public comment period that ended on June 22, 2012. A link to the DEA was available in the May 23, 2012 issue of *The Environmental Notice*. The DEA was also available at the DOFAW office in Lihue and

electronically at DOFAWs website <http://hawaii.gov/dlnr/dofaw/announcements/2012>. Hard copies of the DEA were delivered to each of the six public libraries on Kaua'i and the State Public Library in Honolulu. Digital or hard copies of the DEA were sent to local organizations and County, State, and Federal agencies listed below.

Federal Agencies

- National Park Service
- U.S. Army, Engineer Division
- U.S. Department of Agriculture, Natural Resources Conservation Service
- U.S. Environmental Protection Agency – Pacific Islands Office
- U.S. Fish and Wildlife Service
- U.S. Navy

State Agencies

- Department of Agriculture
- Department of Agriculture, Agribusiness Development Corporation
- Department of Business, Economic Development, and Tourism
- Department of Education
- Department of Hawaiian Home Lands
- Department of Health
- DLNR Historical Preservation Division
- Department of Transportation
- Office of Hawaiian Affairs

County of Kaua'i

- Department of Parks and Recreation
- Department of Planning
- Department of Public Works
- Department of Transportation
- Department of Water

Elected Officials, Local Organizations, & Businesses

- Representative Derek Kawakami
- Representative Jimmy Tokioka
- Senator Ron Kouchi
- BASF
- DOW Agro Sciences
- Kekaha Agricultural Association
- Pioneer Hi-Bred International
- Syngenta Hawai'i

DOFAW received 15 written comments on the DEA. Six written comments were received from Federal, State, and County agencies. Nine written comments were received from the public either at the informational meetings, by mail, or electronically. Comment letter received from agencies, organizations, and individuals, along with corresponding response letters from

DOFAW are included in Appendix D. This FEA has incorporated additional information in response to comments received on the DEA.

6.4.2 LIHUE PUBLIC INFORMATIONAL MEETING

A public information meeting was held from 7 to 9 pm on May 29, 2012 at the Chiefess Kamakaha Middle School, 4431 Nuhou Street., Līhu‘e, Hawai‘i. Public notification of this meeting was published by the following: 1) the May 23, 2012 posting of the DLNR DOFAW press release on the DLNR DOFAW website and facebook pages; 2) the May 25, 2012 issue of the Honolulu Star Advertiser, and 3) the May 29, 2012 issue of The Garden Island.

Jason Vercelli, DOFAW biologist, opened the meeting and introduced project partners. AmeriCorps intern assisted with the sign-in sheet and informational table. Adonia Henry, wetland biologist with Scaup & Willet LLC, gave a presentation on the summarizing the Mānā Plain Wetland Restoration Project. Meeting attendees had the opportunity to ask questions, and provide oral and/or written comments on the DEA. Questions related to wetland restoration activities, water management, and other general aspects of the project were answered by DOFAW staff and project partners.

Oral comments received included comments pertaining to: 1) climate change; 2) surrounding land uses; 3) effects of current pesticide use outside the project site on the Mānā Plain; 4) bird-aircraft strike hazards; and 5) cost of restoration and management. A copy of the sign-in sheet and written comments received at the Līhu‘e meeting are included in Appendix D. This FEA has incorporated additional information in response to oral and written comments received during the public informational meeting in Līhu‘e.

6.4.3 KEKAHA PUBLIC INFORMATIONAL MEETING

A second public information meeting was held from 7 to 9 pm on May 30, 2012 at the Kekaha Neighborhood Center, 8130 Elepaio Road, Kekaha, Hawai‘i. Public notification of this meeting was published by the following: 1) the May 23, 2012 posting of the DLNR DOFAW press release on the DLNR DOFAW website and facebook pages; 2) the May 25, 2012 issue of the Honolulu Star Advertiser, and 3) the May 29, 2012 issue of The Garden Island.

Jason Vercelli, DOFAW biologist, opened the meeting and introduced project partners. AmeriCorps interns assisted with the sign-in sheet and informational table. Adonia Henry, wetland biologist with Scaup & Willet LLC, gave a presentation on the summarizing the Mānā Plain Wetland Restoration Project. Meeting attendees had the opportunity to ask questions, and provide oral and/or written comments on the DEA. Questions related to wetland restoration activities, water management, adaptive management/monitoring, wetland plant species, historical use of the project site, current sand-mining at Kawai‘ele, taro, archeological resources, public access, and other general aspects of the project were answered by DOFAW staff and project partners.

Oral comments received included comments pertaining to: 1) size of the project; 2) water quality; 3) effects of historical pesticide use at the project site; 4) effects of current pesticide use outside the project site on the Mānā Plain; 5) bird-aircraft strike hazards; and 5) cost of restoration and management. A copy of the sign-in sheet and written comments received at the Kekaha meeting are included in Appendix D. This FEA has incorporated additional information in response to oral and written comments received during the public informational meeting in Kekaha.

CHAPTER 7: FINDINGS AND 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 determination based upon the evaluation criteria prescribed for the State Approving Agency. A Finding of No Significant Impact (FONSI) has been determined for the Mānā Plain Wetland Restoration Project.

7.1 FINDINGS UNDER STATE CHAPTER 343, HRS

7.1.1 DETERMINATION

A Finding of No Significant Impact (FONSI) determination is warranted for the Mānā Plain Wetland Restoration Project at the Mānā Plains Forest Reserve based upon the assessment results and information provided in this Final EA. The results of the assessment conducted have determined that the proposed project should not have a significant impact on the surrounding environment. Evaluation of the project effects also included review of comments received on the Draft EA from agencies and the public.

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 wetlands in 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 BMPs 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 hazardous 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 Plain. 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 plane 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.

CHAPTER 8: LITERATURE CITED

- AECOM Technical Services, Inc. 2012. Hawaiian Islands soil metal background evaluation report. Prepared for State of Hawai'i, Department of Health, Hazard Evaluation and Emergency Response Office, Honolulu, Hawai'i, USA.
- ADC (Agribusiness Development Corporation). 1999-2009. NPDES Discharge Monitoring Reports for Outfalls #002 (Kawai'ele pump station) and #003 (Nohili pump station). Submitted to State of Hawai'i, Department of Health, Honolulu, Hawai'i, USA.
- ADC. 2008. Strategic plan. State of Hawai'i Department of Agriculture, Honolulu, Hawai'i, USA.
- Azambuja, L. 2011. County agrees to \$250K settlement with shrimp farm. The Garden Island, 21 March 2011. (http://thegardenisland.com/news/local/article_27b20748-545a-11e0-9c2c-001cc4c03286.html).
- Bishop Museum. 2010. Insects: native species, *Pantala flavescens*. Waipio Valley Stream Restoration Study, Hawai'i Biological Survey, Bishop Museum, Honolulu, Hawai'i, USA. <http://hbs.bishopmuseum.org/waipio/Critter%20pages/pantala.html> (5 January 2012).
- Bonaccorso, F., and C. Pinzari. 2011. Hawaiian hoary bat occupancy at the Pacific Missile Range Facility (PMRF) and satellite facilities. Final report prepared by U.S. Geological Survey, Pacific Island Ecosystems Research Center and Hawai'i Cooperative Studies Unit, University of Hawai'i, Hilo, Hawai'i, USA. 26pp.
- Bruland, G. L., R. A. MacKanzie, C. R. Ryder, and A. R. Henry. 2010. Assessment and monitoring of the water quality and habitat functions of natural, restored, and created wetlands of the Hawaiian Islands. Final report submitted to the Environmental Protection Agency, Region IX, Project Number CD-96981401. Department of Natural Resources and Environmental Management, University of Hawai'i, Honolulu, Hawai'i, USA. 52pp.
- Bruland, G. L. and R. A. MacKenzie. 2010. Nitrogen source tracking with $\delta^{15}\text{N}$ content of coastal wetland plants in Hawaii. *Journal of Environmental Quality* 39:409-419.
- Burt, R.J. 1979. Availability of ground water for irrigation on the Kekaha-Mānā Coastal Plain, island of Kauai, Hawaii. Hawai'i Division of Water and Land Development Report R53 (Revised), September, 50pp.
- Capinera, J. L. 2011. Insecticides and wildlife. ENY-511 (IN881), Entomology and Nematology Department, Florida Cooperative Extension Unit, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida, USA.
- Carter and Burgess, Inc. 2002. Planning for sustainable tourism in Hawaii, Part 1: Infrastructure and environmental overview, county of Kauai. Prepared for the State of Hawai'i Department of Business, Economic Development, and Tourism, Honolulu, HI, USA.

- Carver, E. 2009. Birding in the United States: A demographic and economic analysis. Addendum to the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, Report 2006-4. U.S. Fish and Wildlife Service, Division of Economics, Arlington, Virginia, USA. 16pp.
- Chang, Jen-Hu, 1962. The Role of Climatology in the Hawaiian Sugar-Cane Industry: An Example of Applied Agricultural Climatology in the Tropics. Contribution 121, Experiment Station, Hawaiian Sugar Planters' Association, Honolulu, Hawai'i, USA.
- Chu, P. S., and H. Chen. 2005. Interannual and interdecadal rainfall variation in the Hawaiian Islands. *Journal of Climate* 18:4796-4813.
- Chun, R.K. 1952. Flood of August 1950 in the Waimea area, Kauai, Hawaii. Geological Survey water-supply paper 1137-C, prepared in cooperation with the Territory of Hawai'i, Honolulu, Hawai'i, USA.
- County of Kaua'i. 2000. Kaua'i general plan. Planning Department, County of Kaua'i, Līhu'e, Hawai'i, USA.
- County of Kaua'i. 2004. Interim construction and best management practices (BMPs) for sediment and erosion control for the County of Kaua'i. Department of Public Works, April 2004. 86pp.
- County of Kaua'i. 2012. Kauai online hazard assessment tool (KOHA). <http://www.kauai.gov/default.aspx?tabid=433> (updated 15 January 2012).
- Cox, D.C., Burbank, N.C., and Kay, E. A., 1970, Proposed zones of mixing in coastal waters of Kauai. Memorandum Report No. 26, Water Resources Research Center, University of Hawai'i, Honolulu, Hawai'i, USA.
- Cronk, J. K. and M. S. Fennessy. 2001. Wetland plants: biology and ecology. Lewis Publishers, Boca Raton, Florida, USA. 462pp.
- Curtis, P. C. 2010. Kekaha farm owner has plans for much more than shrimp. The Garden Island. 25 November 2010. (http://thegardenisland.com/news/local/article_eaa5508-f915-11df-9580-001cc4c03286.html).
- Dahl, T. E. 1990. Wetlands losses in the United States 1780's to 1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C., USA. 13 pp.
- Dasbach, J. and S. Hetzel. 2011. Joint Base Harbor-Hickam celebrates World Wetlands Day. Ho'okele Pearl Harbor-Hickam News, 11 February 2011, available at <http://www.hookelenews.com/joint-base-pearl-harbor-hickam-celebrates-world-wetlands-day/>.

- DeMent, G. M. 2008. Quantifying the phosphorus sorption capacity of coastal lowland wetlands of Hawai'i. MS thesis, University of Hawai'i, Honolulu, Hawai'i, USA.
- DOH (Department of Health). 2007. State of Hawaii annual summary 2006 air quality data. Report prepared by the State of Hawai'i Department of Health, Clean Water Branch, Honolulu, Hawai'i, USA.
- DOH. 2010a. Arsenic in Hawaiian soils: questions and answers on health concerns. Arsenic in soils factsheet. Hazard Evaluation and Emergency Response Office, Honolulu, Hawai'i, USA.
- DOH. 2010b. State of Hawaii annual summary 2009 air quality data. Report prepared by the State of Hawai'i Department of Health, Clean Water Branch, Honolulu, Hawai'i, USA.
- DOH. 2011a. Evaluation of environmental hazards at sites with contaminated soil and groundwater. Hawai'i edition. Hazard Evaluation and Emergency Response Office, Honolulu, Hawai'i, USA.
- DOH. 2011b. State of Hawaii annual summary 2010 air quality data. Report prepared by the State of Hawai'i Department of Health, Clean Water Branch, Honolulu, Hawai'i, USA.
- DOH. 2011c. Update to soil action levels for inorganic arsenic and recommended soil management practices. Document 2011-690-RB (updated September 2012). Hazard Evaluation and Emergency Response Office, Honolulu, Hawai'i, USA.
- DOH. 2012. Tier 1 environmental action levels surfer. Available at <http://eha-web.doh.hawaii.gov/eha-cma/Leaders/HEER/environmental-hazard-evaluation-and-environmental-action-levels>. Hazard Evaluation and Emergency Response Office, Honolulu, Hawai'i, USA.
- DOH. 2013. No further action determination. Mana Plain wetland restoration project, west Kauai, Hawaii. Letter from Fenix Grange, SDAR Supervisor, HDOH HEER to William Cutter, Principal Scientist, Integral Consulting, Inc., Honolulu, Hawai'i, USA.
- DOH and Tetra Tech EM, Inc. 2011. Summary of pesticide and dioxin contamination associated with former sugarcane operations. Hazard Evaluation and Emergency Response Office, Honolulu, Hawai'i, USA.
- DeVault, T. L., J. L. Belant, B. F. Blackwell, and T. W. Seamans. 2011. Interspecific variations in wildlife hazards to aircraft: implications for airport wildlife management. *Wildlife Society Bulletin* 35:394-402.
- Devick, W. S. 1991. Patterns of introductions of aquatic organisms to Hawaiian freshwater habitats. Pages 189-213 in *New Directions in Research, Management and Conservation of Hawaiian Freshwater Stream Ecosystem*. Proceedings Freshwater Stream Biology and

- Fisheries Management Symposium. Department of Land and Natural Resources, Division of Aquatic Resources, Honolulu, Hawai'i, USA.
- Diamond, J. M., N. P. Ashmole, and P. E. Purves. 1989. The Present, Past and Future of Human-Caused Extinctions. *Philosophical Transactions of the Royal Society* 325:469-477.
- DOFAW (Division of Forestry and Wildlife). 2008. Meeting notes from the 2 December 2008, meeting with staff from the State of Hawai'i Department of Transportation, Highways Division, Kaua'i, Hawaii, USA.
- Dolbeer, R. A., S. E. Wright, and E. C. Cleary. 2000. Ranking the hazard level of wildlife species to aviation. *Wildlife Society Bulletin* 28:372-378.
- Drigot, D. 2000. Safe guarding Hawaii's endangered stilts. *U.S. Fish and Wildlife Service Endangered Species Bulletin* 25:8-9.
- Ducks Unlimited. 2008. Mana topography map. DU project number HI-40-1, 2, survey datum US SPC NAD83, Hawai'i zone 4, tidal vertical datum, June, 2 sheets.
- Ehrlich, P. R. 1988. The loss of diversity: causes and consequences. Pages 21-27 in E. O. Wilson, ed., *Biodiversity*. National Academy Press, Washinton DC, USA.
- Engilis, Jr., A. and Naughton, M. 2004. U.S. Pacific Islands Regional Shorebird Conservation Plan. U.S. Shorebird Conservation Plan. U.S. Department of the Interior, Fish and Wildlife Service, Portland, Oregon, USA. 17pp.
- EPA (Environmental Protection Agency). 2002. Chlorpyrifos facts. EPA 738-F-01-006. Available on-line at http://www.epa.gov/oppsrrd1/REDs/factsheets/chlorpyrifos_fs.htm.
- EPA. 2006. Decision documents for atrazine. Office of Prevention, Pesticides, and Toxic Substances, Environmental Protection Agency, Washington DC, USA. 323pp.
- EPA. 2012. Atrazine updates. Pesticide Reregistration Status, U.S Environmental Protection Agency. http://www.epa.gov/oppsrrd1/reregistration/atrazine/atrazine_update.htm.
- Eisler, R. 1998. Arsenic hazards to fish, wildlife, and invertebrates: a synoptic review. Contaminant Hazard Reviews Report No. 12. U. S. Fish and Wildlife Service, Patuxent Wildlife Research Center, Laurel, Maryland, USA.
- Erickson, T. A., and C. F. Puttock. 2006. Hawai'i wetland field guide. Environmental Protection Agency, Honolulu, Hawai'i, USA.
- Extension Toxicology Network. 1993. Chlorpyrifos pesticide information profile. Cooperative Extension Office, Cornell University, Ithaca, New York, USA. <http://pmep.cce.cornell.edu/profiles/extoxnet/carbaryl-dicrotophos/chlorpyrifos-ext.html>.

