



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

SCHEDULE

**INVESTIGATION AND SITE VISITS
KEAUHOU, KONA, HAWAII**

COMMISSION ON WATER RESOURCE MANAGEMENT

DATE: September 17, 2014
TIME: 8:00 am – 5:30 pm
PLACE: Various Sites within the Keauhou Aquifer System,
Kailua-Kona

The Commission on Water Resource Management (“Commission”) will conduct a field investigation and site visit pursuant to the Commission’s investigatory authority and responsibilities under the Hawai’i Water Code, Haw. Rev. Stat. §174C-43 and §92-6, as part of the Commission’s process to evaluate the Keauhou Aquifer in Kailua-Kona, Hawaii.

An opportunity for public testimony will be provided at a later date.

This investigation and site visit is for the purpose of scientific investigation and study. This is not a public meeting. *No public testimony will be taken at this time. A meeting to take public testimony will be scheduled at a later date.*

Although the investigation is not a public meeting, there are portions of the site visit which the public may observe, provided that the location is safe and there is no interference with activities on the ground.

The September 17, 2014 site visit times and locations are outlined below. All times are tentative. Any member of the public who attends will be responsible for his / her own transportation.

SITE # 1

Natural Energy Laboratory of Hawaii Authority (“NELHA”) 8:00 am

73-4460 Queen Kaahumanu Hwy, Kailua-Kona, HI 96740 (See Exhibit 1)

Witness the pumping and disposal of salt water through data presentation and observation. Observe the effects on the aquifer and surroundings. Visit anchialine ponds.

Investigation and Site Visit Schedule
Keauhou, Kona, Hawaii
Commission on Water Resource Management
September 17, 2014

SITE # 2

Kohanaiki Beach Park 9:30 am

Kalaoa, HI 96740 (See Exhibit 2)

Drive along shoreline to see anchialine ponds and traditional sites.

SITE # 3

Kohanaiki Shores, LLC 10:00 am

73-4676 Queen Kaahumanu Hwy, Kailua-Kona, HI 96740 (See Exhibit 2)

Witness brackish water irrigation wells, desalting, use of treated water, and disposal of waste. Look at restored anchialine ponds and human effects on the environment.

SITE # 4

Kaloko-Honokohau National Historical Park 10:45 am

Directions: Kaloko Fishpond at the end of Ala Nui Kaloko (Kaloko Fishpond Road).
Heading South on Queen Kaahumanu Highway, Ala Nui Kaloko is your first
right after Hina Lani Street (0.3 miles) (See Exhibit 3)

Witness Kaloko fishpond and anchialine ponds and near-shore waters in natural
environment.

[Lunch]

SITE # 5

Honokohau Harbor 12:45 pm

74-380 Kealakehe Pkwy, Kailua Kona, HI 96740 (See Exhibit 3)

Visit Aimakapa fish pond, 'Ai'ōpio Fishtrap, and Honokahou Harbor.

Investigation and Site Visit Schedule
Keauhou, Kona, Hawaii
Commission on Water Resource Management
September 17, 2014

SITE # 6

King Kamehameha Kona Beach Hotel 2:00 pm – 5:30 pm

75-5660 Palani Road, Kailua-Kona, HI 96740 (Ballroom 4) (See Exhibit 4)

Presentations by the National Park Service on their Petition for Designation <http://dlnr.hawaii.gov/cwrm/groundwater/activities/keauhou/> and the U.S. Geological Survey Isotope Study <http://pubs.usgs.gov/of/2014/1173/>

SCHEDULE FOR OCTOBER TO DECEMBER, 2014

On October 9, 2014, the Commission will hold a *second* investigation and site visit in Kona. The schedule for the second visit has not yet been finalized.

On December 10, 2014, the Commission has tentatively scheduled a *public meeting* at the West Hawaii Civic Center to decide (pursuant to Haw. Rev. Stat. §174C-41) whether to continue the process. *Public testimony will be taken at the December 10, 2014 meeting.*

If the Commission decides to continue the process on December 10, 2014, then a *public hearing* will be scheduled (pursuant to Haw. Rev. Stat. §174C-42) in the Keauhou area some time in early 2015. *Public testimony will be taken.*

After the public hearing is closed, the Commission will schedule *another public meeting* to make a final decision on the petition to designate (pursuant to Haw. Rev. Stat. §174C-46).

For further information, please contact the Commission on Water Resource Management.

