Kona Kai'Ola

FINAL ENVIRONMENTAL IMPACT STATEMENT

VOLUME 2-B: EIS COMMENTS AND RESPONSES

Kealakehe, North Kona District, Island of Hawaii

Prepared for:
Jacoby Development, Inc.
171 17th Street, NW, Suite 1550
Atlanta, GA 30363

For Accepting Authority:
Hawai'i State Department
of Hawaiian Home Lands
1099 Alakea Street, Suite 2000
Honolulu, HI 96813

Prepared by:
oceanit
828 Fort Street Mall, Suite 600
Honolulu, HI 96813

In Cooperation with:
Hawai'i State Department
of Land and Natural Resources
1151 Punchbowl Street, Room 130
Honolulu, HI 96813

JULY 2007

COMMUNITY ORGANIZATIONS

February 5, 2007

Dayan Vithanage
Oceanit
828 Fort Street Mall, 6th Floor
Honolulu, HI 96813

Aloha Dayan,
I have been the President of Hawai`i Island Paddlesports Association since 1996 and would like to comment in reference to the *Draft Environmental Impact Statement* and the project plan for *Kona Kai Ola* project at Honokohau Harbor in Kona.

To NOT think about going forward with this project is thinking only about today and not the future. Even as I say that, this project IS needed today. There is a shortage of commercial boat slips NOW, there is a shortage of recreation boat slips NOW, there is a shortage of recreation sailboats slip NOW, there is a shortage of coastline access places for Six-person and solo outrigger paddlers NOW, there is a shortage of shoreline access place for youth programs NOW and there is a shortage of Non-resort hotel rooms in Kona for kama`aina and business travelers NOW.

Considering the current traffic problems and affordable home shortages, one can make a slight argument that we don't need to add to this problem, but everything about this project addresses those problems as it deals directly with this project and beyond. The project also solves the other problems mentioned previously. If project moves forward on a reasonable schedule, with the current road projects in the pipe and the affordable home project in the works, it doesn't take a long reach to see that we will be long on the way to fixing the current problems when *Kona Kai Ola* would come to fruition.

We have a rare opportunity to solve a number of problems in a culturally and environmentally sound way before they grow even bigger.

To prevent this project from moving forward is thinking with very limited short vision and not looking at where we want to be for the next generation and to wait till we fix every other problem in Kona before we move forward is simply mismanagement of our future.

Mahalo for your attention

Randy Botti
President, Hawai`i Island Paddlesports Association

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Randy Botti
Kona Sales Manager

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July 23, 2007

Randy Botti, President
Hawai‘i Island Paddlesports Association
P.O. Box 3523
Kailua-Kona, Hawai‘i 96745

Dear Mr. Botti:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Dated February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement.

We concur with your statement regarding the existing demand for the marina and marina support facilities at Kona Kai Ola. The need to expand existing facilities is reflected in JDI's proposal for a new marina on State lands.

We assure you that JDI has studied all possible project impacts, and the DEIS and FEIS document these studies, as well as include specific measures to mitigate impacts. We believe that mitigation of these impacts will also improve and enhance existing conditions. For example, in Phase 1 of the project, JDI will not only provide access to the commercial parcel, but also address regional traffic issues through the improvements of the roadway system. JDI plans to improve the intersection of the Queen Ka‘ahumanu Highway and the Kealakehe WWTP Access Road. The Kealakehe WWTP Access Road is planned to be realigned and widened to an 80-foot road right-of-way (ROW) that will serve the Commercial Parcel No. 1 and eventually intersect with the proposed Kuakini Highway Extension to the west. Such improvements will ensure that the project minimizes its own impacts while improving existing conditions.

We acknowledge your long-term thinking. It reflects a sincere desire to see the community move forward in a positive direction.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Hawaii Electric Light Company, Inc. • PO Box 1027 • Hilo, HI 96721-1027

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February 2, 2007

Oceanit Center
Attention: Mr. Dayan Vithanage
828 Fort Street Mall, 6th Floor
Honolulu, Hawaii 96813

Gentlemen:

Subject: Kona Kai Ola Project in Kealakehe, North Kona – Draft Environmental Impact Statement
TMK: (3) 7-4-008:071-072, (3) 7-4-008:003 (portion) and (3) 7-4-008:099

Thank you for the opportunity to review the Subject Project located in Kealakehe. HELCO will not be able to provide electrical service to the entire 70,000 kW of the project development however, may serve some of the phases of the project. We request that the timing of the phases and the capacity be sent to us for further review.