- Extension Toxicology Network. 1994. Glyphosate pesticide information profile. Cooperative Extension Office, Cornell University, Ithaca, New York, USA.
<http://pmep.cce.cornell.edu/profiles/extoxnet/dienochlor-glyphosate/glyphosate-ext.html>.
- Faye, C. 1997. Touring Waimea. Kaua'i Historical Society, Līhu'e, Hawai'i, USA, 30pp.
- FEMA (Federal Emergency Management Agency). 2010. Flood Insurance Rate Map 1500020120F, Kaua'i County, Hawai'i, USA.
- FEMA. 2011. Coastal construction manual, principles and practices of planning, siting, designing, constructing and maintaining residential buildings in coastal areas (Fourth Edition). FEMA P-55, Volume 1, August, 253p.
- Fletcher, C. H. 2010. Hawai'i's changing climate, briefing sheet. University of Hawai'i Sea Grant College Program, Center for Island Climate Adaptation and Policy, Honolulu, Hawai'i, USA. Available on-line at <http://www.soest.hawaii.edu/coasts/publications/>.
- Fletcher, C. H., Grossman, E. E., Richmond, B. M., and Gibbs, A. E. 2002. Atlas of natural hazards in the Hawaiian coastal zone. U.S. Geological Survey, U.S. Department of Interior, Geologic Investigations Series, I-2761, prepared in cooperation with University of Hawai'i, State of Hawai'i Office of Planning, and National Oceanic and Atmospheric Administration, 182pp.
- Fletcher, C. H., B. M. Romine, A. S. Genz, M. M. Barbee, M. Dyer, T. R. Anderson, S. Chyn Lim, S. Vituosek, C. Bochicchio, and B. M. Richmond. 2012. National assessment of shoreline change: historical shoreline change in the Hawaiian Islands. Open-File Report 2011-1051, U. S. Geological Survey, 55p. Available on-line at <http://pubs.usgs.gov/of/2011/1051/>.
- Foote, D. E., E. L. Hill, S. Nakamura, and F. Stephens. 1972. Soil survey of the islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii. U.S. Department of Agriculture, Soil Conservation Service, U.S. Government Printing Office, Washington D.C., USA. 232pp+guide and maps.
- Fredrickson, L. H. 1991. Strategies for water level manipulations in moist soil systems. U.S. Fish and Wildlife Service Leaflet 13.4.6.
- Giambelluca, T. W., H. F. Diaz, and M. S. A. Luke. 2008. Secular temperature change in Hawai'i. *Geophysical Research Letters* 35: L12702, doi:10.1029/2008GL034377.
- Gingerich, S.B. and R. L. Whitehead. 1999. Hawaii in Ground Water Atlas of the United States, Segment 13, Alaska, Hawaii, Puerto Rico, and the U.S. Virgin Islands: U.S. Geological Survey Hydrologic Investigations Atlas 730-N, p. N12–N22, N36.
<http://sr6capp.er.usgs.gov/gwa/gwa.html>

- Gosselink, J. G. and R. E. Turner. 1978. The role of hydrology in freshwater wetland ecosystems. Pages 63-78 in R. E. Good, D. F. Whigham, and R. L. Simpson, editors. *Freshwater wetlands: ecological processes and management potential*. Academic Press, New York, New York, USA.
- Green, T. R., M. Taniguchi, H. Kooi, J. J. Gurdak, D. M. Allen, K. M. Hiscock, H. Treidel, and A. Aureli. 2011. Beneath the surface of global change: impacts of climate change on groundwater. *Journal of Hydrology* 405:532-560.
- Gunasekara, A. S., and T. Troung. 2007. Environmental fate of fipronil. Environmental Monitoring Branch, Department of Pesticide Regulation, California Environmental Protection Agency, Sacramento, California, USA.
- Haraguchi, K. 1987. Rice in Hawaii: a guide to historical resources. The Humanities Program of the State Foundation on Culture and the Arts in cooperation with The Hawaiian Historical Society, Honolulu, Hawai'i, USA. xvii+45pp.
- Hawai'i Audubon Society. 2005. Update to the checklist of the birds of Hawaii – 2002. March 5, 2005, Published by Hawai'i Audubon Society, Honolulu, Hawai'i, USA.
- Hawai'i CZMP (Coastal Zone Management Program). 1996. Hawaii's Coastal Nonpoint Pollution Control Program: Management Plan, Volume 1. Office of State Planning, Honolulu, Hawai'i, USA.
- Hawai'i Pacific Engineers and Tom Nance Water Resources Engineering. 1994. Final report of groundwater and surface water drainage at the Pacific Missile Range Facility, Kekaha-Mana Plain, Kauai, Hawaii. Prepared for: Pacific Division Naval Facilities Engineering Command, Pearl Harbor, Hawai'i, Contract no. N62742-92-D-0005, June 1.
- Hawaiian Sugar Planters' Association. 2004. Register of the Kekaha Sugar Company 1880-1946. Hawaiian Sugar Planters' Association Plantation Archives, University of Hawai'i at Mānoa Library-Hawaiian Collection, Honolulu, Hawai'i, USA.
- Hem, J. D. 1985. Study and interpretation of the chemical characteristics of natural water. U.S. Geological Survey Water-Supply Paper 2254, 3rd edition, U.S. Department of the Interior, U.S. Geological Survey, 263p.
- Henry, A. R. 2010. Mana Plain Wetland Restoration: Phase II: Soil sampling for the hydrological assessment, Mana Wetland Restoration Design. Prepared for Ducks Unlimited on behalf of State of Hawai'i of Forestry and Wildlife, PAHIO Development, Inc., and other Restoration Partners, prepared by Scaup and Willet LLC, March, 16 pp.
- Integral Consulting, Inc. 2013. Assessment of arsenic in surface soils: Mana Plain wetland restoration project, west Kauai, Hawaii. Prepared by Integral Consulting, Inc., Honolulu, Hawai'i USA. 137pp.

- IPCC (Intergovernmental Panel on Climate Change). 2007. Climate change 2007: the physical science basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor and H. L. Miller (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, New York, USA. 996 pp.
- Island Matters LLC. 2011. Kauai quarterly economic outlook, Q4 2011. Prepared for the Office of Economic Development, County of Kaua'i, Līhu'e, Hawai'i, USA.
- Jackson, D., C. B. Cornell, B. Luukinen, K. Buhl, and D. Stone. 2009. Fipronil technical fact sheet. National Pesticide Information Center, Oregon State University Extension Services, Corvallis, Oregon, USA.
- Kamman Hydrology & Engineering, Inc. 2012. Hydrologic feasibility assessment, Mana Wetland Restoration Project, Kauai, Hawaii. Prepared for the Mānā Plain Wetland Restoration Partnership for the State of Hawai'i Division of Forestry and Wildlife, Līhu'e, Hawai'i, USA.
- Kaua'i Shrimp. 2012. Kauai shrimp facilities: grow-out facility. Sunrise Capital, Inc. Available on-line at http://www.kauaishrimp.com/farm_growout.html.
- Keddy, P. A. 2010. Wetland ecology principles and conservation. Cambridge University Press, New York, New York, USA. 497pp.
- Klimas, C., L. Fredrickson, D. Shafer, and R. Fischer. 2012. Site characterization and wetland restoration feasibility study: Mana Plain, Kaua'i. Prepared for Pacific Missile Range Facility, Barking Sands, Hawai'i, by U.S. Army Engineer Research and Development Center, Environmental Laboratory, Vicksburg, Mississippi, USA. 29pp.
- Knudsen, E. A., and G. P. Noble. 1944. Kanuka of Kauai. Tongg Publishing Company, Honolulu, Hawai'i, USA. 208pp.
- Koopman, M. E. and W. C. Pitt. 2007. Crop diversification leads to diverse bird problems in Hawaiian agriculture. *Human Wildlife Conflicts* 1:235–243.
- Len, G. H. 2010. 30 DoD volunteers protect Hawaiian reef from invasive plant species. *Armed with Science*, 12 October 2010. Available at <http://science.dodlive.mil/2010/10/12/30-dod-volunteers-protect-hawaiian-reef-from-invasive-plant-species/>.
- MacDonald, G.A., Davis, D.A., and Cox, D.C. 1960. Geology and ground-water resources of the island of Kauai, Hawaii. Bulletin 13, State of Hawai'i, Division of Hydrograph, prepared in cooperation with the Geological Survey, U.S. Department of Interior, 212pp, 2 plates.

- Mink, J. F. and L. S. Lau. 1992. Aquifer identification and classification for Kauai: groundwater protection strategy for Hawaii. Technical report no. 186, prepared by Water Resources Research Center, University of Hawai'i at Manoa, Honolulu, Hawai'i, USA.
- Mitsch, W. J. and J. G. Gosselink. 1993. Wetlands. John Wiley & Sons, New York, New York, USA. 722pp.
- Mitsch, W. J. and J. G. Gosselink. 2000. Wetlands. Third Edition. John Wiley & Sons, New York, New York, USA. 920pp.
- Mitchell, C., C. Ogura, D. W. Meadows, A. Kane, L. Strommer, S. Fretz, D. Leonard, and A. McClung. 2005. Hawaii's Comprehensive Wildlife Conservation Strategy. State of Hawai'i Department of Land and Natural Resources. Honolulu, Hawai'i, USA. 722 pp.
- North American Bird Conservation Initiative. 2009. The state of the birds: United States of America, 2009. U. S. Committee of the North American Bird Conservation Initiative, U.S. Department of the Interior, Washington, D.C., USA. 36pp.
- NRCS (Natural Resources Conservation Service). 2010. Custom soil resource report for the island of Kauai, Hawaii, Mana Plain vicinity. U.S. Department of Agriculture, Natural Resource Conservation Service.
- Oki, D. S., L. S. Lau, and J. F. Mink. 1992. Wellhead protection methodology for Hawaii. Special report 01.31:92, prepared for State of Hawai'i Department of Health, prepared by Water Resources Research Center, University of Hawai'i at Manoa, Honolulu, Hawai'i, USA.
- Oregon State University. 2010. Chlorpyrifos general fact sheet. Available on-line at <http://npic.orst.edu/factsheets/chlorpgen.html#env>.
- PMRF (Pacific Missile Range Facility). 2008. Bird aircraft strike hazard (BASH) plan. PMRFINST 5090.7A N3A/RG:dkk. Department of the Navy, Pacific Missile Range Facility, Kekaha, Hawai'i, USA.
- PMRF. 2010. Pacific Missile Range Facility Intercept Test Support Environmental Assessment. Commander, Pacific Missile Range Facility, Kekaha, Hawai'i, USA.
- PMRF. 2012. PMRF Bird air strike data 2004 to present. Email dated 15 February 2012, from John Burger, PMRF to Thomas Kaiakapu, DOFAW.
- PCJV (Pacific Coast Joint Venture). 2012. Hawaii: about us. Hawai'i Wetland Joint Venture. Available on-line at <http://www.pcjv.org/hawaii/about.html>.
- Pesticide Action Network. 2012. Pesticide Makers in Paradise. Available on-line at <http://www.panna.org/blog/pesticidemakers-paradise>. Updated April 2012.

- Peyton, K. A. 2009. Aquatic invasive species impacts in Hawaiian soft sediment habitats. Dissertation, University of Hawai'i at Manoa, Honolulu, Hawai'i, USA. 151pp
- Polhemus, D. A. 2006. An aquatic insect survey of the Mana wetlands, Kauai. Prepared by the State of Hawai'i DLNR Division of Aquatic Resources, submitted to the State of Hawai'i DLNR DOFAW, Lihu'e, Hawai'i, USA.
- Prokopovich, N. P. and D. J. Hebert. 1965. Sedimentation in the Delta-Mendota Canal. *Journal of the American Water Works Association* 57:375-382.
- Pyle, R. L. 2002. Checklist of the birds of Hawaii – 2002. *Elepaio* 62:137-148.
- R.M. Towill Corporation. 1990. Kauai water use and development plan, Hawaii water plan. Prepared for Department of Water, Kauai, HI and Commission on Water Resource Management, Department of Land and Natural Resources, State of Hawai'i, Honolulu, Hawai'i, USA.
- Raup, D. M. 1986. Biological extinction in earth history. *Science* 231:1528-1533.
- Safeeq, M. and A. Fares. 2011. Hydrologic response of a Hawaiian watershed to future climate change scenarios. *Hydrological Processes*. DOI: 10.1002/hyp.8328.
- Santo, L. T., S. Schenck, H. Chen, and R. V. Osgood. 2000. Crop profile for sugarcane in Hawaii. Hawai'i Agriculture Research Center, Aiea, Hawai'i, USA.
- Shade, P. J. 1995. Water Budget for the island of Kauai, Hawaii. U.S. Geological Survey Water-Resources Investigations Report 95-4128.
- Shimoda, T. and T. Sakihara. 2006. An aquatic survey of the Mana wetlands, Kauai. Prepared by the State of Hawai'i DLNR Division of Aquatic Resources, submitted to the State of Hawai'i DLNR DOFAW, Lihu'e, Hawai'i, USA.
- Sickel, J. B. 1986. *Corbicula* population mortalities: factors influencing population control. *American Malacological Bulletin*, Special Edition 2:89-94.
- The Fish Site. 2007. Facts on White Spot Syndrome Virus (WSSV). Available on-line at <http://www.thefishsite.com/articles/290/facts-on-white-spot-syndrome-virus-wssv>.
- Timm, O. and H. F. Diaz. 2009. Synoptic-Statistical Approach to Regional Downscaling of IPCC Twenty-First Century Climate Projections: Seasonal Rainfall over the Hawaiian Islands. *Journal of Climate* 22:4261-4280.
- Tribble, G. 2008. Ground water on tropical pacific islands – understanding a vital resource. U.S. Geological Survey, Circular 1312, Pacific Islands Water Science Center, Honolulu, Hawaii, USA. Available on-line at <http://pubs.usgs.gov/circ/1312/>.

- UHERO-Kaua'i Interactive Database. 2012. Total visitor arrivals, Kauai County. Compiled for the Office of Economic Development, County of Kaua'i, Līhu'e, Hawai'i, USA. Available on-line at <http://uhero-kauai.prognoz.com/>.
- University of Hawai'i. 2001. Hawaiian native plant propagation database. College of Tropical Agriculture and Human Resources, University of Hawai'i at Manoa, Honolulu, Hawai'i, USA. Available on-line at <http://www.ctahr.hawaii.edu/hawnprop/>.
- University of Hawai'i. 2004. Kekaha Sugar Company History. Hawaiian Sugar Planters' Association Plantation Archives, University of Hawai'i at Manoa Library, Hawaiian Collection, August 2004. Available at http://www2.hawaii.edu/~speccoll/p_kekaha.html.
- University of Hawai'i. 2009a. Kaua'i economic outlook summary: Kaua'i hit hard by global recession. Prepared for the County of Kaua'i, prepared by the University of Hawai'i, Economic Research Organization, Honolulu, Hawai'i, USA.
- University of Hawai'i. 2009b. Native plants Hawai'i. University of Hawai'i at Manoa, Honolulu, Hawai'i, USA. Available on-line at <http://www.nativeplants.hawaii.edu/>.
- University of Hawai'i. 2011. County of Kauai important agricultural lands study. Final report—second draft. Prepared for the County of Kaua'i Planning Department, Līhu'e, Hawai'i, by the University of Hawai'i Department of Urban and Regional Planning and the University of Hawai'i Economic Research Organization, Honolulu, Hawai'i, USA.
- U.S. Census Bureau. 2011. United States 2010 census interactive population search. Available on-line at <http://2010.census.gov/2010census/>.
- USDOT (U.S. Department of Transportation). 2011. Construction noise handbook. Federal Highway Administration, Washington DC, USA
- USACE (U.S. Army Corps of Engineers). 2009. Wetlands of Marine Corps Base Hawaii, island of Oahu, Hawaii. Final Report, Honolulu District, Honolulu, Hawai'i, USA. 43pp.
- USACE. 2010. HEC-RAS River Analysis System, Hydraulic Reference Manual, v.4.1. Hydrologic Engineering Center, CPD-69, January 2010. 417pp.
- USFWS (U.S. Fish and Wildlife Service). 2003. Endangered and threatened wildlife and plants – Final designation or nondesignation of critical habitat for 95 plant species from the islands of Kauai and Niihau, HI; Final Rule. 50 CFR Part 17, Vol.68, No. 39, pp. 9115-9479.
- USFWS. 2011. Recovery plan for Hawaiian waterbirds. Second revision, Region 1, U. S. Fish and Wildlife Service, Portland, Oregon, USA. 233pp.
- USFWS. 2012. Kealia Pond National Wildlife Refuge profile. Available at <http://www.fws.gov/refuges/profiles/index.cfm?id=12531>.

- Van Voorhis, V. 2011. Seeds 101: BASF Plant Science in Kekaha. The Garden Island, 9 April 2011, 23 updated April 2011, http://thegardenisland.com/business/local/article_4e0481f0-634b-11e0-86aa-001cc4c03286.html.
- Wager, K. 2012. Climate change law and policy in Hawai'i briefing sheet. UNIHI-SEAGRANT-GG-12-01, University of Hawai'i, Sea Grant College Program, Center for Island Climate Adaptation and Policy, Honolulu, Hawai'i, USA. 12 pp. Available on-line at <http://icap.seagrant.soest.hawaii.edu/icap-publications>.
- Wallsgrove, R. and D. Penn. 2012. Water resources and climate change adaptations in Hawaii: adaptive tools in the current law and policy framework. Center for Island Climate Change Adaptation and Policy, Honolulu, Hawaii, USA. Available on-line at <http://icap.seagrant.soest.hawaii.edu/icap-publications>.
- Water Resource Associates. 2004. Agricultural water use and development plan, prepared for Department of Agriculture, State of Hawai'i, Honolulu, Hawai'i, USA. 190p.
- Western Regional Climate Center. 2010. Historical climate summaries. Available on-line at <http://www.wrcc.dri.edu/>.
- Yent, M. 2005. Archeological assessment Kawia'ele Wildlife Sanctuary, phase 2. Prepared by the State of Hawai'i DLNR Division of State Parks for the State of Hawai'i DLNR Division of Forestry and Wildlife. 58pp.
- Zakrajsek, E. J. and J. A. Bissonette. 2005. Ranking the risk of wildlife species to hazardous military aircraft. Wildlife Society Bulletin 33:258-264.