Commission on Water Resource Management
1151 Punchbowl St. Rm 227
Honolulu, Hawaii 96813
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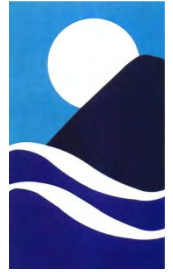
NELHA SITE VISIT

September 17, 2014

EXHIBIT 1

**Natural Energy Laboratory of Hawaii Authority
Site Visit and Briefing**

Wednesday, September 17, 2014



Visitors: Commission on Water Resource Management

8:10 – 8:15 am

Welcoming

Mr. Gregory Barbour
NELHA Executive Director

8:15 – 8:30 am

NELHA Briefing

Mr. Keith Olson
NELHA Water Quality Laboratory Manager

Mr. Alexander Leonard, PhD
NELHA Administrative and Project Manager

8:35 – 8:50 am

Field Observations of NELHA Anchialine Pond A3

8:55 – 9:15 am

Field Observations of NELHA Ocean Transect OT6

Visitors should bring sunglasses, hat and wear close-toed shoes

**Location Map showing NELHA Facilities at the
Hawaii Ocean Science and Technology Park
Kailua-Kona, Island of Hawaii**



Commission on Water
Resource Management
NELHA Site Visit

September 17, 2014

Environmental
Monitoring at the
Natural Energy
Laboratory of Hawaii
Authority



“The Big Picture”

- ✓ **NELHA is a state operated, master-permitted, zoned industry, ocean science and technology park on the Big Island of Hawaii**
- ✓ **NELHA has managed 870 acres and an ocean research corridor for 40 years with no significant impact to the environment**
- ✓ **NELHA’s tenants, scientists, government agencies and the public depend on pristine quality class AA ocean water for their operations, research projects, recreation and cultural practices**



Seawater Pumping at NELHA

- NELHA pumps ~30Mgal/day of seawater to its clients for aquaculture, mariculture, alternative energy and water bottling activities
- ~ 30Mgal/day of seawater is discharged into onshore surface trenches throughout the 870 acre facility

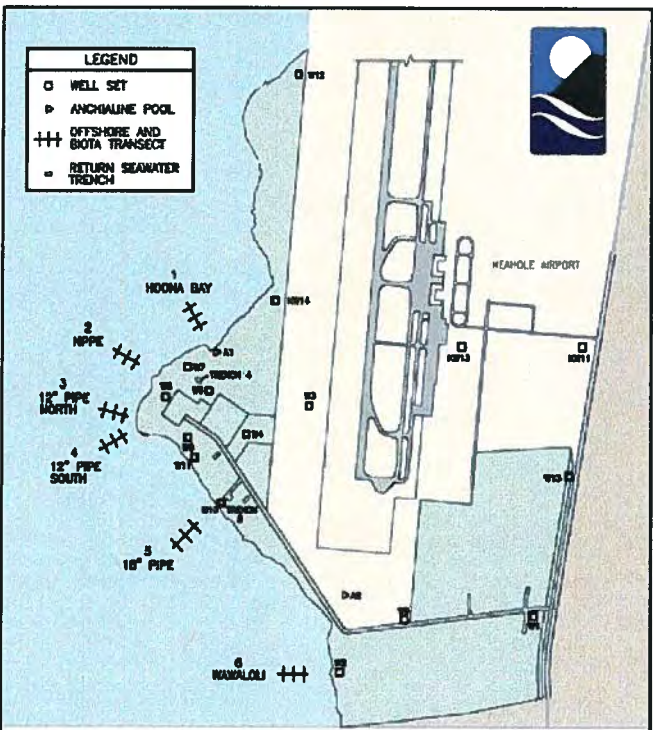


32 Years of Monitoring Results

- NELHA's monitoring program has found ***no evidence of harmful change*** to its benthic, fish biota, and anchialine pond communities



NELHA's Been Provided Several Servings of Compliance Regulation Alphabet Soup



"128 Location Sampled Quarterly"

NELHA WATER MONITORING STATIONS



REV. 01/09

Monthly Pipeline Sampling

Deep Seawater

3 pipelines, 3 sample locations

Surface Seawater

3 pipelines, 3 sample locations

Quarterly Environmental Sampling

Groundwater Sample Locations

34 Wells

3 Anchialine Ponds

Marine Water Sample Locations

30 Marine Transect Stations

1 Coastal Station

Tenant Effluent Discharge Locations

54 Tenant Discharge Sites

Annual Biota Surveys

Marine Fish Species and Biomass

18 Marine Fish Survey Sites

Coral Species Abundance

18 Benthic Community Sites

Anchialine Pond Species Abundance

15 Anchialine Pond Survey Sites



Environmental Monitoring Parameters at NELHA

Surface Seawater Pipeline Monitoring (n=1282)

- ✓ NO₃ & NO₂, PO₄, SiO₃ (1982 – present)
- ✓ NH₄, TDN & TDP (1986 – present)
- ✓ Salinity (1982 – present)
- ✓ Temperature (1982 – present)
- ✓ TOC (1986 – 2007)
- ✓ TSS (1986 – present)
- ✓ DO (1987 – present)
- ✓ Alkalinity (1987 – 2008)
- ✓ Vibrio & Marine Agar (2005 – 2007)
- ✓ Turbidity (2010 – present)

Deep Seawater Pipeline Monitoring (n=986)

- ✓ NO₃ & NO₂, PO₄, NH₄, SiO₃ (1988 – present)
- ✓ TDN & TDP (1988 – present)
- ✓ Salinity (1988 – present)
- ✓ Temperature (1988 – present)
- ✓ TOC (1988 – 2007)
- ✓ TSS (1994 – present)
- ✓ DO (1988 – present)
- ✓ Alkalinity (1988 – 2008)
- ✓ Vibrio & Marine Agar (2005 – 2007)
- ✓ Turbidity (2010 – present)