The following is a summary of our initial comments:

1. Generation Capacity - HELCO's current system peak load is 201,300 kW and our total generation system capability is 271,850 kW. Our reserve margin is 35 percent and has adequate generation to serve the above. However, HELCO does not have the adequate reserve capacity for emergencies and growth. HELCO plans on installing a new 18,000kW steam turbine in 2009, which will not be enough to serve the ultimate 70,000 kW load. New generation units will need to be installed to serve the ultimate load.
2. Electrical Substation – The area is currently served by our existing 10.0MVA Kealakehe electrical substation and a 12,470 volt distribution overhead system on the Mauka side of the Queen Kaahumanu Highway which is next to the Kona Police Station. This electrical system will not be adequate to serve the development's anticipated load. Two new switching stations need to be installed along Queen Kaahumanu Highway to tap the existing 69,000 volt lines. If the switching stations are located below Queen Kaahumanu Highway, 69,000 volt underground transmission lines will be required to connect the existing transmission lines on the Mauka side of the highway. The two new switching stations will convert the transmission voltage from 69,000 to 12,470 volts to serve the development. Two lots with a minimum size of 250' by 250' must be deeded to HELCO for the construction of two new switching stations.

HELCO recommends energy efficient and conservation measures to reduce the maximum electrical demand and energy consumption. The developer may call HELCO's Energy Services Manager, Curtis Beck, at (808) 969-0134 for questions or details on available programs.

It is encouraged that the developer's electrical consultant open a service request with HELCO's Engineering Department as soon as practicable to ensure timely electrical facility installation.

Should you have any questions, please contact Shelley Tomita at (808) 327-0504 or myself at (808) 969-0322.

Sincerely,

Hal Kamigaki, Acting Manager
Engineering Department

HKK:gk

cc: J. Dizon
S. Tomita
S. Oshiro

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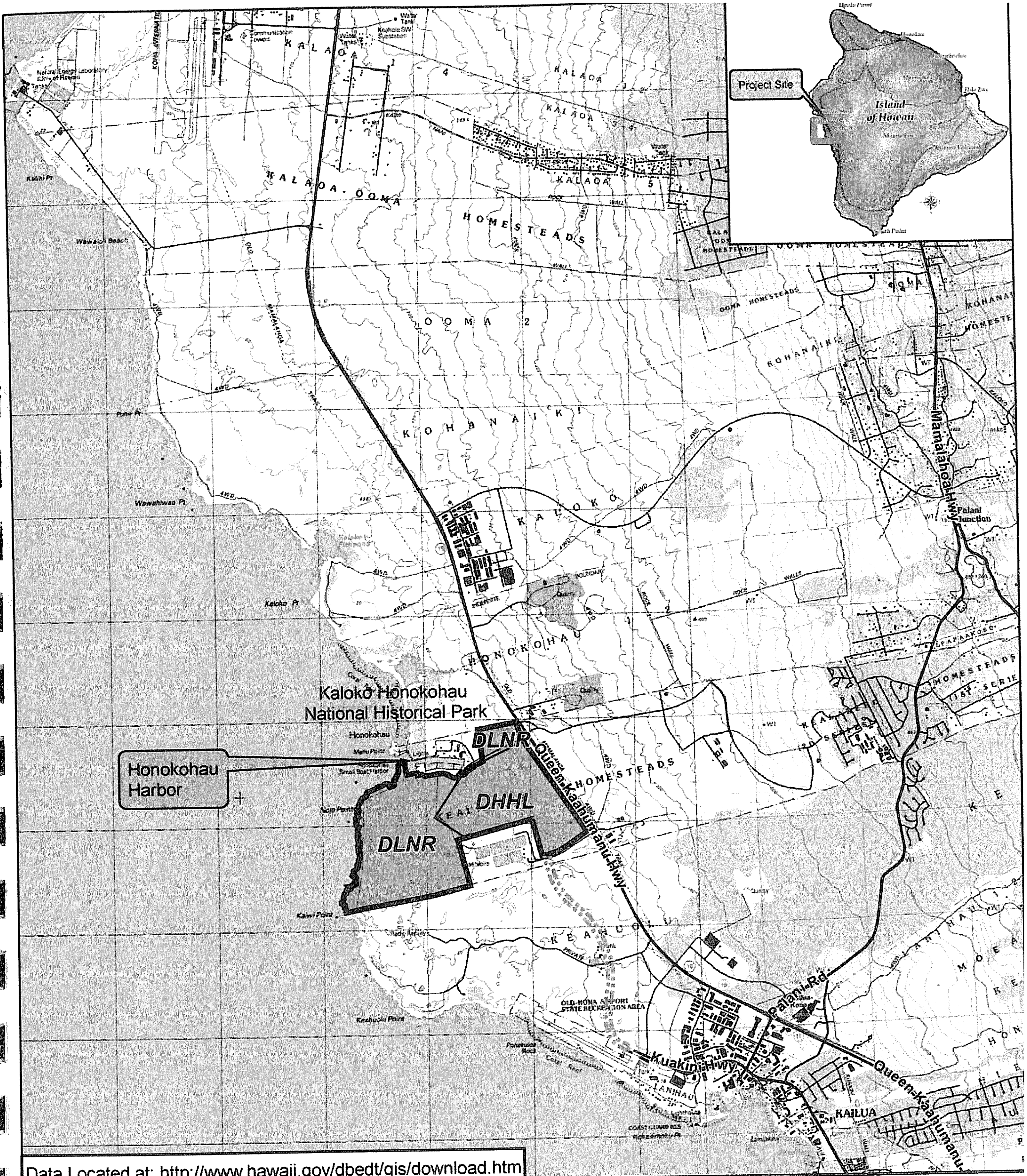