APPENDIX A: PLANT SPECIES

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

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

APPENDIX B: WILDLIFE SPECIES

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

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

**APPENDIX C: PRE-ASSESSMENT CONSULTATION
COMMENT LETTERS AND RESPONSES**

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 Iiwa Street, Room 306
Lihue, Kauai, HI 96766

WILLIAM J. AHA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
OFFICE OF WATER RESOURCE MANAGEMENT

GUY H. KAULUKURU
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

ACHILLE BENOIST
PLANNING AND POLICY DEVELOPMENT
JERELAHU CHENEY-VAUGHN
COMMISSION ON WATER RESOURCES MANAGEMENT
PUNAHU VAPPY AND COASTAL LANDS
CONSERVATION AND RECREATION DEVELOPMENT
ENGINEERING
FORESTRY AND WILDLIFE
RESTORATION PRESERVATION
KAUAI WETLAND RESERVE COMMUNITY
LEARN
MATT 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

NIHI ABLURU'UMIBI
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1060 Hiwa Street, Room 306
Lihue, Kauai, HI 96766

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

GUY H. KALLUKU
FIRST DEPUTY

WILLIAM TANI
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF COUNTY AFFAIRS
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CORPORATE AND BUSINESS ENFORCEMENT
PROGRAMS

FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAUAI LAKE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

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,

A handwritten signature in black ink that reads "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

NEIL ABERCROMBIE
GOVERNOR OF HAWAII



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

WILLIAM J. AHLA, JR.
CHAIRMAN
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WILDLIFE RESTORATION

GUY H. KAHALAKUHI
FIRST DEPUTY

WILLIAM M. TANI
DEPUTY DIRECTOR - WATER

ACQUISITION SERVICES
BOARDING AND UNBOARDING
DEPARTMENT OF TRANSPORTATION
COMMISSION ON WATER RESOURCE MANAGEMENT
PRESERVATION AND RESTORATION
CONSERVATION AND RESTORATION PROGRAMS
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAWAIIAN ISLAND RESERVE COMMISSION
LAND
STATE PARKS

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
DOFAW Wildlife Biologist

NEIL ABERCROMBIE
GOVERNOR
STATE OF HAWAII



STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P O BOX 1879
HONOLULU, HAWAII 96801

ALBERT "ALAPAKI" NAHALE-A
CHAIRMAN
HAWAIIAN HOMES COMMISSION
MICHELLE K. KAUFMAN
DEPUTY TO THE CHAIRMAN
M. WAIALEALE SARSONA
EXECUTIVE ASSISTANT

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-ENVIRONMENTAL ASSESSMENT PUBLIC COMMENT ON WETLAND
RESTORATION PLAN FOR THE MĀNĀ PLAIN FOREST RESERVE
MĀNĀ, KAUA'I, HAWAII

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.

January 11, 2012
Page 2

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

NEH ABERCROMBIE
GOVERNOR OF HAWAII



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

WILLIAM J. AHL, JR.
CHAIRMAN
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCES MANAGEMENT

GUY H. KALLIKUKUI
DEPUTY

WILLIAM ST. FARI
DEPUTY

WATER RESOURCES
PLANNING AND DESIGN DIVISION
BUREAU OF LAND MANAGEMENT
COMMISSION ON WATER RESOURCES MANAGEMENT
CONSERVATION AND WILDLIFE
CONSERVATION AND WILDLIFE
DIVISION
HAWAIIAN WILDLIFE
AND BIRD 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
DOFAW Wildlife Biologist



DEPARTMENT OF THE NAVY
PACIFIC MISSILE RANGE FACILITY
P.O. BOX 128
KEKAHA, HAWAII 96762-0128

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

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 Ewa Street, Room 306
Lihue, Kauai, HI 96766

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

GEYI H. KAI LUKIKU
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY CHIEF OF BUREAU

APPOINTED PERSONNEL
TRAINING AND DEVELOPMENT
BUREAU OF CONVEYANCES
CHIEF OF BUREAU OF WATER RESOURCE MANAGEMENT
CHIEF OF BUREAU OF FOREST AND STREAMS
CONSERVATION AND RECREATION INFORMATION
TRAINING
FORESTRY AND WILDLIFE
ISLAND FORESTRY
LAND AND NATURAL RESOURCES 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,

A handwritten signature in cursive script that reads "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



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

Department of Land and Natural Resources
Division of Forestry and Wildlife
3060, Elwa St. Room 308
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.

Pioneer Hi-Bred International, Inc.

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,

A handwritten signature in black ink that reads "Jon D. Petersen". The signature is written in a cursive style with a large initial "J" and a long, sweeping underline.

Jon Petersen, Manager, Pioneer Kekaha Parent Seed

NEIL ABERT RIMBIE
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. AHA, JR.
COMMISSIONER
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF WATER RESOURCE MANAGEMENT

GUY H. KAUIUKI KUI
DEPUTY COMMISSIONER

WILLIAM M. TAM
DEPUTY COMMISSIONER

ADJUTANT COMMISSIONER
WATER AND OCEAN UTILIZATION
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF WATER RESOURCE MANAGEMENT
CONSERVATION AND RECREATION DIVISION

DEPUTY COMMISSIONER
WATER RESOURCE MANAGEMENT
CONSERVATION AND RECREATION DIVISION
LAND AND FORESTRY COMMISSIONER
STATE PARKS

12 March 2012

To: DuPont Agriculture & Nutrition
Pioneer Supply Management
7431 Kaunualii 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
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



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

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

GUY H. KAULIKUMUHI
FIRST DEPUTY

WILLIAM M. TAN
DEPUTY DIRECTOR FOR WATER

AQUATIC RESOURCES
REGULATORY AND COMPLIANCE DIVISION
BUREAU OF COMPLIANCE
CONSERVATION AND RESTORATION
ENGINEERING
FORESTRY AND WILDLIFE
RESOURCES MANAGEMENT
LAND AND NATURAL RESOURCES
COMMISSION
STATE PARKS

12 March 12, 2012

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

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

Response to Environmental Assessment Scoping Period Comments

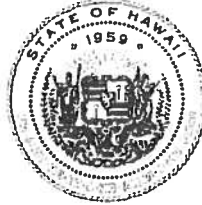
Thank you for your comments and concerns regarding the content of the draft Environmental Assessment for the Mana Plain Forest Reserve Wetland Restoration Project. Your concerns regarding the proximity of the project site to the location of your existing farming activities will be addressed in the published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

Sincerely,

Jason Vercelli
DOFAW Wildlife Biologist

**APPENDIX D: DRAFT ENVIRONMENTAL ASSESSMENT
COMMENT LETTERS AND RESPONSES**

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. AHA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSIONER ON WATER RESOURCE MANAGEMENT
GUY H. KAULUKUKUI
FIRST DEPUTY
WILLIAM M. TAM
DEPUTY DIRECTOR FOR WATER
AQUATIC RESOURCES
BOATING AND OUTDOOR RECREATION
BUREAU OF CONVEYANCES
COMMISSIONER ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL ZONES
CONSERVATION AND RESTORATION PROGRAMS
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

Mānā Plain Wetland Restoration
Public Outreach Meeting Comment/Questionnaire Form
Please Print

Name Carl Berg

Email _____

Phone _____

Mailing Address _____

Affiliation _____

ST

Please state your comment or question below:

- 1) What alternatives have been proposed, what other areas
- 2) Is the land secure from further expansion of PMRF
- 3) Is this area too close to PMRF airstrip for bird and aircraft safety
- 4) Should agricultural land be taken for naval use
- 5) Should ag water be taken?
- 6) Will activities at PMRF, eg missile launchers, be considered excessive "takes"?

Your comment or question will be addressed and included in the final Environmental Assessment. Your personal information will be excluded when addressing your comment or question in the final Environmental Assessment.

If you would like your comment or question addressed personally via email or phone, please check:

YES _____ NO

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

PAUL J. CONRY
INTERIM FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

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

10 September 2012

To Mr. Carl Berg

Responses to Public Outreach Meeting Comments

Thank you for your comments on the draft Environmental Assessment for the proposed Mana Plain Wetland Restoration Project. Please see below our responses addressing your concerns.

1. Alternatives to the preferred action are described in Section 2.3 of the draft Environmental Assessment, including the two alternate sites that were proposed by the U.S. Navy. Justifications for why these sites are not feasible as alternatives are given in section 2.3.5.
2. The project site, which historically made up a small portion of the once expansive wetlands found on the Mana Plain, was transferred to DOFAW by the Board of Land and Natural Resources (BLNR) in November of 2003. Executive Order 4209, dated November 14, 2007 established the Mana Plains Forest Reserve. This document incorporated both the proposed site as well as the existing Kawaele Waterbird Sanctuary into the reserve. Thus, the project area is secure from expansion of the Pacific Missile Range Facility (PMRF).
3. The size and boundary of the project site is a compromise reached between BLNR and the U.S. Navy due to concerns over bird aircraft strike hazards. The originally proposed 313 acres was reduced to 105 acres, in order to accommodate the U.S. Navy's request to set back the project boundary 2,000 feet from the main PMRF runway. Bird aircraft strike hazards were evaluated in Chapter 3, Section 3.10 of the Draft Environmental Assessment.
4. The Project area was formerly leased from the state by the Kekaha Sugar Company. Concerns with the area's lack of productivity led to the abandonment of sugarcane cultivation efforts in the mid 1990's. Following this the land was vacant and unencumbered. In 2003 BLNR transferred the land to DOFAW so that the wetlands that once existed in the project area could be restored.

5. Justification for the intent to utilize ground water that was formerly used during peak years of sugar cane production is expressed in detail in section 3.2.1 of the Draft Environmental Assessment. The groundwater well proposed as a source of water is not currently used for agricultural purposes.

6. In the nearly 20 years of coexistence between the Kawaiele Waterbird Sanctuary and PMRF, there have been no negative effects reported on Kawaiele's resident bird populations coinciding with activities conducted by the U.S. Navy. The proposed restoration project is located adjacent to the existing Kawaiele area, bordering it to the north. Considering the proximity of the two sites, and the lack of historical "take" issues on existing bird populations, DOFAW does not anticipate excessive take incidents to occur resulting from activities at PMRF.

Sincerely,

A handwritten signature in black ink that reads "Jason Vercelli". The signature is written in a cursive, flowing style.

Jason Vercelli
DOFAW Wildlife Biologist

NEIL ABERCROMBIE
GOVERNOR OF HAWAII



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

WILLIAM J. AHA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSIONER OF WATER RESOURCE MANAGEMENT
GUY H. KAUIKUKU
DIRECTOR
WILLIAM M. TAM
DEPUTY DIRECTOR - WATER
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONSERVATION
COMMISSIONER OF WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL ZONES
CONSERVATION AND RESTORATION PROGRAM
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KADOO ANTI-TRUST AND SERVICE COMMISSIONER
LAND
STATE PARKS

Mānā Plain Wetland Restoration
Public Outreach Meeting Comment/Questionnaire Form
Please Print

Name ROLAND P. SAGUM III

Email Y

Phone _____

Mailing A

_____ an

_____ 2

Affiliation _____

Please state your comment or question below:

DOFAN AND THE NAVY HAVE A HISTORY OF WORKING TOGETHER. THE CONCERN HERE RELATES TO BIRD STRIKES HAZARDS, PRIMARILY WITH REGARD TO THE NENE. I WOULD LIKE TO BELIEVE THAT THESE TWO ENTITIES CONTINUE TO WORK TOGETHER TO ACHIEVE A POSITIVE / SUSTAINABLE WETLAND HABITAT ON THE MANA PLAIN.

Your comment or question will be addressed and included in the final Environmental Assessment. Your personal information will be excluded when addressing your comment or question in the final Environmental Assessment.

If you would like your comment or question addressed personally via email or phone, please check:

YES X NO _____

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. AHLA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

PAUL J. CONRY
INTERIM FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

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

10 September 2012

To: Mr. Roland Sagum III

Response to Public Outreach Meeting Comments

Thank you for your comments submitted at the Public Outreach Meeting concerning the Draft Environmental Assessment for the proposed Mana Plain Wetland Restoration Project. Please see below our responses to your comments.

Your concern regarding bird strike hazards was addressed and analyzed in Chapter 3, Section 3.10 of the Draft Environmental Assessment. DOFAW is committed in its efforts to assist the Navy, as well as the U.S. Fish and Wildlife Service, in safeguarding endangered birds that may utilize habitat at PMRF. In addition DOFAW encourages the Navy to continue consultation with the U.S. Fish and Wildlife Service regarding Section 7 of the endangered species act in order to further reduce the BASH risk at PMRF.

We will take your comments into consideration as we prepare the Final Environmental Assessment for publication. It will be available for viewing on the DLNR Division of Forestry and Wildlife website in the fall of 2012.

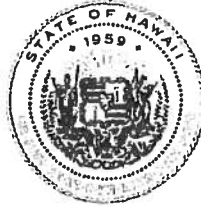
Sincerely,

A handwritten signature in black ink that reads "Jason Vercelli".

Jason Vercelli
DOFAW Wildlife Biologist

KEVAHA

NEIL ABERCROMBIE
GOVERNOR OF HAWAII



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

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

GUY H. KAULUKUHI
VICE CHAIRMAN

WILLIAM M. TAN
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OUTDOOR RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CORRELATION AND SERVICES BUREAU
FISH AND WILDLIFE
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KALI OF LAND AND RESERVE COMMISSION
LAND
STATE PARKS

Mānā Plain Wetland Restoration
Public Outreach Meeting Comment/Questionnaire Form
Please Print

Name Farin M Dameron

Email _____@com

Phone _____

Mailing _____

Affiliation Local Resident

Please state your comment or question below:

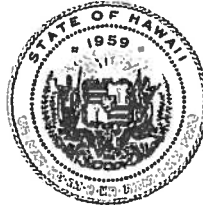
How will you address the pesticide testing that need to be done prior to the construction during and after genetically modified organisms are being formulated for pesticide resistance in the surrounding lands tests need to be done on tissue of fish or animals for the specific pesticides and pesticides resistant organisms that are being produced and used by the surrounding chemical companies under the guise of agricultural

Your comment or question will be addressed and included in the final Environmental Assessment. Your personal information will be excluded when addressing your comment or question in the final Environmental Assessment.

If you would like your comment or question addressed personally via email or phone, please check:

YES NO

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

PAUL J. CONRY
INTERIM 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
KAOI O AWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

10 September 2012

To Ms. Karin Dameron

Response to Public Outreach Meeting Comments

Thank you for your comments regarding the Draft Environmental Assessment for the proposed Mana Plain Wetland Restoration Project. Please see below our responses addressing your concerns.

DOFAW is working with the Department of Health and project partners to test soil at the project site for the possible presence of residual contaminants. DOFAW will also collect water samples from waterways within the project area. These too will be analyzed for the presence of contaminants.

In addition, DOFAW will be adding a section to the final Environmental Assessment addressing the use of pesticides on adjacent lands. It will be available for viewing on the DLNR Division of Forestry and Wildlife website in the fall of 2012.

Sincerely,

A handwritten signature in black ink that reads "Jason Vercelli".

Jason Vercelli
DOFAW Wildlife Biologist

will take diseases from the dump to the constructed wetland.

Dupont Chemical Company (PIONEER) is presently being sued by local residents because of pesticide overspray into their community. The air around the landfill smells, not from garbage, but from chemicals (herbicides & pesticides.) All these chemicals settle on the ground and the water. Birds may not die, but they will be immunocompromised.

Future projects should be far from PMRF & the dump.

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. AII, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

PAUL J. CONRY
INTERDEPARTMENTAL

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

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

20 September 2012

To: Mr. Gordon LaBedz

Response to Public Outreach Meeting Comments

Thank you for your comments regarding the Draft Environmental Assessment (EA) for the proposed Mana Plain Wetland Restoration Project. Please see below our responses addressing your concerns.

1. The wetland restoration project site is approximately 105 acres. During 2001, DOFAW proposed restoring 313 acres of wetland habitats, but the U.S. Navy expressed concerns to DOFAW about the proximity of the project site to the runway due to bird aircraft strike hazards. After discussions between the U.S. Navy and DOFAW, the original proposed 313 acres was reduced to 105 acres to accommodate the Navy's request to set back the project sites border 2,000 feet from the PMRF runway.

DOFAW realizes that the restoration site makes up less than 10 percent of the original wetland habitat on the Mana Plain. However, in the 2011 *Recovery Plan for Hawaiian Waterbirds*, the U. S. Fish and Wildlife Service states that only 200 acres of aquatic habitats currently exist on the Mana Plain. The proposed project of 105 acres will therefore substantially increase the area of wetlands on the Mana Plain, contributing to recovery of endangered Hawaiian waterbirds. Restoration of additional wetland habitats may be feasible when suitable sites and funding become available.

2. The project site was identified as suitable for wetland restoration for several reasons listed below:
 - The project site is part of the historical 1,700 acre wetland habitat that once existed on the Mana Plain. Restoration of historical wetlands is generally more effective than creation of wetlands outside of historical wetland areas. The soils, geological features, and hydrologic features of the project site are suitable for restoration.
 - The project site was vacant and unencumbered prior to it being acquired by DOFAW. There was no expressed interest by agricultural companies to return it to cultivation for diversified agriculture, thus the area was made available for wetland restoration. Because no agricultural practices have occurred at the site

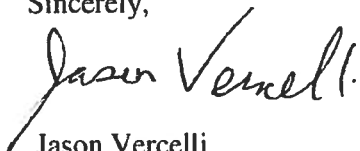
since sugarcane ceased, no pesticides currently used for the production of corn, soybeans, and other crops have been applied at the project site, therefore reducing the risk of soil contamination.