Nearshore Transects Monitoring (n=2520)

- ✓ NO₃ & NO₂, PO₄, NH₄, SiO₃ (1993 – present)
- ✓ TDN & TDP (2007 – present)
- ✓ Salinity (1993 – present)
- ✓ Temperature (1993 – present)
- ✓ DO (2007 – present)
- ✓ Chl-a (2007 – present)
- ✓ Turbidity (1993 – present)

Groundwater Monitoring (n=6012)

- ✓ NO₃ & NO₂, PO₄, SiO₃ (1989 – present)
- ✓ TDN & TDP (1989 – 2007)
- ✓ Salinity (1989 – present)
- ✓ Temperature (1989 – present)
- ✓ TOC (1989 – 2007)
- ✓ DO (1989 – present)
- ✓ Fecal Col. & Enteroc. (1989 – 2007)
- ✓ Turbidity (2008 – present)

Tenant Effluent Monitoring (n=954)

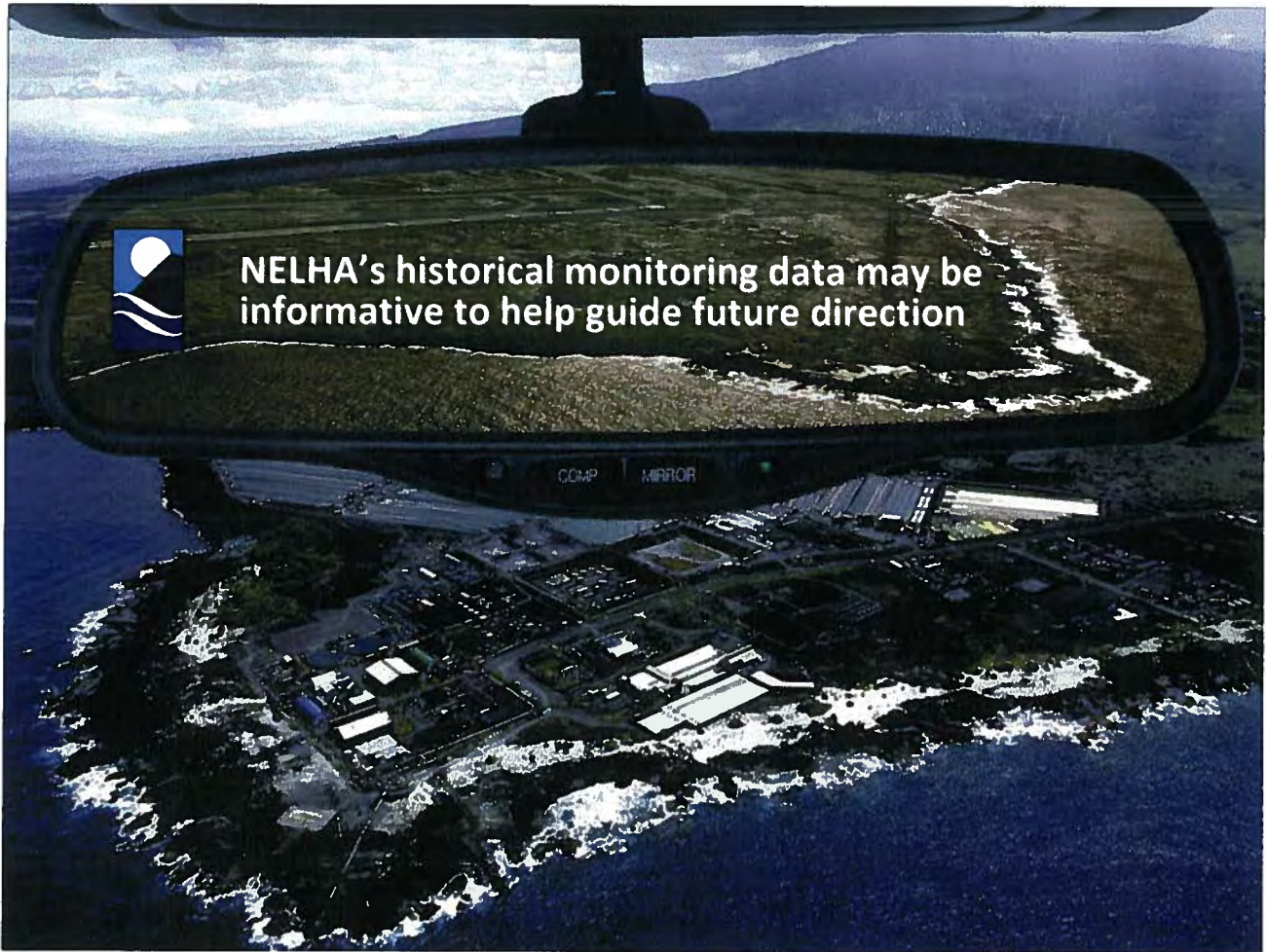
- ✓ TN (2010 – present)
- ✓ TP (2010 – present)
- ✓ TSS (2010 – present)
- ✓ BOD₅ (2010 – present)



Conclusions

- ✓ **NELHA serves the public interest by balancing environmental concerns and economic development in energy generation, water desalinization, mariculture and aquaculture**
- ✓ **NELHA has an extensive environmental monitoring program to protect the pristine class AA ocean water**
- ✓ **NELHA's 32 years of environmental monitoring shows no significant impact on the environment**





NELHA's historical monitoring data may be informative to help guide future direction



Questions?