Figure A: Location Map

Legend

Project Site

Proposed Parkway

N S W E

0 2,000 4,000 Feet

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Oceanit Center
Attention: Mr. Dayan Vithanage
828 Fort Street Mall, 6th Floor
Honolulu, Hawaii 96813

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July 23, 2007

Hal Kamigaki, Acting Manager
Hawai'i Electric Light Company, Inc.
P.O. Box 1027
Hilo, Hawai'i 96721-1027

Dear Mr. Kamigaki:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Dated February 2, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement.

We understand that HELCO will not be able to provide electrical service to the entire 70,000 kW of the project development, although you may serve some of the phases of the project. The timing of the phases and capacity will be sent to HELCO for further review as requested.

We also understand that new generation units will need to be installed to serve the ultimate load.

Regarding the substation, discussions were made in the DEIS for provisions to construct a new electrical substation. However, HELCO is requesting that 2 new switching stations be provided within the development. Each switching station will consist of its own lot measuring 250 feet by 250 feet. Discussions between HELCO and State land owners (DHHL and DLNR) will determine the process for meeting land requirements related to the 2 switching stations.

When practical, the electrical consultant will open a service request with HELCO's Engineering Department to ensure timely electrical facility installation.

We note that JDI has made a corporate commitment to environmental sustainability in all its work. In Kona Kai Ola, JDI intends to incorporate the latest environmental design and technology to create an energy efficient, low environmental impact, sustainable development. Specific energy-related goals include:

- The project will reduce building energy use by 50 percent, as compared to a building that does not incorporate energy efficient strategies (the comparison building is defined by using ASHRAE/IESNA Standard 90.1-2004). The project team has already begun analyzing the energy use in a typical timeshare. Strategies to help reduce energy use include: incorporating significant wall and ceiling insulation; utilizing windows that allow daylight without allowing heat penetration; purchasing energy efficient lighting and appliances; designing the buildings to maximize natural ventilation; and using cold ocean water for air conditioning and cooling.

- The project will use renewable energy technologies on-site to provide the remaining 50 percent of overall building energy use. On Hawai'i Island, one of the most abundant resources is solar insolation. Given the year-round abundance of solar insolation, the use of solar, thermal, and photovoltaic technologies is feasible for the project. The development intends to integrate these technologies into each building's architectural features. Initial calculations show that the timeshare segment can integrate enough solar technologies on each building's roof to completely offset timeshare electricity demand.
- These measures will help to reduce the site's peak energy demand by 50 percent. By reducing the development's demand during the range of hours that most of Hawai'i Island's citizens are using electricity, Kona Kai Ola can help HELCO reduce the probability of brownouts and blackouts. The reduction in peak energy demand can be achieved by using smart technologies that control energy use.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Hawaii Island Economic Development Board
I S L A N D O F O P P O R T U N I T Y

February 12, 2007

SENT VIA FACSIMILE
808-531-3177

Dayan Vithanage
OCEANIT
828 Fort Street Mall, 6th Floor
Honolulu HI 96813

REF: Draft Environmental Impact Statement, Kona Kai Ola, Hawaii Island, North Kona

Hawaii Island Economic Development Board is made up of 115 member organizations who support Jacoby Development's commitment to sustainable development and providing solutions for public infrastructure including a new public marina, a new connector road, shoreline park and access to affordable housing.

We feel this project is committed to protecting the region's natural and cultural resources and enhancing the community's well-being by creating recreational and educational opportunities. Their commitment to "smart growth" development will provide both economic and environmental sustainability for the long term benefit of our island community.

If you have any questions, please do not hesitate to call.

'O wau nō me ka ha'a ha'a

Mark McGuffie
Executive Director

Hilo Office: Hawaii Innovation Center at Hilo • 117 Keawe Street, Suite 107 • Hilo, HI 96720-2811
Ph (808) 935-2180 Fax (808) 935-2187 hiedb@hiedb.org www.hiedb.org
Kona Office: Hawaii Energy Gateway Center, Natural Energy Laboratory Hawaii Authority Ph (808) 326.-2721

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July 23, 2007

Mark McGuffie, Executive Director
Hawai'i Island Economic Development Board
117 Keawe St., Suite 107
Hilo, Hawai'i 96720-2811

Dear Mr. McGuffie:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Dated February 12, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement.