- The project site expands on the existing Kawaiiele area, adding over 100 acres of endangered waterbird habitat.
 - As described in #1 above, DOFAW consulted with the U.S. Navy regarding the project site. Both parties agreed to the 2,000 ft setback from the runway at PMRF to reduce bird aircraft strike hazards. Bird aircraft strike hazards were addressed and evaluated in Section 3.10 of the Draft Environmental Assessment.
3. The project site is approximately 2.5 miles from the Kekaha landfill. The potential for the spread of White Spot Syndrome Virus (WSSV) by Hawaiian waterbirds was addressed in section 3.11.2 of the Draft EA. The four species of endangered Hawaiian waterbirds that are likely to benefit as a result of this project do not forage in upland habitats at the Kekaha Landfill and they are not known vectors of WSSV. Therefore DOFAW does not anticipate the virus to be transferred from the landfill to the project site.
4. Agricultural lands, currently used for cultivation corn, soybeans, and other crops occur throughout the Mana Plain. However, as described in #2 above, no agricultural practices have occurred at the site since sugarcane production ceased. In addition, no active croplands are immediately adjacent to the project site, so risk of overspray of chemicals to the restored wetlands is minimal. DOFAW does not regulate the use of pesticides (including herbicides) on surrounding agricultural lands.

DOFAW and project partners are working with Department of Health to conduct soil sampling and test for contaminants related to historical use of the project site for sugarcane cultivation.

Kawaiiele (previously Kawaiiele Waterbird Sanctuary) has provided habitat for endangered waterbirds for nearly 20 years. All four species of endangered waterbird forage and successfully nest and fledge young at Kawaiiele and have shown no signs of acute or toxic poisoning from pesticides. Kawaiiele also supports several species of native wetland plants, odonates, and other aquatic invertebrates. DOFAW does not anticipate that pesticides used on surrounding croplands will negatively impact the wetlands or waterbirds at the project site. DOFAW is adding a section on contaminants to the Final Environmental Assessment that contains additional information on the Environmental Analyses.

Sincerely,



Jason Vercelli
DOFAW Biologist

PO Box 30848
Anahola, Hawai'i 96703-0848

31 May 2012

State of Hawai'i
Department of Land and Natural Resources (DLNR)
Division of Forestry and Wildlife (DOFAW)
3060 Eiwa Street ~ Room 306
Lihue, Hawai'i 96766-1875

Attention: Jason Vercelli, Wildlife Biologist
Re: *draft Environmental Assessment (dEA)*
Mana Plain Wetland Restoration

To Whom It May Concern:

Aloha! I deeply appreciate the opportunity to comment on the draft Environmental Assessment (*dEA*) of the Mana Plain Wetland Restoration. Mahalo plenty, for the intensive work that went into producing an excellent and comprehensive document. I commend those responsible (*DLNR DOFAW* Kaua'i office and the other partners / affiliates / individuals / etc.) in attempting to reestablish / rehabilitate wet land habitat for four (4) endangered endemic Hawaiian water birds **and** native Hawaiian plants.

The *dEA* is educational, heartening & exciting: that there is such cross-sector community involvement & *kokua* from our island community, *all* working together on the recovery / restoration of the Mana Plains Forest Reserve... the focus being more native wet land habitat for the Hawaiian endangered water birds. Additionally, other native wet land animals & plants, also most importantly: sustainable management means to restore the Mana wet lands – which traditionally were the largest wet land area in Hawai'i Nei .

Cliché for wet lands: “kidneys of the landscape”. Wet lands are essential: during storms by controlling flooding, they filter water pollutants & trap sediment. Half of the wet lands in the U.S. are gone... they were drained and used for farmland – this same story has been repeated in Hawai'i Nei. Since this land is in recovery from Big Agriculture the previous ag wells will be used to naturally manage the Mana Plains Restoration – the project benefits the protection of four (4) endangered water bird species, native plants and animals.

My 'Ohana both blood and extended (numerous people who do not have time or the ability to express themselves) strongly support the DLNR DOFAW in a 'green light' for the acceptance of the dEA that the document is issued A findings of No significant Impact (FONSI).

The efforts to rehabilitate a tiny portion (105-acres) of the Mana Plain are praiseworthy! It's glorious past, a wet land complex of 1,700-acres which was drained & converted to agriculture lands. The responses published in the *dEA*: 'Pre-Assessment Comments' by various agriculture businesses for the most part were of the similar mindset from the 1870's. That of – fee simple – Western mentality – that of insatiable self-corporate indulgence – with no thought of repercussions to surrounding flora / fauna. *That* rampant corporate attitude, still unfortunately global today and here on Kaua'i – resulting in climate change – is manifest in those corporate comments. As well, hopefully, Pacific Missile Range Facility (*PMRF*) will *kokua* BIG TIME in this ecosystem wet land rehabilitation on Kaua'i

It's fantastic that the Mana Plain Wetland Restoration will incorporate citizen participation e.g. high school students in conjunction with Kaua'i Community College (*KCC*), environmental education for residents & visitors focused on native Hawaiian endangered species, native plants and cultural resources of Mana Plain.

Again, I (and my collective 'Ohana) are appreciative to have the opportunity to comment on the *dEA* and wholeheartedly support this grand Mana Plain Wetland Restoration Project ~ Hope it starts in fall 2012! ~

Sincerely with ALOHA,

Bonnie P. Bator and 'Ohana

 k 'ohana

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. AHLA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

PAUL J. CONRY
DEPUTY CHIEF 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 EDUCATION
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

10 September 2012

To: Ms. Bonnie Bator and Ohana

Response to Draft Environmental Assessment Comments

Thank you for your enthusiastic comments regarding the content of the Draft Environmental Assessment for the proposed Mana Plain Wetland Restoration Project. Your acknowledgement of the educational opportunities and public involvement that the project will provide is encouraging. We also appreciate your comments regarding the benefits the restoration of these wetlands will bring to the island of Kauai's Ecosystem. We will take your comments into consideration as we prepare the final Environmental Assessment for publication. It will be available for viewing on the DLNR Division of Forestry and Wildlife website in the fall of 2012.

Sincerely,

A handwritten signature in black ink that reads "Jason Vercelli".

Jason Vercelli
DOFAW Wildlife Biologist



STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to
EMD/CWB

06005PKP.12

June 5, 2012

Mr. Jason Vercelli
Biologist
Division of Forestry and Wildlife
Department of Land and Natural Resources
3060 Eiwa Street, Room 306
Lihue, Hawaii 96766

Dear Mr. Vercelli:

**SUBJECT: Comments on the Draft Environmental Assessment for the
Mana Plain Wetland Restoration Project
Waimea, Island of Kauai, Hawaii**

The Department of Health (DOH), Clean Water Branch (CWB), acknowledges receipt of your letter, received on May 25, 2012, requesting comments on your project. The DOH-CWB has reviewed the subject document and offers these comments. Please note that our review is based solely on the information provided in the subject document and its compliance with the Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at: <http://www.hawaii.gov/health/environmental/env-planning/landuse/CWB-standardcomment.pdf>.

1. Any project and its potential impacts to State waters must meet the following criteria:
 - a. Anti-degradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.
 - b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.
 - c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).
2. You may be required to obtain a National Pollutant Discharge Elimination System (NPDES) permit for discharges of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55). For the following types of discharges into Class A or Class 2 State waters, you may apply for an NPDES general permit coverage by submitting a Notice of Intent (NOI) form:

- a. Storm water associated with construction activities, including clearing, grading, and excavation, that result in the disturbance of equal to or greater than one (1) acre of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. This includes areas used for a construction base yard and the storage of any construction related equipment, material, and waste products. An NPDES permit is required before the start of the construction activities.
- b. Hydrotesting waters.
- c. Construction dewatering effluent.

You must submit a separate NOI form for each type of discharge at least 30 calendar days prior to the start of the discharge activity, except when applying for coverage for discharges of storm water associated with construction activity. For this type of discharge, the NOI must be submitted 30 calendar days before to the start of construction activities. The NOI forms may be picked up at our office or downloaded from our website at:
<http://www.hawaii.gov/health/environmental/water/cleanwater/forms/genl-index.html>.

3. For other types of wastewater not listed in Item No. 2 above or wastewater discharging into Class 1 or Class AA waters, an NPDES individual permit will need to be obtained. An application for an NPDES individual permit must be submitted at least 180 calendar days before the commencement of the discharge. The NPDES application forms may be picked up at our office or downloaded from our website at <http://hawaii.gov/health/environmental/water/cleanwater/forms/environmental/water/cleanwater/forms/indiv-index.html>.
4. If your project involves work in, over, or under waters of the United States, it is highly recommend that you contact the Army Corp of Engineers, Regulatory Branch (Tel: 438-9258) regarding their permitting requirements.

Pursuant to Federal Water Pollution Control Act [commonly known as the "Clean Water Act" (CWA)], Paragraph 401(a)(1), a Section 401 Water Quality Certification (WQC) is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may **result** in any discharge into the navigable waters..." (emphasis added). The term "discharge" is defined in CWA, Subsections 502(16), 502(12), and 502(6); Title 40 of the Code of Federal Regulations, Section 122.2; and HAR, Chapter 11-54.

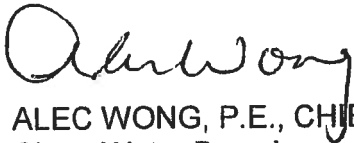
Mr. Jason Vercelli
June 5, 2012
Page 3

06005PKP.12

5. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 WQC are required, must comply with the State's Water Quality Standards. Non-compliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of \$25,000 per day per violation.

If you have any questions, please visit our website at:
<http://www.hawaii.gov/health/environmental/water/cleanwater/index.html>, or contact the Engineering Section, CWB, at (808) 586-4309.

Sincerely,



ALEC WONG, P.E., CHIEF
Clean Water Branch

KP:np

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. AHLA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

PAUL J. CONRY
INTERIM 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 RESTORATION DEVELOPMENT

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

24 September 2012

To: State of Hawaii
Department of Health
P.O. Box 3378
Honolulu, HI 96801

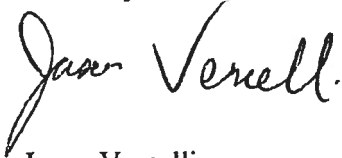
Responses to the State of Hawaii, Department of Health's comments on the Draft Environmental Assessment for the proposed Mana Plain Wetland Restoration Project

Thank you for your responses to the Draft Environmental Assessment (EA) for the proposed Mana Plain Wetland Restoration Project. Please see our responses below addressing your comments.

1. As discussed in the draft EA, the Mana Plain Wetland Restoration Project will meet the criteria set forth in HAR, Sections 11-54-1.1, 11-54-3 as well as sections 11-54-4 through 11-54-8.
2. The Division of Forestry and Wildlife (DOFAW) will obtain a National Pollutant Discharge Elimination System (NPDES) permit prior to any construction activities. DOFAW will submit a Notice of Intent (NOI) form for each type of discharge at least 30 calendar days prior to the start of construction. Thank you for providing the on-line link to the NOI.
3. DOFAW will obtain an individual NPDES permit as required by law for the proposed project. DOFAW will submit an application at least 180 calendar days before the commencement of any discharge. Thank you for providing the on-line link to the application forms.
4. DOFAW will coordinate with the Army Corps of Engineers, Regulatory Branch for any activities in waters of the United States.

5. DOFAW acknowledges that all discharges related to the project construction or operation activities, must comply with the State of Hawaii's Water Quality Standards. DOFAW is aware that noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements specified in HAR, Chapter 11-55, may be subject to penalties.

Sincerely,

A handwritten signature in black ink that reads "Jason Vercelli". The signature is written in a cursive style with a large, sweeping initial "J".

Jason Vercelli
DOFAW Wildlife Biologist

June 16, 2012

Jason Vercelli
Wildlife Biologist
State of Hawaii DLNR DOFAW
3060 Eiwa Street, Room 306
Lihue, HI 96766

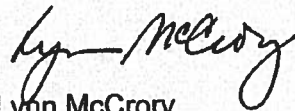
Re: Mana Plain Wetland Restoration Project, Kauai, Hawaii

Dear Mr. Vercelli:

This letter is in SUPPORT of the Mana Plain Wetland Restoration project as described in your May 2012 Environmental Assessment. It is very encouraging to see the State take an active role in creating and then maintaining a wetland restoration. Providing habitat for the four endangered wetland birds, along with the native plants will provide a learning experience for all of Kauai.

Your "Friends of Mana" community organization also allows all of us to take part in the enjoyment that comes from being outside and making a difference in our island. Thank you for making all of this possible.

Very truly yours,



Lynn McCrory
5140 Hanalei Plantation Road
Princeville, HI 96722

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. AHLA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

PAUL J. CONRY
DEPUTY 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
KABOHELEWAI AND RESERVE COMMISSION
LAND
STATE PARKS

10 September 2012

To: Ms. Lynn McCrory

Response to Draft Environmental Assessment Comments

Thank you for your comments regarding the content of the Draft Environmental Assessment for the proposed Mana Plain Wetland Restoration Project. We commend your support concerning the value of providing habitat for Hawaii's four endangered waterbirds. We also appreciate your enthusiasm for the volunteer involvement opportunities this project will provide the public. We will take your comments into consideration as we prepare the Final Environmental Assessment for publication. It will be available for viewing on the DLNR Division of Forestry and Wildlife website in the fall of 2012.

Sincerely,

A handwritten signature in black ink that reads "Jason Vercelli".

Jason Vercelli
DOFAW Wildlife Biologist

June 16, 2012

Jason Vercelli
Wildlife Biologist
State of Hawaii DLNR DOFAW
3060 Eiwa Street, Room 306
Lihue, HI 96766

Re: Mana Plain Wetland Restoration DRAFT Environmental Assessment (EA)

Dear Mr. Vercelli:

The goals of the Mana Plain Wetland Restoration fit perfectly with Kauai. That the State of Hawaii, DLNR DOFAW, is moving forward with restoring native habitat where it once functioned is wonderful. This land having been in agriculture for almost 100 years, while certainly benefiting Kauai economically, resulted in the reduction of our wetland birds and native plant communities. The opportunity that you are providing our island is very important.

Your goal of promoting environmental education for the schools and communities will give all of us a better understanding of what it will take to continue to support our native species. Educating the tourists is always helpful in broadening their comprehension of keeping Kauai Kauai.

What is also very clear from your EA is the complexity of restoring the wetland. Thank you for working for many years on what will be a very special place on our island.

Sincerely,



Barbi Shinno
P.O. Box 665
Anahola, Kauai, Hawaii 96703

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

PAUL J. CONRY
INTERIM 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
EMPOWERMENT

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

10 September 2012

To: Ms. Barbi Shinno

Response to Draft Environmental Assessment Comments

Thank you for your comments regarding the content of the Draft Environmental Assessment for the proposed Mana Plain Wetland Restoration Project. We are encouraged by your sentiments regarding the value of restoring native habitat on Kauai. We also appreciate your support for the environmental education opportunities that the project will provide. We will take your comments into consideration as we prepare the final Environmental Assessment for publication. It will be available for viewing on the DLNR Division of Forestry and Wildlife website in the fall of 2012.

Sincerely,

A handwritten signature in black ink that reads "Jason Vercelli".

Jason Vercelli
DOFAW Wildlife Biologist

June 18, 2012

Jason Vercelli
Wildlife Biologist
State of Hawaii DLNR DOFAW
3060 Eiwa Street, Room 306
Lihue, HI 96766

Re: Mana Plain Wetland Restoration DRAFT Environmental Assessment

Dear Mr. Vercelli:

My initial knowledge of what was a wetland, what would be the benefits, why would you restore a wetland, what are wetland birds, what plants and water qualities are important, plus many more similar questions, could be labeled minimal. The information you have provided and the work that you completed in order to determine what would be the best alternatives for restoring a wetland clearly showed the work that must be done. The success of the continuance of the wetland also will strongly depend on the State of Hawaii, DLNR DOFAW funding the staff and work necessary.

Having the wetland located along the main highway, will provide the opportunity for both the community and the tourists to assist in keeping the wetland functioning. Whether they volunteer to assist at the tourist shop, or by weeding or planting or whatever tasks are needed, this will offset some of the needed funds. It will also aid in the community taking ownership, as it will be very visible.

Thank you for working to place the Mana Plan Wetland restoration on Kauai.

Sincerely,

A handwritten signature in black ink, appearing to read 'Ronald Sakoda', with a long horizontal flourish extending to the right.

Ronald Sakoda
1840A Leleiona Street
Lihue, Hawaii 96766

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. AHLA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

PAUL J. CONRY
INTERIM FIRST DEPUTY

WILLIAM BI. 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
KAIHOLOAWI AND RESERVE COMMISSION
LAND
STATE PARKS

10 September 2012

To: Mr. Ronald Sakoda

Response to Draft Environmental Assessment Comments

Thank you for your comments regarding the content of the Draft Environmental Assessment for the proposed Mana Plain Wetland Restoration Project. We appreciate your support for the community involvement that the project will provide.

DOFAW has leveraged federal and private funding sources to augment state funds for the wetland restoration. DOFAW is committed to managing the restored wetlands and currently has one biologist assigned to the project and is planning to hire a biological technician to assist with the management of the restored wetlands. DOFAW staff will continue to collaborate with internship programs that increase cost effectiveness and provide on-the-job training for students interested in natural resource conservations. Volunteer work days will also be continued.

In addition DOFAW will continue partner with other agencies and organizations to pursue grant funding from federal, state and private sources, to augment state funding. We will take your comments into consideration as we prepare the Final Environmental Assessment for publication. It will be available for viewing on the DLNR Division of Forestry and Wildlife website in the fall of 2012.

Sincerely,

A handwritten signature in black ink that reads "Jason Vercelli".