KOHANAIKI SHORES SITE VISIT

September 17, 2014

EXHIBIT 2

Kohanaiki Natural Resource Management Plan Background and History

The Kohanaiki project was undertaken with a commitment to preserve and restore anchialine ponds. Without intervention and preservation measures, the ponds which are so vital to Hawaiian culture could be lost. To guide the restoration and preservation efforts, Richard Brock, Ph.D. prepared an Anchialine Pond Management Plan in October of 2002. The Plan was updated and revised in April of 2004. Objectives of the Pond Management Plan include: restoring, enhancing and maintaining the environmental integrity of the anchialine pools, providing educational, cultural and interpretive opportunities for the public and visitors, and providing scientific research and monitoring studies.

In March of 2005, The Army Corps of Engineers issued a Letter of Permission which allowed for the implementation of the measures described in Dr. Bock's report to remove exotic, non-native vegetation and fishes and, as appropriate, excess sediment from the ponds. The plan also calls for installing native plantings that are adapted to the coastal environment to minimize future infilling of the pools with non-native invasive species.

Ponds within the Public Park areas are available for educational talks, tours and other programs to further public understanding of the unique features of the Kohanaiki anchialine resource. The Kohanaiki Pond Manger is tasked with assisting the community in any efforts that they collectively wish to undertake to restore and/or maintain anchialine pools for cultural use in pools located within the Park. The Kohanaiki Pond Manager, Kohanaiki Cultural Committee and the Pond Scientist are tasked with working together to insure protection of the anchialine pools.

Researchers from the University of Hawaii, the United States Geological Survey and the National Park Service have taken advantage of opportunities to sample the monitoring wells and ponds within the Kohanaiki property to further advance the understanding of the coastal ecosystem and environment. Kohanaiki continues to monitor groundwater, anchialine pools and the ocean (including monitoring marine life in the ocean fronting and adjacent to the property) to assure no impacts to the ecosystem are occurring due to development in and around the Kohanaiki project site.

(B) Underground R-2 Irrigation watering bio-swale

(A) Waste Water Treatment Facilities

← Beach

9.30am ←

Kohala

Queen K Hwy

Kailua-Kona

ENTRANCE

Ioani Kohala LLC

(D) R.O. Production well

(E) R.O. Plant

(F) R.O. Injection well

(G) Irrigation lake
*R.O. Water
*Littoral Shelves
*10.5 Million Gal.

(H) Monitoring Well #400 (next to KAHO)

(I) Pond 2: Restored pond native vertebrate species prevalent

(J) Beach Restaurant Vantage point to show relation to KAHO & Harbor

Pāwili Point

(C-1) Pond 139 Restored pond invasive vertebrate species prevalent

Wahi He'e Nalu

(C-2) Pond 88 "Pine Trees"

(B) Grass Bio-Swale Used to channel runoff into drains, filter pollutants and protect ponds

Bay of Pāwili

(C-3) Pond 72 No restoration invasive Species prevalent

Wawahiwa'a Point

Clubhouse Spa and Fitness

Diving

Beach Club

Future Residential

Kaloko-Honokohau National Historical Park



SCORE CARD

HOLE	PIN	LENGTH
1	5	514
2	3	201
3	3	480
4	9	411
5	3	240
6	4	322
7	3	414
8	5	521
9	9	360
OUT	46	3,346
10	4	401
11	4	355
12	5	611
13	3	400
14	4	593
15	4	440
16	3	210
17	5	509
18	4	455
IN	45	3,687
OUT	36	3,346
TOTAL	72	2,334

NOTES

Blank lined area for notes.



STATE OF HAWAII COMMISSION ON WATER RESOURCE MANAGEMENT

Itinerary Map Supplement

September 17, 2014

(A) Waste Water Treatment Plant Facilities

Per conditions of the SMA permit, Kohanaiki is required to treat waste water to R-2 quality. Kohanaiki is currently operating its interim WWTP to produce R-2 water that is being re-used to irrigate the grass swales. Kohanaiki recently completed Phase I of its permanent waste water plant which will produce R-1 reclaimed water. This water, up to 210,000 gallons per day at full build out, will be used to irrigate landscaping along roadways within Kohanaiki, at the County Park, and on the County frontage road. The lake at the entry to Kohanaiki will serve as a storage lake for the R-1 reclaimed water where it will be mixed with water from on-site brackish wells. Along the edge of the lake are "Littoral Shelf" planter beds which are partially submerged and contain native pond plants which help filter nutrients out of water; and attract foraging water birds.