Jason Vercelli
DOFAW Wildlife Biologist



DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

NEIL ABERCROMBIE
GOVERNOR
RICHARD C. LIM
DIRECTOR
MARY ALICE EVANS
DEPUTY DIRECTOR
JESSE K. SOUKI
DIRECTOR
OFFICE OF PLANNING

OFFICE OF PLANNING

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824

Ref. No. P-13628

June 20, 2012

Mr. Jason Vercelli, Wildlife Biologist
Division of Forestry and Wildlife
Department of Land and Natural Resources
3060 Eiwa Street, Room 306
Lihue, Hawaii 96766-1875

Dear Mr. Vercelli:

Subject: Mana Plain Wetland Restoration
Draft Environmental Assessment

Thank you for the opportunity to provide comments on the Draft Environmental Assessment (Draft EA) for the proposed Mana Plain Wetland Restoration project located at Waimea, Kauai, Hawaii, TMK: (4) 1-2-2: portion of 001.

It is our understanding that the Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) is proposing to restore wetland and associated coastal upland habitat within the Mana Plains Forest Reserve. Wetland restoration is proposed on an approximately 105-acre site immediately north of the existing Kawaele Waterbird Sanctuary. The proposed restoration includes the following actions: wetland and coastal strand restoration; habitat restoration for native Hawaiian plants and waterbirds, improvements to support DOFAW operational needs; and environmental education, outreach, and wildlife-oriented recreation activities.

The Office of Planning (OP) has reviewed the Draft EA, and has the following comments to offer:

1. The entire state is defined to be within the Coastal Zone Management Area (Hawaii Revised Statutes (HRS) Section 205A-1 - definition of "coastal zone management area"). While the Draft EA has a cursory section on Coastal Zone Management (Section 5.2.2, page 96 of the Draft EA), there is no discussion of the proposed project's consistency with the objectives and policies of the Coastal Zone Management Program, which are binding upon all agencies. (HRS Section 205A-4(b))

The Final EA's section on Coastal Zone Management should be expanded to include a discussion on the proposed project's consistency with each of the objectives and policies set forth in HRS Section 205A-2.

Mr. Jason Vercelli
Page 2
June 20, 2012

2. The Hawaii Coastal Zone Management (CZM) Program includes the Coastal Nonpoint Pollution Control Program (CNPCP). The CNPCP, established through Section 6217 of the National CZM Act, is administered through the National Oceanic and Atmospheric Administration (NOAA) and the Environmental Protection Agency (EPA) via state CZM programs and networked agencies. The program strives for increased coordination between coastal zone managers and water quality experts to reduce polluted runoff in the coastal zone by focusing on pollution prevention, minimizing the creation of polluted runoff, and encouraging pollution prevention efforts at the local level. The CNPCP sets forth various management measures for a number of categories, including wetlands, riparian areas, and vegetated treatment systems.

The proposed project may be viewed as implementation of a CNPCP management measure through the restoration and protection of wetlands and riparian areas. Wetlands and riparian areas play a significant role in protecting water quality and reducing adverse water quality impact associated in nonpoint source pollution.

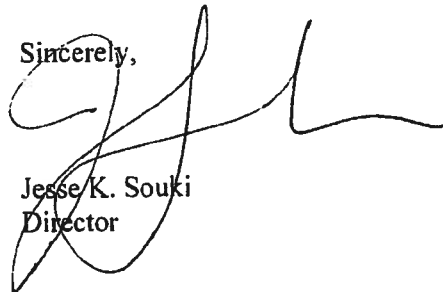
We refer you to the *Hawaii Watershed Guidance*, for additional information on the management measures for wetlands, riparian areas, and vegetated treatment systems. A copy of this document can be found online at <http://hawaii.gov/dbedt/czm/initiative/nonpoint/HI%20Watershed%20Guidance%20Final.pdf>.

Additional information on the CNPCP can be found at <http://hawaii.gov/dbedt/czm/initiative/nonpoint.php>, or by contacting Kenneth Roberts at (808) 587-2803.

Once again, thank you for the opportunity to comment on the Draft EA for the proposed project.

Should you have questions or require clarification, please do not hesitate to contact Leo Asuncion, CZM Program Manager, at (808) 587-2875.

Sincerely,



Jesse K. Souki
Director

c: Mr. Ardalan Nikou, AECOM Technical Services

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
COMMISSIONER OF WATER RESOURCE MANAGEMENT

PAUL J. CONRY
DISTRICT FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

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

24 September 2012

To: State Of Hawaii
Department of Business, Economic Development & Tourism
Office of Planning
235 South Beretania Street, 6th Floor
Honolulu, Hawaii 96804

Responses to the Department of Business, Economic Development & Tourism's comments on the Draft Environmental Assessment for the proposed Mana Plain Wetland Restoration Project

Thank you for your responses to the Draft Environmental Assessment for the proposed Mana Plain Wetland Restoration Project. Please see our responses below addressing your comments.

1. DOFAW has expanded its section in the EA concerning Coastal Zone Management. The additions discuss how the proposed project will be consistent with the ten objectives and policies of Hawaii's Coastal Zone Management Program.
2. DOFAW is encouraged by the possibility that the proposed restoration of this wetland may be viewed as implementation of a Coastal Nonpoint Pollution Control Program management measure. DOFAW would like to discuss any potential for your office to share cost in this restoration project, or provide assistance in identifying additional funding sources.

Sincerely,

A handwritten signature in black ink that reads "Jason Vercelli".

Jason Vercelli
DOFAW Wildlife Biologist

Jason Vercelli
Wildlife Biologist
DLNR-DOFAW
3060 Eiwa Street Rom 306
Lihue, HI 96766-1875

June 20, 2012

Dear Mr. Vercelli:

I am writing to express my support of the Preferred Alternative for the Mānā Plains Forest Reserve Wetland Restoration Project. This project is a perfect complement to other existing managed wetland areas on the island and will be critical to the recovery of endangered Hawaiian waterbirds.

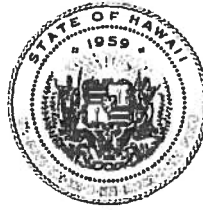
It is my hope that DOFAW continues to expand more wetland areas on the island and other parts of the State.

Sincerely,

A handwritten signature in black ink, appearing to read "Christine Ogura". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Christine Ogura

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. AHLA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

PAUL J. CONRY
INTERIM 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
KAOHOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

10 September 2012

To: Ms. Christine Ogura

Response to Draft Environmental Assessment Comments

Thank you for your comments regarding the content of the Draft Environmental Assessment for the proposed Mana Plain Wetland Restoration Project. We appreciate your support concerning the value of the recovery of Hawaii's endangered waterbirds, as well as expanding wetlands on Kauai and throughout the State. We will take your comments into consideration as we prepare the Final Environmental Assessment for publication. It will be available for viewing on the DLNR Division of Forestry and Wildlife website in the fall of 2012.

Sincerely,

A handwritten signature in black ink that reads "Jason Vercelli".

Jason Vercelli
DOFAW Wildlife Biologist



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
2012-TA-0346

JUN 22 2012

Mr. Jason Vercelli
Wildlife Biologist
3060 Eiwa Street, Room 306
Lihue, Hawaii 96766

Subject: Technical Assistance for Mana Plain Wetland Restoration Draft Environmental Assessment, Kauai

Dear Mr. Vercelli:

The U.S. Fish and Wildlife Service (Service) received your electronic correspondence, dated May 14, 2012, requesting our comments on the draft Environmental Assessment (EA) for the Mana Plain Wetland Restoration Project on the island of Kauai. The State of Hawaii Department of Land and Natural Resources – Division of Forestry and Wildlife (DOFAW) is proposing to restore 105 acres of wetland and coastal upland habitat adjacent to the existing Kawaiele Waterbird Sanctuary [TMK (4) 1-2-2: por. 1]. Both wetland sites are within the State's Mana Plain Forest Reserve. The western border of the project area parallels the Pacific Missile Range Facility (PMRF).

The purpose of the project is to restore habitat suitable for the federally endangered Hawaiian coot (*Fulica alai*), Hawaiian moorhen (*Gallinula chloropus sandvicensis*), Hawaiian stilt (*Himantopus mexicanus knudseni*) and Hawaiian duck (*Anas wyvilliana*) (collectively referred to as Hawaiian waterbirds). The draft EA identifies actions including: (1) wetland and coastal strand restoration; (2) habitat restoration for native Hawaiian plants and native Hawaiian waterbirds; (3) improvements to support operational needs; and (4) environmental education, outreach, and wildlife-oriented recreational activities. Funding for the planning and implementation of this project has been provided by the Service and other partners.

The Mana Plain once encompassed approximately 1,700 acres of permanent, semi-permanent, and seasonal wetlands. This important area has degraded over time due to agricultural land use. Currently, only 200 acres of aquatic habitat remain, most of which is not suitable for Hawaiian waterbirds due to impacts from invasive species. Despite its degradation, Mana Plain remains an important wetland complex in the Hawaiian Islands, and is listed as Core Wetland in the Recovery Plan for Hawaiian Waterbirds (Service 2011, Appendix A). The Service supports the State's action to restore this portion of Mana Plain, and agrees that the project is essential for the

TAKE PRIDE[®]
IN AMERICA 

recovery of native Hawaiian waterbirds. We offer the following comments to assist you in further developing this project:

Hydrology and Wetland Design

Based on our review of the project description, we understand the restored wetland and associated hydrology will be a complex, integrated system, requiring continued management to control and maintain wetland functions for the benefit of Hawaiian waterbirds. We recognize the ingenuity of the design, but are concerned about the high level of management needed to maintain the system. We recommend you identify long-term funding sources to ensure necessary staff and resources will be available to maintain the wetland in perpetuity. We also suggest you develop a Wetland Hydrology Management Plan with adaptive management provisions to ensure future site managers will be able to maintain intended wetland functions, especially the potential variations due to hydrological conditions.

Under the proposed action, all basins except N3 and N13 will be supplied solely by groundwater. These two basins will be designed to receive surface water pumped from the northern drainage canal. However, a statement on page 9 indicates there is no intention to intersect the ground water table. We recommend you clarify whether excavation into the ground water table is necessary for basin water systems.

Abandoned field irrigation ditches that are no longer used will be filled with on-site soils of low permeability. Yet the major drainage canals that bisect the site will not be altered. We recommend describing how maintaining the major drainage canals, which continue to drain the wetland, will be managed to contribute to the long term hydrologic regime of the restored area.

To ensure that restored wetland system is functioning properly, we recommend incorporating water quality monitoring into your Wetland Hydrology Management Plan. Poor water quality is detrimental to ecosystem health and may increase the occurrences of disease, including avian botulism. Water management within basins should maximize quality for native Hawaiian waterbirds. Prior to water level manipulation, wetland managers should ensure that the change in water level will not result in the loss of active waterbird nests.

Predator Control and Fencing

The draft EA states that a perimeter fence will be installed to keep large non-native mammalian predators and ungulates, such as dogs, pigs, and goats out of the restored wetland basins. Control of other invasive mammals, including cats and rats will be implemented. However, no details are given on predator control activities or implementation. To avoid the restored site becoming a "sink" or "attractive nuisance," predator control must be consistent and effective. We recommend the draft EA identify specific predator management actions and state how DOFAW will ensure long-term resources necessary to conduct these measures. Further, we recommend DOFAW consider revising the fence plans to include the Kawaiie Waterbird Sanctuary. As these two sites are adjacent to each other and offer habitat to the same population of Hawaiian waterbirds, it is essential that both sites receive the same level of protection from invasive predators.

We also recommend the draft EA be updated to reflect the increased number of mongoose sightings on Kauai and the capture of an adult male mongoose in Lihue. Hawaiian waterbird populations on Kauai are not currently subject to predation by mongoose; thus, the potential establishment of mongoose on Kauai may significantly affect the survivorship and recovery of Hawaiian waterbirds. The draft EA should identify specific measures to monitor for evidence of mongoose in the restored wetland area, as well as actions to implement predator control if mongoose are detected.

Human Disturbance

The draft EA identifies outreach education as a priority. Current plans include a visitor's center, restroom facilities, walking trails, viewing platforms, and guided tours. The Service shares DOFAW's commitment to wildlife education programs. However, to minimize potential adverse impacts to listed species from visitor use, we suggest that pets be prohibited and educational signs should inform path users of area regulations and the presence of sensitive species. Leaving marked trails, approaching or feeding wildlife, and littering should be prohibited. If possible, we recommend full access to the site be closed when the visitor's center is not open and/or when staff are not available to monitor visitor use activities. Certain areas of the restored wetland may need to be periodically closed to visitor use in areas where Hawaiian waterbirds are nesting. We also recommend the use of sturdy animal-proof garbage containers to reduce the attraction of the area to non-native species, such as house mice, rats, and feral cats.

Wildlife Hazards at the Pacific Missile Range Facility

The project site is immediately adjacent to PMRF, a U.S. Navy and Department of Defense training site. The wetland restoration project site is located approximately 2,000 feet from PMRF's active runway. Wildlife species in the vicinity of runways are known to be a hazard to the safe operation of aircrafts. PMRF currently operates a Bird Aircraft Strike Hazard Program (BASH) to reduce the potential for collisions between wildlife and aircrafts. In particular, PMRF is concerned about the presence of the federally endangered Hawaiian goose (*Branta sandwicensis*) due to their large body size and flocking behavior. We understand PMRF has coordinated with DOFAW on the proposal to restore wetlands within the vicinity of the runway, and has provided comments in the development of the draft EA.

The draft EA states that it is not the intent of the project to attract the Hawaiian geese to the area. The document notes that the adjacent Kawaiele Waterbird Sanctuary does not support breeding Hawaiian geese and the wetland design (i.e. vegetated berms, no irrigated grasses, low water depths) will reduce the attractiveness of geese to the area. Despite these measures, due to other factors, Hawaiian geese are expected to increase on Kauai, and the distribution of the species across the island will likely result in some birds being attracted to the site.

Currently, PMRF is addressing their BASH program and other actions in formal consultation with our office pursuant to section 7 of the Endangered Species Act of 1973 [16 U.S.C. 1531-1544], as amended. Together we are working on additional measures to reduce the attractiveness of the training facility to Hawaiian geese. We appreciate DOFAW's willingness to assist PMRF in their efforts to reduce potential Hawaiian goose hazards. However, please note that any measures to haze or relocate Hawaiian geese away from PMRF must be addressed through

PMRF's section 7 consultation. While the State holds the authority to manage Hawaiian geese pursuant to their section 6 agreement with the Service, these activities are required to be for the purpose of species recovery, and should not be conducted in response to PMRF's concerns. We request DOFAW coordinate with our office for any actions to relocate Hawaiian geese away from the leeward side of Kauai. Additionally, as this wetland restoration is expected to have minimal benefit for Hawaiian geese, we urge DOFAW to pursue the possibility of restoring other areas of Mana Plain specifically for the benefit of Hawaiian geese.

Hawaiian Hoary Bats

Although the area is not being restored for the benefit the federally endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), the species is known to occur in the area. A recent study conducted by the U.S. Geological Survey observed significantly high levels of bat detections at adjacent PMRF during the late summer and early fall (Bonaccorso 2011). The study concludes the area may have regional significance as a Hawaiian hoary bat breeding site. We recommend the draft EA include additional information on the presence of Hawaiian hoary bats in the project area and possible benefits of the restoration for the species. Additionally, we suggest DOFAW monitor bat seasonal use and distribution through the use of passive acoustic detectors.

Wetland Names and Titles

We note that the draft EA refers to numerous wetland areas within the Mana Plain. However, use of these names and titles is often inconsistent, making it difficult to ascertain which areas are being discussed in different sections. We recommend you consistently refer to wetland areas with the same name throughout the document. Additionally, we are concerned that the title of the project, "Mana Plain Wetland Restoration," may infer that the entire Mana Plain is being restored. To clarify the intent of this project, we recommend you revise the title to reflect the scope of the wetland restoration project in the final EA.

Thank you for your commitment to endangered species and native ecosystems. If you have questions regarding this letter, please contact Michelle Bogardus, Consultation and Habitat Conversation Planning Program (phone: 808-792-9400; fax: 808-792-9581).

Sincerely,

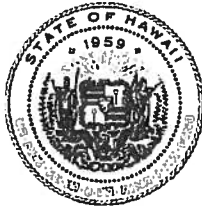


for Loyal Mehrhoff
Field Supervisor

Reference:

Bonaccorso, Frank. 2011. Hawaiian hoary bat occupancy at the Pacific Missile Range Facility (PMRF) and satellite facilities – Final Report. U.S. Geological Survey, Pacific Islands Ecosystems Research Center.

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

ESTHER KIA'AINA
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
KAIHULAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

March 8, 2013

To: U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Blvd., Rm 3-122
Box 50088
Honolulu, HI 96850

Response to comments received on the Draft Environmental Assessment for the proposed Mana Plain Wetland Restoration Project

Thank you for your comments to the draft Environmental Assessment (EA) and your support for the proposed Mana Plain Wetland Restoration Project. Please see our responses below addressing your concerns.

1. *Hydrology and wetland design* – The Hydrogeological Study completed for the proposed project identifies cost efficient and effective design criteria that will be included in the design specifications. As explained in Section 2.2 of the draft Environmental Assessment, DOFAW will develop an adaptive management plan. This plan will include hydrology (including water management and water quality), monitoring as well as other pertinent aspects of wetland management.