(B) Grass Bio-Swale / Site Drainage:

Collection of surface run-off within Kohanaiki was carefully designed to minimize impact to the near-shore aquifer. Grass swales were constructed – based in part on input from Kaloko-Honokahau N.H.P. - along all of the roadways within the Kohanaiki community and along Kohanaiki Beach Park road. These bio-swales serve as a filtration element which helps to trap and absorb potential contaminants running off of road before they can enter into drainage seepage structures. The seepage pits on the golf course were constructed with charcoal filters to prevent fertilizer or other compounds from entering the ground water. The golf holes in Kohanaiki are designed as large retention basins. There are four sump pumps at the seepage pits at the golf holes along the shoreline to prevent surface water from entering the anchialine ponds by pumping storm water to inland retention basins in the event of a large rain event.

(C) Anchialine Ponds

C-1, Pond 139

Anchialine Pond which had invasive flora & fauna present, but has since had invasive flora species removed and replaced with transplanted native flora species. The two main invasive flora species that were removed during restoration efforts were *Batis maritima* (Pickleweed) and *Rhizophora mangle* (Red Mangrove). Since restoration efforts have concluded, pond 139 has seen an increase in foraging, nesting, and rearing of water birds including the endangered Hawaiian Stilt (Ae'ō).

C-2, Pond 88

The northern edge of pond 88 was one of the last non-tidal areas to be cleared along the Kohanaiki golf course envelope. There were a number of invasive trees and shrubs present on this edge of the pond including *P. sataceum*, *R. mangle*, & *S. terebinthefolius*, all of which were removed.

C-3, Pond 72:

Anchialine Pond with invasive flora & fauna present, minimal restoration efforts have been performed on this pond to date. Invasive flora is outcompeting native pond flora, most prevalent invasive flora species present is *Batis maritima* (Pickleweed). Invasive fauna present is mostly in the form of the *Poeciliidae* family of fish, also known as guppies or mosquito fish which are known to predate native invertebrate species like *Halocaridina rubra* ('Ōpae 'ula). Invasive flora will be removed as part of the ongoing Pond Management Plan.

(D) Brackish Production Well:

There are eight production wells on site at Kohanaiki that draw up to 1.5 MGD of brackish ground water for irrigation. This water is treated through Kohanaiki's Reverse Osmosis (R.O.) plant. Treated water is stored in a large irrigation lake (G) and is used to irrigate the golf course and landscaping at Kohanaiki.

(E) Reverse Osmosis Plant (R.O.):

The R.O. facility produces irrigation quality water for the Kohanaiki property by reducing the concentrations of salts, bi-carbonates, and other particulates from the water. The water produced is not potable quality, but is suitable for plants that are tolerant of brackish water. Kohanaiki has used a grass type for the golf course and a palette of landscape plants for all common areas that are brackish water tolerant. Most of the plants in this palette are naturally found along the sea shore.

(F) R.O. Injection Well:

After water is run through R.O. plant, the "concentrate" water containing the removed salts is conveyed by gravity flow back underground into this injection well. This injection well is possibly unique in the State of Hawai'i; care is taken to place the concentrate water into the ground water at the appropriate depth. This is done to match as closely as possible the salinity of the existing ground water, minimizing any potential change in salinity in the near shore environment.

(G) Irrigation Lake:

This 10.5 million gallon irrigation lake stores water that is run through the R.O. plant; water is then used to irrigate the golf course and landscaping at Kohanaiki. Similarly with the lake at the entry to the community, the edges of lake is constructed with "Littoral Shelf" planter beds which are partially submerged and contain native pond plants which help filter nutrients out of the water and attract foraging water birds.

(H) Monitoring Well (#400):

One of eight monitoring wells spread throughout the Kohanaiki property, North & South, Mauka & Makai, which are used by project scientists and various regulatory agencies and researchers to sample and monitor ground water quality at Kohanaiki. This particular well is one of three which are located right on the boundary between Kohanaiki and Kaloko-Honokohau National Historic Park. Recently presented data from the National Park Service indicated that salinity levels at this site have decreased somewhat since development started at Kohanaiki. In addition to the eight monitoring wells, near shore ocean waters are sampled and tested, and the anchialine ponds at Kohanaiki are sampled and tested regularly as part of our registration in the Audubon International Silver Signature Program on the golf course construction and operation. Audubon and Kohanaiki developed a Natural Resource Management Plan (NRMP) to serve as a guide for the design, construction and management of the golf course. The plan focuses on wildlife management, habitat enhancement, waste management, energy efficiency, water quality and conservation and pest management.

(I) Pond 2:

Anchialine Pond which had invasive flora present, but did not have invasive vertebrate species present like *poeciliidae* and therefore still has a healthy population of the native anchialine pool shrimp like *Halocaridina rubra* ('Ōpae 'ula). Invasive plant species have been removed from past restoration efforts and now a healthy assortment of native anchialine pool plant species are thriving in the area.

(J) Beach Restaurant Vantage Point

The recently constructed Beach Club at Kohanaiki provides a useful vantage point to get a sense of the geographical relationship between Kohanaiki, the National Park, and Honokahau Harbor. Two clumps of trees can be seen from the Makai lanai – one is located with the Park and the more distant near the harbor.