DOFAW is committed to managing the restored wetlands and has cooperated with staff at U.S. Fish and Wildlife Service Kauai National Wildlife Refuge Complex to ensure that the design and management of the restored wetlands are cost effective. DOFAW currently has one biologist assigned to the project and is planning to hire a biological technician to assist with the management of the restored wetlands. These staff positions, as well as operating expenses, are supported by Pittman-Robertson Funding, along with proceeds from the sand mining project at Kawaiiele. In addition, DOFAW staff will continue to collaborate with internship programs (e.g., AmeriCorps, HYCC, etc.) that provide on-the-job training in wetland management for students interested in natural resource conservation. Volunteer work days will also be continued. As the project progresses, DOFAW will continue to seek additional funding as needed.

Proposed wetland basin within the project site will not be excavated to intersect the groundwater, see Section 2.2. Groundwater used as a water source will be provided from an off-site well as identified in Section 2.2 of the draft EA.

The main drainage canals that bisect the project site are maintained by the U.S. Navy and the Agribusiness Development Corporation for agricultural production on the Mana

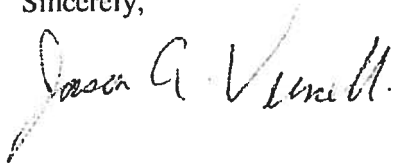
Plain. As described in, Section 2.2 of the draft EA, slurry walls will be used to reduce, if not eliminate lateral drainage of water to the main canals. This will allow effective management of water within the restored wetland basins while not increasing flooding risk of agricultural lands.

We have added information to Section 2.2 to demonstrate that water level manipulation will not be done in a manner that will adversely affect nesting activities of endangered waterbirds.

2. *Predator Control and Fencing* – In addition to the fence designed to exclude large mammalian predators DOFAW will conduct predator control for cats, rodents and mongoose within the project area. We have expanded Section 3.3.2 in regards to predator control, and added information regarding the recent capture of two mongooses on Kauai. Funding and resources for predator control include the same as listed under response #1. DOFAW has plans to fence Kawaiele (previously Kawaiele Waterbird Sanctuary) to exclude large non-native mammals, however, management and restoration actions at Kawaiele are outside the scope of the proposed action of this EA.
3. *Human Disturbance* – The draft EA states that wildlife-oriented recreation and education will be allowed in a manner that does not disturb breeding waterbirds. We appreciate the additional suggestions you provided for regulations pertaining to visitor service. Trails and observation overlooks along the south boundary of the restoration site are outside of the wetland areas and will have minimal disturbance to waterbirds. Access to areas of nesting waterbirds will be regulated to reduce disturbance following successful model for visitor access used at other wetlands in Hawaii managed by U.S. Fish and Wildlife Service and the State DLNR. All regulations will be clearly posted for visitors.
4. *Wildlife Hazards at the Pacific Missile Range Facility* – DOFAW has addressed comments received from the U.S. Navy and addressed and evaluated the bird aircraft strike hazard in Section 3.10 of the draft EA. Historically DOFAW has assisted the U. S. Navy with management of Hawaiian geese at PMRF and is willing to continue this collaboration pursuant to the U.S. Navy's Section 7 consultation. In the event that Hawaiian geese do nest at the restoration site and pose a threat to aviation safety, DOFAW will collaborate with USFWS and follow all applicable laws and regulations to reduce BASH risks and safeguard this endangered species.
5. *Hawaiian Hoary Bats* –Hawaiian hoary bats are listed in Section 3.3 of the draft Environmental Assessment. Thank you for providing a copy of the report referenced in your comment letter. We have incorporated this information into the final EA and look forward to cooperating with U.S. Fish and Wildlife Service and U.S. Geologic Survey on monitoring and research to increase our understanding of Hawaiian hoary bat ecology on the Mana Plain. However, endangered endemic waterbirds are the first priority for monitoring efforts at the restored wetlands; monitoring of other species will be conducted as time and resources permit.

6. *Wetland Names and Titles* – We have reviewed the draft Environmental Assessment to ensure consistent use of names. We described the proposed action in Section 2.2 as wetland restoration on 105 acres of the Mana Plains Forest Reserve.

Sincerely,

A handwritten signature in black ink that reads "Jason A. Vercelli". The signature is written in a cursive style with a large initial 'J' and 'V'.

Jason Vercelli
DOFAW Wildlife Biologist
(808) 241-3768



DEPARTMENT OF THE NAVY

PACIFIC MISSILE RANGE FACILITY
P. O. BOX 128
KEKAHA, HAWAII 96752-0128

IN REPLY REFER TO:

11010
Ser N4F/0371
22 Jun 2012

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

SUBJECT: PACIFIC MISSILE RANGE FACILITY (PMRF) RESPONSE TO DRAFT ENVIRONMENTAL ASSESSMENT, MANA PLAIN WETLAND RESTORATION, DATED MAY 2012

This letter is in response to our review of the Draft Environmental Assessment (EA) for the proposed "Mana Plain Wetland Restoration" to be constructed in proximity of our active runway. The wetland boundary is five times closer than the recommend Federal Aviation Administration (FAA) separation of 10,000 feet between an wetlands and an airfield servicing turbine-powered aircraft. As we have previously indicated both in correspondence and discussions with the Department of Land and Natural Resources/Division of Forestry and Wildlife (DLNR/DOFAW) leadership, it is the (E) Hawaiian goose that is now prevalent on the Mana Plain that is of grave concern to our aircraft and personnel safety. Our recorded observations confirm that the incidence of sightings of the nene in and around existing drainage ditches has dramatically increased - especially within 1,000' of RW34.

Please consider the following:

1. Please correct or strike this statement, #7 at the bottom of Page 22:

"Nene are attracted to habitats on PMRF and the U.S. Navy has not changed management of these habitats to deter nene".

This presumes that watered/mowed lawns are responsible for "attracting nene". Historical documentation of sightings in recent years confirms that nene are most frequent adjacent to and in the existing ditch system surrounded by ruderal vegetation, and in areas where the only moisture is rainfall. Watering is now limited, and eliminated in areas of prior sightings. Navy HAS changed management practices. We have an additional USDA/APHIS/WS technician focused on nene harassment and PMRF is investigating further options that will still meet fire safety requirements and not create new habitat preferred by other Bird Aircraft Strike Hazard (BASH) avian species.

2. The DOFAW preferred site will not be a "restoration". It will be a reconstruction, just as alternate Site B investigated by the Navy would be. The term "restoration" should be replaced throughout the document with "reconstruction" as indicated by wetlands SMEs retained for the project.

SUBJECT: PACIFIC MISSILE RANGE FACILITY (PMRF) RESPONSE TO DRAFT ENVIRONMENTAL ASSESSMENT, MANA PLAIN WETLAND RESTORATION, DATED MAY 2012

3. The draft Environmental Assessment (EA) does not evaluate or estimate the operation and maintenance cost for this reconstruction project. This cost analysis and the funding sources to perpetuate the project are required to assess the economic impact to the taxpayer, and are to be included in the process.
4. The Division of Fish and Wildlife (DOFAW) did not consider alternative sites that might be suitable for true "restoration" rather than expensive reconstruction. This is inherent in the spirit of "environmental analysis".
5. The U.S. Navy initiated the Agricultural Preservation Initiative ten years ago to maintain Range sustainability with compatible land use - agriculture. At that time, there was pressure to develop non-compatible projects on the Mana Plain, and the wetland agreement was initiated by the DLNR Land Board, specifically by the Kauai Representative at that time. The final acreage and location was a compromise that was based on the four target species that Navy Wildlife Biologists did not consider a BASH concern. The Hawaiian goose, nene, was NOT present at that time.
6. Nene have been present on Makaha Ridge, within sight of Barking Sands, for over 15 years. The flock first observed on Barking Sands was from the first fledglings released from the DOFAW site at Kokee in 2007, and a second flock arrived the following season before that project was terminated. Prior to those releases, only three nene had been observed on Barking Sands in the 10 years prior to the DOFAW Kokee project.
7. The US Navy was NOT a signatory to the Federal MOA to Address-Wildlife Strikes referenced under 5.3.4 FEDERAL AVIATION ADMINISTRATION on page 105.

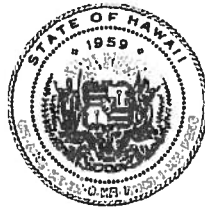
Should you have any questions regarding this matter, please contact LCDR John Baise at 808-335-4635 or Mr. John Burger at 808-335-4632.

Sincerely,



JOHN W. BAISE
Lieutenant Commander, CEC, U.S. Navy
Public Works Officer
By direction of the
Commanding Officer

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

ESTHER KIA'AINA
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

March 8, 2013

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

Response to comments received on the Draft Environmental Assessment for the proposed Mana Plain Wetland Restoration Project

Thank you for your comments on the draft Environmental Assessment (EA) for the proposed Mana Plain Wetland Restoration Project. Please see below our responses addressing your concerns.

1. We have corrected item #7 in section 2.3.5 of the draft EA to include management efforts by the U.S. Navy. However, Hawaiian geese or nene (*Branta sandvicensis*) are known to feed on managed lawns/short grassy area at PMRF. DOFAW encourages the Navy to continue their efforts to reduce lawn attractiveness by keeping lawns less watered during the summer flocking months. DOFAW also supports your posting of signs stating "Please do not feed nene."

Please continue to consult with the U.S. Fish and Wildlife Service regarding Section 7 of the Endangered Species Act of 1973 [16 U.S.C. 1531-1544], to further reduce the Bird Aircraft Strike Hazard (BASH) at PMRF. In addition, DOFAW has and will continue to assist the U.S. Navy, as well as the U.S. Fish and Wildlife Service in safeguarding nene that utilize areas at PMRF.

2. Prior to being drained for agricultural purposes, the Mana Plain contained approximately 1,700 acres of wetlands. The project area is considered part of the historical 1,700 acre wetland that was modified by ditching, draining, filling, and pumping. DOFAW plans to, as close as possible within the limitations of the surrounding infrastructure, return the project area to its former condition. The New Oxford American Dictionary (2011) defines restoration as, *the action of returning something to a former condition*. The Society of Ecological (2004) restoration defines ecological restoration as *the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed*. The degree of physical alteration determines the magnitude of implementation and management measures necessary to restore wetland systems. Because extensive land use modifications on the Mana Plain have altered the physical environment and natural wetland processes, reconstruction and management of wetland habitats is necessary in order to restore historical wetland functions to the project site. Therefore, DOFAW has

used 'restoration' throughout the draft EA to describe the proposed actions. Restoration of managed wetlands has been successfully implemented throughout Hawaii and on the U.S. mainland providing important resources for wetland dependent wildlife.

3. DOFAW is committed to managing the restored wetlands and has cooperated with staff at U.S. Fish and Wildlife Service Kauai National Wildlife Refuge Complex to ensure that the design and management of the restored wetlands are cost effective. Therefore, an estimate of the operation and maintenance cost for the Mana Plain Wetland Restoration Project will be added to the final EA. DOFAW currently has one biologist assigned to the project and is planning to hire a biological technician to assist with the management of the restored wetlands. These staff positions, as well as operating expenses, are supported by Pittman-Robertson funding and proceeds from the sand mining at Kawaiele. In addition, DOFAW staff will continue to collaborate with internship programs (e.g., AmeriCorps, HYCC, etc.) that provide on-the-job training in wetland management for students interested in natural resource conservation while conducting required management tasks at the project site. Volunteer work days will also be continued. As the project progresses, DOFAW will continue to seek additional funding as needed.
4. DOFAW addressed the feasibility of two alternative sites, one proposed by the U.S. Navy during December 2011 and a second site proposed during the scoping period, in Section 2.3.5 of the draft EA. For reasons cited in that section, DOFAW staff and project partners determined that these sites would not provide the same benefits as the current project site. In addition, PMRF engaged the U.S. Army Engineer Research and Development Center (ERDC) to evaluate the alternative sites in question and determine their suitability as substitutes for the current project site. The ERDC study determined that the alternative site located in the borrow pit did not possess the physical characteristics necessary to meet the objectives of the proposed restoration project, and therefore was eliminated from further consideration. For the alternative site located in the historical Nohili Pond wetland area, the ERDC found that the site had more extensive land-use modifications than the current project site, including the disruption and/or burial of native soils. ERDC states that this site "appears to have a limited ability to hold water." In addition, higher salinities at the proposed Nohili site will not provide suitable habitat for the four targeted species of endangered Hawaiian waterbirds.

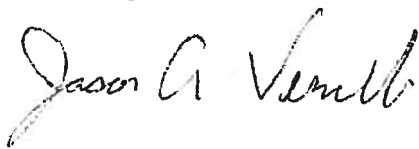
As explained in response #2 above and Section 2.3.5 of the draft EA, restoration of the historical wetland(s) on the Mana Plain is not feasible due to the extensive land use modifications and the existing infrastructure that is maintained to continue draining the historical wetland to support diversified agriculture on surrounding lands. These lands are not available for wetland restoration at this time. DOFAW and project partners have spent considerable time evaluating alternative sites proposed by the U.S. Navy. Staff from the U.S. Navy participated in a field visit to the project site during June 2009, which described the on-going restoration planning and proposed project design. However, the U.S. Navy did not express any BASH concerns to DOFAW at that time and waited until December 2011 when planning at the current site was almost complete.

5. The four Federal and State listed endangered waterbird species, the Hawaiian duck (*Anas wyvilliana*), Hawaiian Stilt (*Himantopus mexicanus knudseni*), Hawaiian coot (*Fulica alai*), and Hawaiian gallinule (*Gallinula galeata sandvicensis*) are intended to benefit from the proposed restoration project. These are the four targeted species that Navy

Wildlife Biologists did not consider a BASH concern when the Navy and the Board of Land and Natural Resources (BLNR) agreed on the project site boundaries. The species that the Navy has expressed BASH concerns with is the Hawaiian goose (*Branta sandvicensis*), or nene. As described in Chapter 3, Section 3.10 of the draft EA, the proposed project is not being developed to benefit the nene.

6. The Kauai nene population is increasing annually. This trend is expected to continue. As their population increases, it is predicted that nene will seek out and utilize more diverse habitat types around the island. With or without the proposed wetland restoration project at the project site, the occurrence of nene on the Mana Plain can be expected to continue. Once again, DOFAW encourages the Navy to continue efforts to discourage nene utilization of habitat at PMRF. DOFAW will continue to assist the Navy and the U.S. Fish and Wildlife Service in safeguarding nene that may utilize PMRF habitats.
7. In Chapter 5, Section 5.3.4 of the draft EA, DOFAW did not state that the U.S. Navy was a signatory to the Federal MOA. DOFAW made reference to the U.S. Air Force, U.S. Army, U.S. Fish and Wildlife Service, and other federal agencies as listed as being signatories of a Federal MOA to address wildlife strikes. This MOA is pertinent to list because U. S. Fish and Wildlife Service is one of the partners on the proposed project.

Sincerely,



Jason Vercelli
Wildlife Biologist
(808) 241-3768



Water has no substitute.....Conserve it

June 29, 2012

UID #1503

Mr. Jason Vercelli
State of Hawaii-DLNR-Forestry
3060 Eiwa Street, Room 306
Lihue, HI 96766

Dear Mr. Vercelli:

Subject: Draft Environmental Assessment for Mana Plain Wetland Restoration Project,
TMK: 1-2-02: por. 1, Kaumualii Highway, Mana, Kauai

This is in regard to your letter that we received on May 18, 2012. We have no objections to the proposed Mana Plain Wetland Restoration Project. However, the applicant is made aware that:

1. The Department of Water does not have a domestic water system serving this area.
2. Prior to the Department of Water recommending building permit approval, the applicant must:

Either:

- a) Complete a Waiver and Release Agreement with the Department of Water agreeing that domestic water service is not available from the Department of Water for this project.

Or:

- b) Submit a copy of the current deed for this lot to the Department of Water. The Deed must specifically indicate that County (Department of Water) water service is not available to the lot or similar wording, as approved by the Department.

If you have any questions, please contact Mr. Edward Doi at (808) 245-5417.

Sincerely,

A handwritten signature in black ink, appearing to read "GF", with a long horizontal stroke extending to the right.

Gregg Fujikawa
Chief of Water Resources and Planning Division

T-14008 Mana, Vercelli - Draft EA/ED:loo

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

PAUL J. CONRY
INTERIM 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

7 September 2012

To: County of Kauai
Department of Water
4398 Pua Loke St., P.O. Box 1706
Lihue, HI 96766

Responses to Draft Environmental Assessment Comments

Thank you for your comments regarding the Draft Environmental Assessment for the proposed Mana Plain Wetland Restoration Project. Please see below our responses to your comments.

1. DOFAW is aware that the Department of Water does not have a domestic water system serving the project area.
2. Prior to applying for building permits, DOFAW will complete a Waiver and Release Agreement with the department of water agreeing that domestic water service is not available from the Department of Water for this project.

Sincerely,

A handwritten signature in black ink that reads "Jason Vercelli".

Jason Vercelli
DOFAW Wildlife Biologist



August 20, 2012

United States
Department of
Agriculture

Animal and
Plant Health
Inspection
Service

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

Wildlife Services

**SUBJECT: USDA APHIS WILDLIFE SERVICES (WS) RESPONSE TO MANA
PLAIN WETLAND RESORATION DRAFT ASSESSMENT, DATED MAY 2012**

Hawaii State Office

3375 Koapaka Street,
Suite H-420
Honolulu, Hawaii
96819-1869

Tel: (808) 838-2840
Fax: (808) 838-2860

This letter is in response to our review of the Draft Environmental Assessment (EA) for the proposed "Mana Plain Wetland Restoration" to be constructed in proximity to an active runway on Pacific Missile Range Facility (PMRF). USDA, Wildlife Services is currently contracted by the U.S. Navy to conduct operations in and around the areas adjacent to and including the active airport operating at PMRF. WS works to reduce the threat of Bird Air Strike Hazards (BASH) involving US Navy aircraft and airmen/airwomen and potential wildlife threats in the PMRF aerodrome. In this capacity, WS personnel have a unique perspective regarding observations and movements of avian fauna in this area. WS Operations are conducted five days a week, from 6:00 am to 6:00 pm actively patrolling the airfield environment, striving to reduce the wildlife threat to naval air personnel.

Although the proposal states that four species of endemic and endangered Hawaiian waterbirds (Hawaiian duck, Hawaiian stilt, Hawaiian moorhen and Hawaiian coot) are the primary driving force behind the proposed expansion of the Mana Plain wetland area, many other species will undoubtedly be attracted to and benefit from the enlarged wetland area, including Hawaiian geese. The population of Hawaiian geese have been steadily increasing, and the west-side/Mana Plain area is no exception. The number of geese sightings at PMRF have been increasing since 2007(see below).

YEAR	2005	2006	2007	2008	2009	2010	2011	2012*
# Sightings	6	7	191	364	641	629	198	228

(*2012 total from 01/01/2012-07/31/2012)

Many of the geese observed are un-banded, and very likely are birds uncounted during State and Federal surveys. To date (January 1 through July 31, 2012), there have been 158 Hawaiian goose (nene) sightings in an area denoted as "The Hangout" in the map/photo below. This is an area where groups of geese have been observed loafing or feeding numerous times. The largest single group of geese observed so far occurred on June 18 this year, when 31 individual geese were observed and subsequently hazed/harassed while swimming down Kini Kini Ditch just to the east of the bridge crossing the ditch on Nohili Road. They were swimming toward "The Hangout" which is less than 1,000 feet from the approach end of Runway 34 (see below, compare this view to Figure 1.1, and page 2 in the DLNR Draft EA). The geese undoubtedly use the network of drainage and irrigation ditches located

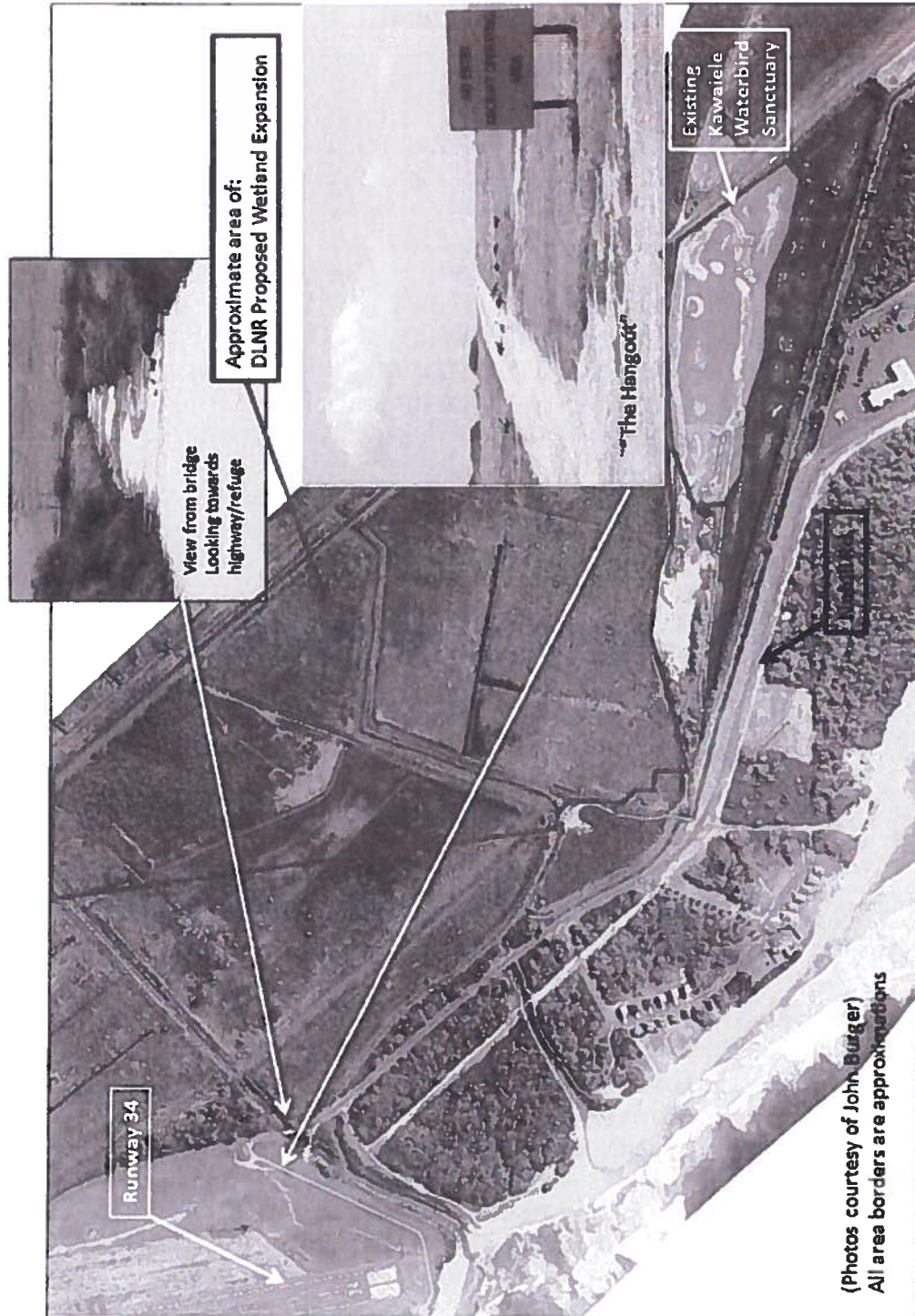


Safeguarding American Agriculture

APHIS is an agency of USDA's Marketing and Regulatory Programs
An Equal Opportunity Provider and Employer

Federal Relay Service
(Voice/TTY/ASCII/Spanish)
1-800-877-8339

throughout the area in and around PMRF as “passageways” to gain access to preferred locations.



What follows are some comments and observations formed during our view of the Draft Environmental Assessment, Mana Plain Wetland Restoration. May 2012.

- Page 4. Section 1.4 Need For Action. Citing worldwide extinction rates, the Hawaiian extinction “crisis”, or the loss of wetlands on the Mana plain are not relevant to justifying the wetland expansion close to PMRF’s runways. These arguments are not germane to extant Hawaiian waterbird species that have shown potential for population growth when manmade wetlands are provided such as at the aquafarms at Kahuku, Oahu, Kauai Lagoons Resort on Kauai, Cyanotech in Kona, Kealakehe Sewage Treatment Ponds in Kona, to name a few.
- Page 8, Section 2.1. No Action Alternative. “The land would remain vacant and dominated by non-native, invasive plant species.” This sentence implies that non-native plants are invasive, in other words “undesirable” and that if the land is vacant, undesirable plants will dominate. This is misleading and not accurate. Not all non-natives are invasive. Many wetland plants are non-native; they could even be categorized as invasive, hence, using the same rationale as the EA: more wetlands could also result in more invasive plant species.
- Page 8, Section 2.1. No Action Alternative. “The project site would not contribute to the recovery of endangered Hawaiian waterbirds because no additional suitable habitat would be available.” The statement is not true because it claims that if no additional suitable wetlands are made available, the existing wetland would not contribute to recovery efforts. The existing wetland is not intensively managed for endangered waterbirds. If the quality of the wetland were improved the existing wetland site could contribute to the recovery by providing more suitable habitat within the existing site footprint.
- Page 8, Section 2.2. The proposed project will be 2,000 feet from the PMRF runway. The Navy is following FAA advisory which recommends a separation distance of 10,000 feet from a wildlife hazard attraction.
- Page 17. Section 2.3 Alternatives Considered But Not Analyzed in Detail. #1. Is not a realistic alternative to mention. #2 Increasing the size of wetlands as proposed will also increase “invasive” species associated with wetlands. #9. Seems like alternative locations proposed by the US Navy were analyzed in detail in Section 2.3-5. Not sure why #9 is listed here. Why would the consideration of sites outside the Mana Plain not “optimize habitat?” Hawaiian waterbirds do not need historical wetlands for recovery if upland sites can be made suitable.
- Page 18. Section 2.3.1, Waimea Irrigation System as Primary Water Source – you have not shown how these invasive species have impacted the waterbird populations that currently exist throughout the ditch system and reservoirs on the Mana Plain. There seems to be an unrealistic and unsubstantiated anti-nonnative bias which is being used to support the proposed action or discount the alternatives.

- Page 20. Section 2.3.3. “Because of its potential superior quality and lack of introduced species...” It is not realistic to claim that no introduced species will enter the project if groundwater is used if that is a justification for not using alternatives. Again, not all introduced species are bad for such a wetland and some will provide essential resource requirements for the Hawaiian waterbirds.
- Page 22, #1. Since the crash landing into the Hudson River of US Airways flight 1549 out of LaGuardia International Airport in January 2009, caused by the ingestion of Canada Geese, many airfield managers including PMRF have reassessed their bird-aircraft strike management policies. PMRF now considers the separation distance of 2,000 feet between the runway and the project as insufficient. The project according to FAA advisory should be considered a wildlife hazard attractant and the minimum separation distance should be 10,000 feet for turbine powered aircraft. #5 “Bird aircraft strike hazards are ...not expected to increase”. If the purpose of the project is to increase the number of Hawaiian waterbirds and migratory waterfowl within 2,000 feet of PMRF, one cannot rationalize that this will not also increase the hazards to aviation. #7. DOFAW has not used their Section 6 authority to assist PMRF in removing nests to discourage nesting. Nene are hazed throughout PMRF and there would be more nesting if hazing was not successful.
- Page 81- Wildlife Hazards to Aircraft. The following table lists similar species or groups of birds involved in collisions with aircraft that are expected to increase in number if the proposed project was carried out. This list should be included in this section of the EA.
- Total reported strikes to civil aircraft (does not include military), USA, 1990-2011.

Species	Total	With Damage	w/Negative EOF	w/Multiple Animals	Aircraft Down Time (hours)	Cost
Common Moorhen	3	1	1		24	\$990
American Coot	121	26	11	6	2788	\$1,200,267
Black Crowned Night Heron	47	4	2	2	49	\$281,200
Cattle Egret	240	25	37	56	227	\$70,575
Waterfowl	3077	1679	848	1393	132,033	\$164,102,483

- 82 Paragraph 1. “Nene 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.” This statement implies that if the nene (which may not be a wetland obligate species but is still categorized as waterfowl) were not endangered, they would not be counted in a waterbird survey; it is irrelevant and misleading.
- Page 83 Section 3.10.2 Environmental Consequences, Preferred Alternative. There is no mention of migratory waterfowl that would be attracted to the project and which are considered to have sufficient mass to cause damaging strikes. “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.” This statement implies that Hawaiian waterbirds because of their small size and smaller flock size would be less of a threat to aircraft at PMRF. Below we introduced an incident which involved a small, non-flocking species. On May 25, 2008 a Kalitta Airlines Boeing 747-200 taking off from Brussels Airport ingested a European Kestrel (*Falco tinnunculus*), aborted take-off and broke into three pieces (AAIU-2008-13, 10 July 2009 Final Report on the Accident Occurred on 25 May 2008 at Brussels Airport on a Boeing B747-209F Registered N704CK). The adults of these birds weigh from 150-190 g. All the Hawaiian waterbird species have masses that exceed this range. See photo insert.



- Page 83 3.10.2 Environmental Consequences, Preferred Alternative. “Given the lack of suitable habitat for the four target species of endangered waterbirds on the makai side of the PMRF runway...” Hawaiian ducks, which are one of the four target species and Black Crowned Night Herons are seen at the mouth of Kini Kini Ditch on the makai side of the runway. Nene frequently swim from the direction of the proposed project site makai along Kini Kini Ditch and enter the runway safety zone. The statement ignores the other wetland species that are not endangered, that may increase in number due to the wetland expansion proposal and it inaccurately suggests that upland habitats are not used by waterbirds.
- Page 83 3.10.2 Environmental Consequences, No Action Alternative “DOFAW will continue to cooperate with the navy to relocate birds that have nested on the base.” In the recent 2011-2012 nene nesting season, this was not true, DOFAW did not cooperate to relocate nesting birds after it was requested by the Navy and Wildlife Services.
- Page 84- “enlargement of Percolation Ditch Wetland” at Kaneohe Marine Corps Base (KMCB) on Oahu. While it is true that Dr. Diane Drigot and her associates have worked extensively to enhance and expand the wetland areas on KMCB, the area described is well over 7,000 feet distant from the active runway at the Marine Corps base, quite a difference from the 2,000 feet separation of the proposed Mana Plain expansion.
- Page 85- “clearing Sag Harbor Wetlands” which lies less than 1,500 feet from the active runway on KMCB. What it fails to mention is the fact that Sag Harbor Wetlands is less than ¾ of an acre in size. According to the publication: WETLANDS OF MARINE CORPS BASE HAWAII, ISLAND OF OAHU, HAWAII published by U.S. Army Corps of Engineers, Honolulu District, July 2009; Sag Harbor Wetlands is 30,545 square feet (approximately 0.70 acres). Quite a difference than the proposed 105 acre project site discussed in the Mana Plain Draft EA. Wildlife Services conducts BASH management at KMCB under interagency agreement. WS personnel assigned to KMCB indicate that Hawaiian Ducks using Sag Harbor Wetlands are frequently hazed from the airfield back into the wetland.
- Page 86. “The proposed project will increase the area of wetland habitat on the Mana 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”. What may not be a significant increase in a population for a wetland expansion project may indeed be significant in terms of BASH risk management. FAA and Wildlife Services have a zero tolerance for geese and one pair of ducks on an airfield is treated as a serious threat to aviation due to their size and density.
- Page 105- “5.3.4 FEDERAL AVIATION ADMINISTRATION... *Federal MOA to Address Aircraft-Wildlife Strikes*”. The U.S. Navy did not sign or partake in this particular Memorandum of Agreement.

This is by no means a comprehensive review of the Draft EA for Mana Plain Wetland Restoration document. It is meant only to urge all parties involved to take a closer look at the proposed action and its potential consequences as well as its benefits.

The expansion of the wetland area on Mana Plain will violate the recommendations in FAA Advisory Circular (AC) 150.5200-33 regarding land use and the potential to attract hazardous wildlife on or near airports. 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 from any wildlife attractants.

The expansion of the wetland area on Mana Plain will not only benefit the four endemic/endangered species described in its introduction, but many other species as well. Some of them are considered species hazardous to aircraft because of their size/mass and or flocking and flight behavior. Some of them are already problematic species that WS must deal with on a daily basis.

The following page contains some graphic photographs of what a bird air strike really is. It is what we at Wildlife Services strive so hard to avoid. I hope this will encourage those involved to seek an alternative site to enhance habitat for Hawaii's unique waterbirds.

Any questions or comments please feel free to contact:

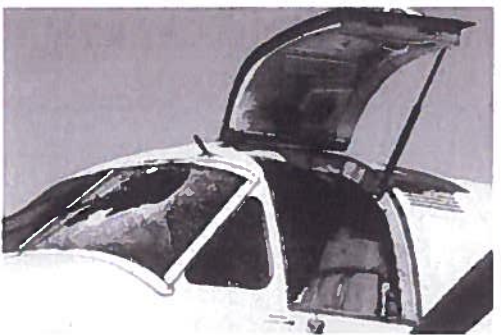
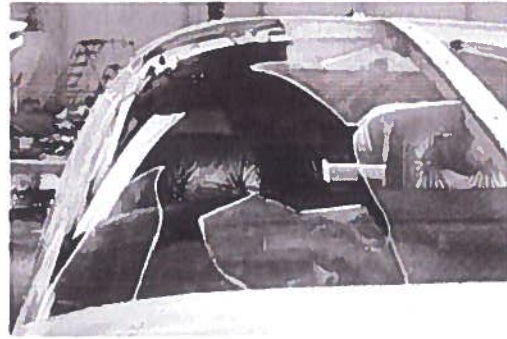
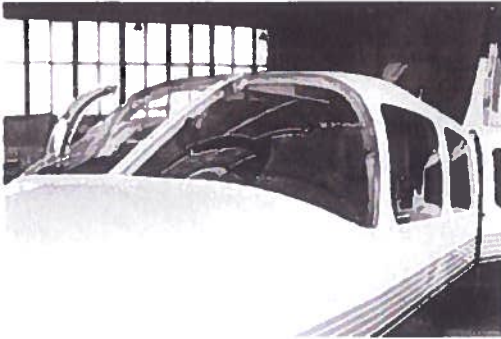
Scott Williamson
USDA Wildlife Biologist
Pacific Missile Range Facility, Kekaha, HI
Phone: 808-335-8254, Fax: 808-335-8274
scott.p.williamson@aphis.usda.gov

Sincerely,



Mike E. Pitzler
State Director, Hawaii/Guam/Pacific Islands

Bird air strike photos taken from the FAA website.



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

ESTHER KIA'AINA
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONSERVATION
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENFORCEMENT

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

March 8, 2013

To: USDA Animal and Plant Health Inspection Services
Wildlife Services
Attn: Mike Pitzler
3375 Koapaka St., Suite H-420
Honolulu, HI 96819

Response to comments received on the Draft Environmental Assessment for the proposed Mana Plain Wetland Restoration Project

Thank you for your comments on the draft Environmental Assessment (EA). Please note that your comments dated 20 August 2012 were received via email 42 days late, or 42 days after the end of the 45-day comment period and 57 days after the published 30-day comment period. However, we are addressing your concerns given the importance of bird aircraft strike hazard (BASH) concerns.