(Pond 2: Before, during, and after restoration efforts)



(Pond 7: Before and after restoration efforts)



(Pond 13: Before and after restoration efforts)



(Pond 80: Before and after restoration efforts)



(Pond 30: Before, during, and after restoration efforts)

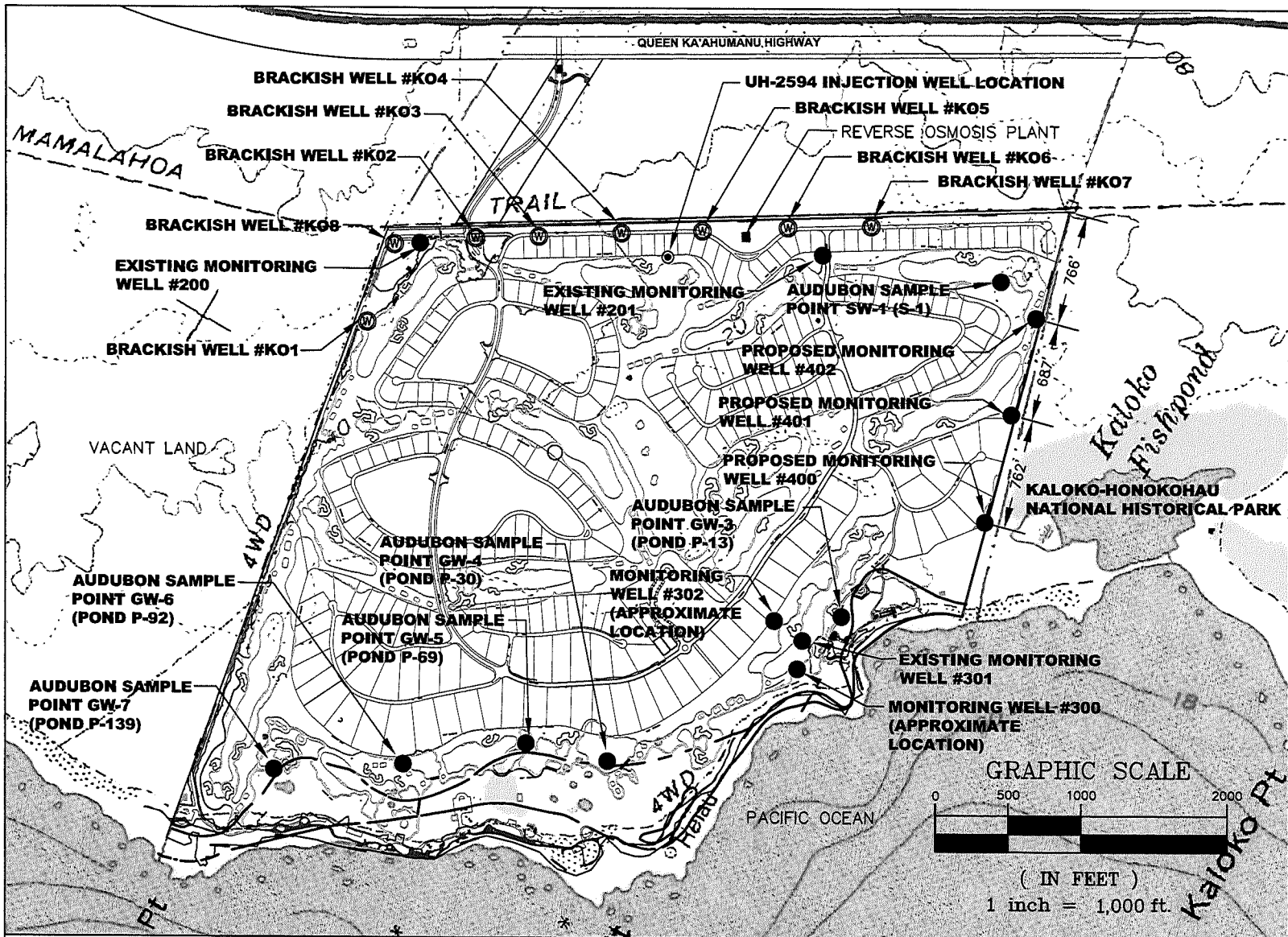


(P-88: Before, during, and after restoration efforts)



(P-139 Before and After)





**THE SHORES AT KOHANAIKI SITE PLAN
SHOWING EXISTING AND PROPOSED GROUND WATER MONITORING LOCATIONS**

TMK 7-3-09: 003 (3RD DIVISION)



SCALE: 1"=1,000'

NATIONAL PARK SERVICE SITE VISIT

September 17, 2014

EXHIBIT 3



Ka Wai Ola o Kaloko-Honokōhau The Living Water of Kaloko-Honokōhau

Commission on Water Resource Management Site Visit
September 17, 2014

“Each ahupua’a developed around a recognition that all of its elements were interdependent. What affected the mauka regions, affected the makai. What affected the neighboring ahupua’a affected it. What affected the land affected the fishponds and the sea. What affected the water cycle affected the total environment. This is the way it was and is at Ka-loko Hono-kō-hau”

—*The Spirit of Ka-loko Hono-kō-hau (1974)*



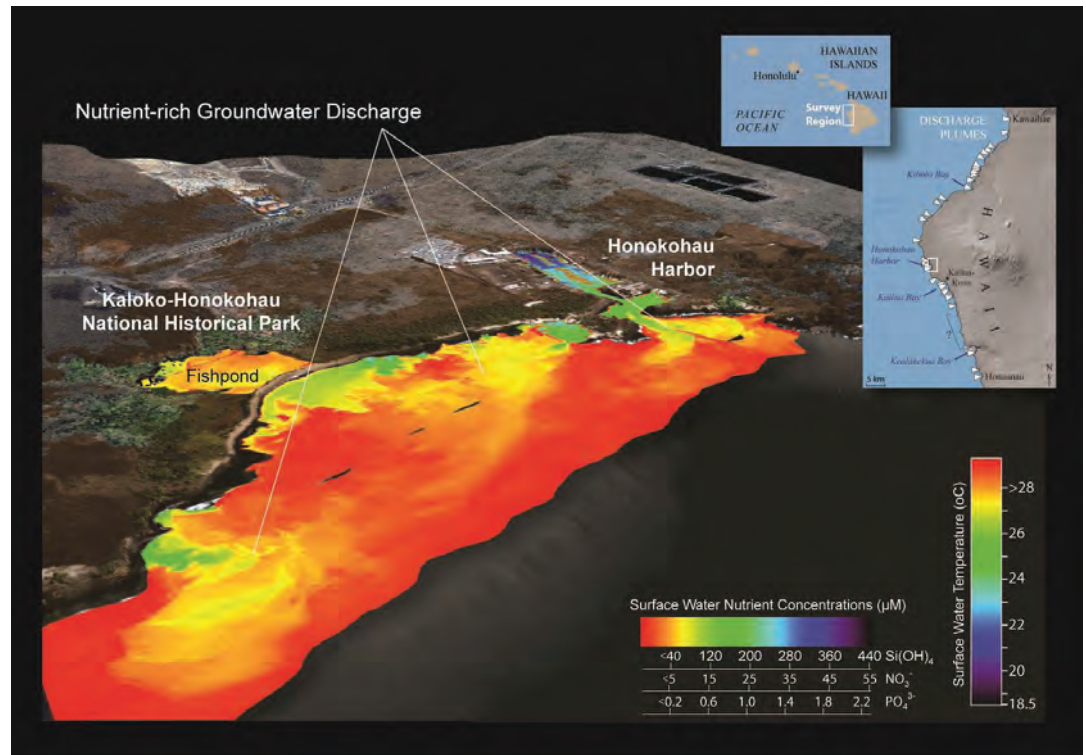
Site Visit Itinerary

10:45 a.m. – 12:15 p.m.	Site 1: Kaloko Fishpond and Site 2: Anchialine pools
12:15 – 12:45 p.m.	Lunch at Kaloko Fishpond picnic area
12:45 – 1:00 p.m.	Transit time to Honokōhau Small Boat Harbor and Observation well KAHO2 (Well No. 4161-02)
1:00 – 1:45 p.m.	Site 3: 'Ai'ōpio Fishtrap and Site 4: 'Aimakapā Fishpond



- **Driving**
- **Walking**

“The spirit of Kaloko-Honokōhau revealed itself to the ancient Hawaiians in another form which was, perhaps, the most critical factor in their decision to settle in the area. What they found scattered along the shoreline and among the jagged lava, were cool, brackish water springs.”

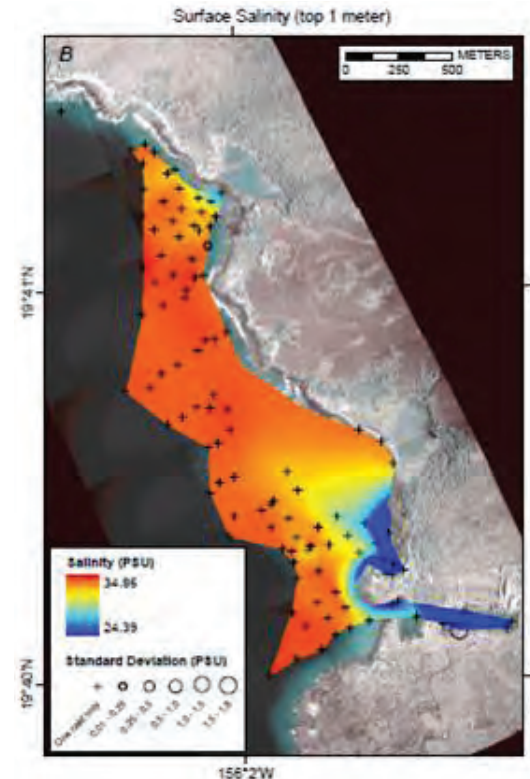


Thermal infrared image of the park's nearshore waters. UNIVERSITY OF HAWAII SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY/CRAIG GLENN

Groundwater Discharge

Much scientific research has been conducted on the movement and nature of groundwater at Kaloko-Honokōhau. Research shows:

- Colder, fresher groundwater from the Keauhou Aquifer System discharges to the inland and nearshore marine waters in the park.
- Fresh groundwater discharge creates estuarine conditions for native fish and wildlife in the park.
- In 2005, thermal infrared imaging identified 31 major submarine groundwater discharge plumes in the vicinity of the park.