DOFAW agrees that as a result of the increasing population of nene (Hawaiian geese) on Kauai, there have been increased occurrences of nene on the Mana Plain. However, the increase of nene on the Mana Plain has not been correlated with an increase in wetland habitats on the Mana Plain. As the island wide nene population has increased, nene have dispersed to new habitats that provide resources for one or more life history stages. Nene are attracted to the area you identified as the "hangout" because there are food resources at that location. Nene may fly, swim, or walk to foraging areas. DOFAW is not responsible for management of the Kini Kini Ditch where nene have been observed swimming toward the "hangout."

We have addressed your specific comments below, as well as provided some additional history on the project.

Please see our responses below addressing specific concerns identified in your comment letter:

1. Citing that most worldwide and Hawaiian species extinction rates are directly attributed to human activity, as has occurred on the Mana Plain, is justification for restoring wetlands that were part of the historical "Mana Swamp." The location of the Mana Plain Wetland Restoration project was proposed by DOFAW in 2001. Subsequently, DOFAW discussed the project goals and location with the U.S. Navy. During a 2002 meeting with

Senator Inouye's office, the U.S. Navy was not interested in collaborating on wetland restoration at different location on the Mana Plain. Both the U.S. Navy and DOFAW agreed to a modified project boundary which reduced the project site from 313 acres to the current 105 acres in order to have a 2,000 foot buffer from the PMRF runway as requested by the U.S. Navy.

Endangered Hawaiian waterbirds are limited by available habitat, and therefore use a variety of wetland and aquatic habitats, including natural, managed, and man-made wetlands. However, research by the University of Hawaii has shown the man-made created wetlands in Hawaii do not have the same functions as natural, restored, and managed wetlands.

2. More than 50% of the non-native plant species that have been documented at the project site are classified as either "high risk" by the Hawaii Pacific Weed Assessment, "aggressive invasive" by the Hawaii Wetland Field Guide, "invasive" by the Early Detection and Distribution Mapping System, and/or "noxious" by the State of Hawaii Department of Agriculture. All of the non-native shrubs, including the most abundant non-native species at the project site are classified as "high risk" by the Hawaii Pacific Weed Assessment. Therefore, we believe it is accurate to say that under the No-Action Alternative, "The land would remain vacant and dominated by non-native, invasive plant species," because the site is currently dominated by non-native species that are classified as invasive.

DOFAW agrees that wetlands also contain non-native plants, many of which are classified as invasive. Some non-native wetland plants can also provide food resources for endangered Hawaiian waterbirds, but only if they do not become thick and overgrown to the point where waterbirds are unable to access the seeds and/or rhizomes. Although we realize that we will not be able to eradicate 100% of the non-native species from the project site, one of the goals listed in Section 1.5 of the draft EA is to "Restore and manage diverse resilient native plant communities." DOFAW plans to control non-native, invasive wetland plants to the greatest extent possible in order to restore native wetland habitats to maximize nesting, foraging, and loafing resources that the endangered waterbirds evolved to use in the Hawaiian Islands.

3. Currently no delineated wetland habitats occur within the proposed 105-acre project site; therefore the proposed project site is not contributing to the recovery of endangered waterbirds. The existing Kawaiele parcel (previously Kawaiele Waterbird Sanctuary), which lies outside the proposed project site "footprint", is indeed managed for endangered waterbirds and continues to contribute to their recovery.
4. The FAA advisory that recommends a separation distance of 10,000 feet for public-use airports serving turbine-powered aircraft that the U.S. Navy is following, was issued during May 1997 and was in effect during 2002 when the U.S. Navy requested that the project site be setback 2,000 feet from the PMRF runway.
5. #1 – This alternative is included because DOFAW received comments on restoring the natural hydrology of the Mana Plain wetlands vs. restoring managed wetlands that mimic natural condition.

#2 – Refers to the use of water from Kawaiiele as an alternative and does not address the size of restored wetlands. The size of restored wetland basins within the 105 acre project site is listed as #8.

#9 – All nine alternatives considered but not analyzed in detail are listed in the introduction to Section 2.3. Five of the nine alternatives, including the alternative sites proposed by the U.S. Navy, are described in more detail in sub-sections 2.3.1, 2.3.2, 2.3.3, 2.3.4, and 2.3.5.

DOFAW did not state that sites outside of the Mana Plain would not optimize habitat. However, DOFAW does not have management authority for other lands on the Mana Plain outside of the Mana Plains Forest Reserve. For reasons described in sections cited above, creation of wetlands in upland areas is not as ecologically productive and does not provide the same functions and resources as wetlands restored on historical wetland sites.

6. Section 2.3.1 describes that introduced, non-native tilapia significantly reduce that amount of aquatic vegetation in a wetland, therefore reducing resources available to waterbirds. In addition, a goal of the proposed project is to restore *native* habitats for endangered waterbirds. Therefore as stated in Section 2.3.1, using a water supply that has invasive species in it is a lower priority, compared to other available water sources.
7. Section 2.3.3 does not state that no introduced species will enter the project site if groundwater is used. It states that groundwater does not have introduced species (e.g., tilapia). We agree that some non-native species are used by Hawaiian waterbirds, but overall, non-native wetland species have invasive characteristics and are identified as threats to wetlands and waterbirds by the U.S. Fish and Wildlife Service, State of Hawaii DLNR, and the Hawaii Wetland Joint Venture. If USDA Wildlife Services has research or other reports that show introduced species will “provide essential resource requirements for the Hawaiian waterbirds,” while not compromising the ecological function of the wetland, we would like copies of these reports.
8. Wetlands that exist closer than the FAA recommended 10,000 feet to an active turbine powered aircraft runway already exist in Hawaii. Please reference section 3.10.2 which describes the coexistence, of multiple managed wetlands and runway 04/22 at the Kaneohe Marine Base on Oahu. Please also see additional references added to the final EA about a wetland managed by the U.S Navy at Joint Base Pearl Harbor Hickam.

The project is not expected to increase the number of Hawaiian waterbirds and migratory waterfowl within 2,000 feet of the PMRF runway. The project site is outside of the 2,000-foot buffer, a distance that was previously agreed upon by the Navy and DOFAW. In fact, if DOFAW is able to maximize the attractiveness of habitat within the project area, it is possible that waterbirds currently utilizing marginal habitat within the buffer zone would be drawn away from those areas and reduce the number of waterbirds within the 2,000-foot buffer. The only way that the proposed restoration project would be within 2,000 feet of an active runway at PMRF, is if the Navy were to disregard the agreed upon buffer zone, and construct a new runway or expand their air operation facilities into the existing buffer zone.

DOFAW staff did in fact assist the Navy to relocate a family of nene that nested on PMRF property during the 2009/2010 breeding season. This was the first known incidence of nene successfully nesting at PMRF. No incidents of nene nesting at PMRF were reported to DOFAW during the 2010/2011 breeding season. However, during the 2011/2012 breeding season, two nene nests were located within the boundaries of PMRF; one of these was at the same location as the original nest site. DOFAW was again willing to assist with the translocation of these two nene families. Unfortunately the Navy was not current with their section 7 consultation with the U.S. Fish and Wildlife Service, and thus DOFAW was unable to assist. To date DOFAW is not aware of any changes regarding the Navy's section 7 consultation status.

9. Based on the life histories of the four endangered Hawaiian waterbirds DOFAW does not expect the BASH risk to increase as a result of the restoration project, as explained in the draft EA.
10. The table included in your letter will be attached, along with your letter in its entirety, to the section of the final EA containing comments to the draft EA. The table you referenced showed cattle egrets as the second most frequent species to be involved in BASH incidents. The project management plan calls for the active removal of cattle egrets from the project area, as they pose a threat (predation) to young waterbirds. Currently, cattle egrets are not being removed from the project area. With the implementation of the restoration project, the number of cattle egrets on the Mana Plain will be reduced, thus the risk from BASH incidents at PMRF resulting from this species should be reduced.
11. The sentence you referred to on page 82 of the draft EA as irrelevant and misleading has been removed from the final EA.
12. Migratory waterfowl are addressed in Section 3.10.2 under the subheading migratory waterbirds, which includes migratory waterfowl and shorebirds (see page 86 of the draft EA).

The analysis of Hawaiian waterbirds and BASH risk in Section 3.10.2 is based on research cited on page 81 of the draft EA that found avian body mass was strongly associated with percentage of all strikes that caused damage, the relative hazard score increased with body mass, and the greatest avian strike hazards to aircraft were large (> 1,000 g) flocking species. Representatives from PMRF have not expressed concern to DOFAW over the potential BASH risk of Hawaiian waterbirds for which this project is being developed.

Your reference to the Kallita Air Freighter crash at Brussels Airport in which five people suffered minor injuries, failed to point out some key elements of the incident contributing to the plane damage. This information was reported by The Air Accident Investigation Unit (AAIU) of Belgium's Federal Public Service Mobility and Transport Agency in their final report of the incident (Birdstrike News, July 13th. 2009). The report stated that a momentary stall did occur upon take off in the #3 engine resulting from the ingestion of a European kestrel. However, the report also states other factors that contributed to the plane damage not mentioned in your letter. Prior to their attempt to takeoff, the crew lined the aircraft up at a runway intersection, not the end of the runway for which the

takeoff parameters were computed. Once the decision was made to abort the takeoff, the crew neglected to make maximum use of the planes deceleration devices. The AAIU found that the thrust reversers had not been deployed, nor did the speed brakes appear to have been utilized, as the speed brake lever was found to be in the retract position and the brakes stowed. The plane reached the embankment and dropped 4 meters, breaking into 3 parts.

Birds of various sizes will exist on the Mana Plain with or without the implementation of this restoration project, and will continue to occur at PMRF if suitable conditions exist along the runway. DOFAW encourages the Navy as well as Wildlife Services to continue efforts to reduce BASH risks associated with nene at PMRF and to stay current with section 7 consultations with The U.S. Fish and Wildlife Service. As previously stated, DOFAW is willing to assist with these efforts.

13. The wording in section 3.10.2 has been changed to reflect that there exists only marginal habitat for waterbirds on the makai side of the PMRF runway. You stated that nene have been sighted in the PMRF runway safety zone. This fact demonstrates the need for section 7 consultation, in order to eliminate any attractants that may exist there. We also added that the Navy should consult with the U.S. Fish and Wildlife Service about these areas, in order to make them less attractive to waterbirds and nene alike.

DOFAW did not intend to suggest that upland habitats are not used by waterbirds. To the contrary, upland habitats that lie adjacent to wetland habitats can provide cover, forage and nesting areas for waterbirds.

14. In section 3.10.2 DOFAW states that it will continue to cooperate with the Navy to relocate nene that have nested at PMRF. This statement is in fact true. DOFAW staff did assist the Navy in the relocation of a family of nene that nested on PMRF property during the 2009/2010 breeding season. This was the first known incidence of nene successfully nesting at PMRF. No incidents of nene nesting at PMRF were reported to DOFAW during the 2010/2011 breeding season. However, during the 2011/2012 breeding season, two nene nests were located within the boundaries of PMRF; one of these was at the same location as the original 2009/2010 nest site. DOFAW was again willing to assist with the translocation of these two nene families. Unfortunately the Navy was not current with their section 7 consultation with the U.S. Fish and Wildlife Service, and thus DOFAW was unable to assist. This occurred again during the 2012/2013 nesting season, when three nene nests occurred at PMRF. As previously mentioned, DOFAW is not aware of any change in the Navy's section 7 consultation status. The fact that DOFAW is not permitted to aid the Navy with nene translocation without a current section 7 consultation has been reiterated to DOFAW by the U.S. Fish and Wildlife Service on several occasions (please refer to their comment letter pertaining to the draft EA that will be included in the final EA). This aside, DOFAW wishes to emphasize, again, that they are willing, if allowed, to assist the Navy with nene translocation efforts.

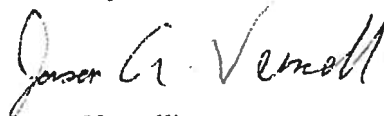
15. Referencing the location of the Percolation Ditch Wetland at Kaneohe Marine Corps Base (KMCB) on Oahu demonstrates that managed wetlands and active runways can coexist within the FAA recommended separation distance of 10,000 feet. DOFAW has added the distance between the Percolation Ditch Wetland and runway 04/22, the active runway at KMCB to the final EA.
16. Again, reference to the Sag Harbor Wetland on Kaneohe Marine Corps Base (KMCB) Hawaii was to demonstrate that wetlands that exist within the FAA recommended 10,000 foot separation distance to an active turbine powered aircraft runway are not unique to the proposed project. We have added the size of the Sag Harbor wetland to the final EA.

Dense kiawe growth occurs within the 2,000 foot buffer zone that separates the project site and the runway at PMRF (a distance agreed upon by the Board of Land and Natural Resources and the U.S. Navy). Because waterbirds do not use dense kiawe habitats, their numbers are not expected to increase within the buffer zone.

The fact that Wildlife Services personnel frequently haze koloa-mallard hybrids from the airfield at KMCB indicates that there is some characteristic of that habitat which encourages birds to utilize the area. DOFAW encourages Wildlife Services staff, as well as officials from KMCB to contact the U.S. Fish and Wildlife Services to discuss ways to reduce the attractiveness of the airfield to birds.

17. DOFAW has determined that the proposed project is not likely to increase waterbird use of habitats at PMRF, or to increase the occurrence of them crossing the PMRF runway. If Wildlife Services has a zero tolerance for geese on the airfield at PMRF, and as you pointed out there have been 158 nene sightings this year at an area on PMRF known as the "hangout", then current BASH management practices at PMRF are apparently insufficient. DOFAW once again encourages Wildlife Services and PMRF to work diligently with the USFWS to rectify this situation.
18. In Section 5.3.4 of the draft EA, DOFAW did not state that the U.S. Navy was a signatory to the Federal MOA. DOFAW made reference to the U.S. Air Force, U.S. Army, U.S. Fish and Wildlife Service, and other federal agencies as being signatories of a Federal MOA to address wildlife strikes.

Sincerely,



Jason Vercelli
DOFAW Wildlife Biologist
(808) 241-3768

LHME

Mānā Plain Wetland Restoration Project
Environmental Assessment Informational Meeting

Name	Affiliation & Address	Email	Phone	Interests (circle all that apply)
RONALD SAKODA	U.S. SENATOR ISONYE	F		<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide oral comment(s) <input type="checkbox"/> Other
DENNIS ROWLEY	LANAPOSTO			<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
Sabra Kauka				<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
RICHARD KUGA	ENGINEERING, INC P.O. BOX 506 WAIMAN, HI 96796			<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
Jana Rothenberg Buis	6162 Hauwai Rd KONA HI 96754			<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
Tom F. Shie Kadlberg	335 Aiea Mahi Pl Kapaa, HI 96744			<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other

LHME

Mānā Plain Wetland Restoration Project
 Environmental Assessment Informational Meeting

Name	Affiliation & Address	Email	Phone	Interests (circle all that apply)
Chuck Blay	TEOK Investigations 5162 Louisa Rd Pawley, WI 91678-6			<input checked="" type="checkbox"/> Join in the formation of Friends of Mānā <input checked="" type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide oral comment(s) <input type="checkbox"/> Other
Carl Berg	2637 Appone SI Luhue			<input checked="" type="checkbox"/> Join in the formation of Friends of Mānā <input checked="" type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
Lelan Nishob	KUL Luhue	C K		<input checked="" type="checkbox"/> Join in the formation of Friends of Mānā <input checked="" type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
				<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
				<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
				<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other

KEKAH

Mānā Plain Wetland Restoration Project
 Environmental Assessment Informational Meeting

Name	Affiliation & Address	Email	Phone	Interests (circle all that apply)
Steve Lykes	P.O. Box 81 Kekaha			<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide oral comment(s) <input type="checkbox"/> Other
DENNIS ROONEY	HAWAII			<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
BLAND SAGUN	P.O. Box 956 Lanai, Hawaii 90765			<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
HERBERT HOLO KAUATI	P.O. Box 358 KEKAHA, KAUAI HI 96752			<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
Ben Nishi	Kekaha			<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
D. Kuanan Apoolani	BX 433 Kekaha, HI 96752			<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other

V-KAATA

Mānā Plain Wetland Restoration Project
Environmental Assessment Informational Meeting

Name	Affiliation & Address	Email	Phone	Interests (circle all that apply)
JESU VESTAR Lee W. Vestar	PO 1899 Koloa			<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide oral comment(s) <input type="checkbox"/> Other
NEIL BROSNIAN	PO Box 1206 Kalaheo, 96741			<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
Billie Dawson	PO Box 1206 Kalaheo, 96741			<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
JOE ESTACIO	PO. Box 217 KALAHEO, HI 96752			<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
				<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
				<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other

KEKA'A

Mānā Plain Wetland Restoration Project
 Environmental Assessment Informational Meeting

Name	Affiliation & Address	Email	Phone	Interests (circle all that apply)
Karin M Dameron	P.O. Box 272 Wainūea, HI 96794			<input type="checkbox"/> Join in the formation of Friends of Mānā <input checked="" type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide oral comment(s) <input type="checkbox"/> Other
GORDON LABEDZ	SURFERIDER FOUNDATION PO BOX 819 WAINUEA, HI 96796	G		<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input checked="" type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
				<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
				<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other
				<input type="checkbox"/> Join in the formation of Friends of Mānā <input type="checkbox"/> Volunteer during upcoming Malama Mānā days <input type="checkbox"/> Learn more through project mailings and updates <input type="checkbox"/> Provide Oral Comment(s) <input type="checkbox"/> Other