Mean salinity in the park's nearshore waters during December 2003. U.S. GEOLOGICAL SURVEY SCIENTIFIC INVESTIGATIONS REPORT 2010-5081

“To the Hawaiians, the presence of these springs throughout the area was indication that there was enough of an underground water source to sustain the everyday needs of a settlement of people.”



Kahinihini'ula anchialine pool with *ahu* in the background. NPS PHOTO

#2 on map

Anchialine Pools

Water is precious in this arid environment. Fresh groundwater mixes with salt water near the ocean to create brackish anchialine pools.

- The park contains over 185 anchialine pools.
- The mean salinity of the pools in 2009 was about 15 ppt or 43% seawater.
- Anchialine pools provide substantial habitat for rare and culturally important native species, including the candidate-endangered orange-black Hawaiian damselfly, two candidate-endangered Hawaiian anchialine pool shrimp (*Metabetaeus lohena* and *Palaemonella burnsi*), and the endemic 'ōpae 'ula (*Halocaridina rubra*).



Traditional uses of the anchialine pools include sources of bait, drinking water, and bathing water, and the raising and holding of native fishes.



The orange-black Hawaiian damselfly. HAWAII BIOLOGICAL SURVEY/D. PRESTON

“Good water quality is essential to fishpond culture, and since the source is almost entirely in the rainy mauka areas, management of these and other lands adjacent to the park will have a direct impact on water resources within the park. Thus, cooperative planning efforts with the state, county, and private landowners is an important part of this proposal.”



Aerial view of Kaloko Fishpond and the restored kuapā in 2012. NPS PHOTO

#1 on map

Kaloko Fishpond

Fishpond culture continues to be of vast importance to the Hawaiian way of life, and fishponds are among the great engineering feats of Hawaiians. The Kaloko Fishpond is both culturally significant and a lesson in historic preservation.

- Kaloko Fishpond is an 11-acre *loko kuapā*.
- Fresh groundwater discharge to the fishpond provides protective nursery habitat for culturally important fish such as *‘ama‘ama* or striped mullet.
- The National Park Service is restoring the fishpond for traditional aquaculture.



The Hawaiian Legacy program supports the preservation of traditional knowledge and artisan skills, including Hawaiian *uhu humu pohaku*—traditional Hawaiian dry-set masonry. NPS PHOTO

“Fish and other marine life were plentiful along the shoreline and offshore water, with ōpelu, ‘aku, and ‘ahi in the offshore deeps and migrating akule in the shallows.”



'Ai'ōpio Fishtrap is a 1.7-acre enclosure modified by Hawaiians to trap fish at low tide. NPS PHOTO

#3 on map

'Ai'ōpio Fishtrap

An opening in the trap enabled fish to enter, and the walled section of the trap allowed fish to be stored until needed.

- The estuarine nearshore ecosystem is shaped by the dynamic interaction of climate, groundwater discharge, and nearshore circulation patterns.
- West Hawai'i's coral reefs developed to a relatively pristine state over hundreds to thousands of years of estuarine influence.
- Tide pools and the nearshore marine waters support over 150 species of fish.



Coral reefs in the park attract diverse marine life. NPS PHOTO

“The majority of sites are clustered about the Ka-loko and ‘Aimakapā fishponds and shoreline, which indicates that these areas were the vital centers of activity in the prehistoric life of the Ka-loko, Hono-kō-hau settlement.”



‘Aimakapā Fishpond is a 15-acre *loko i'a*. NPS PHOTO

#4 on map

‘Aimakapā Fishpond

In historic times ‘Aimakapā Fishpond was used to raise fish for the *ali'i*.

- Groundwater discharge to ‘Aimakapā wetland provides important foraging and breeding habitat for native waterbirds

and migratory waterfowl, including the endangered Hawaiian coot and the endangered Hawaiian stilt.

- ‘Aimakapā Fishpond is listed as a Core Wetland by the U.S. Fish & Wildlife Service in their Recovery Plan for Hawaiian Waterbirds.



The *alae ke'oke'o* or Hawaiian coot and the *ae'o* or Hawaiian stilt. NPS PHOTO



Removal of non-native vegetation in ‘Aimakapā wetlands. NPS PHOTO

King Kamehameha Hotel Presentations

September 17, 2014

National Park Service

<http://dlnr.hawaii.gov/cwrp/groundwater/activities/keauhou/>

U.S. Geological Survey

<http://pubs.usgs.gov/of/2014/1173/>

EXHIBIT 4



Meeting room



Free parking



200 feet