We acknowledge the support of the Hawaii Economic Development Board for the Kona Kai Ola project. We also concur with your acknowledgement of the incorporation of environmentally sound practices, and EIS Section 1.5.2, Project Sustainable Design, provides sustainability goals in the areas of design, energy, water, waste and transportation. These goals are consistent with the principles of smart growth development and reflect JDI's commitment to development that sustains and enhances the physical, cultural, social and economic environment. Section 1.5.2, Project Sustainable Design, has been expanded to include specific project sustainability goals, and is contained in Attachment 1 of this letter.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

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Attachment 1

1.5.2 Project Sustainable Design

The U.S. General Services Administration defines sustainable design as a process that “seeks to reduce negative impacts on the environment, human health and comfort of building occupants, thereby improving building performance” (GSA 2006). Sustainable design is a process that requires integration and communication between all parties involved in the design and construction of a development. In a typical development, an owner works with an architect and site planner to design the development. Following a site’s design, engineers are hired to design the structure and systems of a building. Eventually a contractor is brought in to construct the development. In this version of development, the designers and contractors work in isolation. In contrast, sustainable design requires that team members work together to understand how all pieces to a development fit within the whole. This integration allows project members to offer unique solutions to common design and construction problems while also integrating environmental concerns into a project.

JDI has made a corporate commitment to environmental sustainability in all its work. In Kona Kai Ola, JDI intends to incorporate the latest environmental design and technology to create an energy efficient, low environmental impact, sustainable development at Kona Kai Ola. The vision for the project is to develop a project that has minimal impact on the environment by striving to significantly reduce water consumption, waste disposal, energy use and carbon dioxide emissions.

One key to measuring the sustainability of the project’s design and operation is to use the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. The LEED Green Building Rating System is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings. LEED gives building developers and operators the tools they need to have an immediate and measurable impact on their buildings’ performance (LEED 2006). JDI has experience with the LEED certification process from its other projects both for individual buildings, and for large campus infrastructure as well. JDI intends to pursue, at a minimum, Silver LEED certification for its development of the Kona Kai Ola project.

At the project’s onset, JDI developed goals related to design, energy, water, waste and transportation, and the following sections present goals in each of those areas.

~~Sustainable design principles include the ability to:~~

- ~~minimize non-renewable energy consumption~~
- ~~optimize site potential~~
- ~~use environmentally preferable products~~
- ~~protect and conserve water~~
- ~~enhance indoor environmental quality~~
- ~~optimize operational and maintenance practices~~

Hawaii's Thousand Friends

25 Maluniu Ave., Suite 102., PMB 282 • Kailua, HI 96734 • Phone/Fax: (808) 262-0682 E-mail: htf@lava.net

January 8, 2007

Oceanit
828 Fort Street Mall, Suite 600
Honolulu, Hawai`i 96813

State Department of Hawaiian Homes
1099 Alakea Street, Suite 2000
Honolulu, Hawai`i 96813

Office of Environmental Quality Control
235 S. Beretania Street
State Office Tower Suite 702
Honolulu, Hawai`i 96813

RE: Kona Kai Ola Environmental Impact Statement
Kealakehe, North Kona District, Island of Hawai`i

Hawaii's Thousand Friends, a state wide organization with members on the Big Island who use this area, is very concerned about the environmental impacts of this project and the unusual tactic for a Hawai`i environmental report. Contrary to law this impact statement does not consider the usual array of alternatives to the project.

As pointed out in the Honolulu Advertiser "The authors of the report argue that since Jacoby [the project developer] is obligated under its agreement with the state to build an 800-slip marina, the project must be dense enough "to provide an acceptable level of economic return" to the developer."

"The market study found that the current proposed density and mix is the optimum to meet the anticipated financing and development cost obligations for the public features associated with the development," according to the impact statement."

This line of reasoning does not make any sense. Other than the few circumstances where federal agencies have successfully argued that NEPA compliance relating to a particular project is precluded because Congress has removed the agency's discretion and thus that the informational purposes of NEPA are obviated, Hawaii's Thousand Friends has never heard of anything as outlandish as the argument put forward here that an EIS need not look at alternatives to the proposed project because only the project as proposed will meet the economic requirements of the State's contractor.

This assumes, incorrectly, that the State has the authority to approve leases requiring such density and need not itself conduct an evaluation of alternatives. This scheme, if successful, would essentially eliminate the "alternatives" analysis for ANY project where a state (or presumably county) official colludes with a developer to "impose" requirements making the project economically infeasible (allegedly) unless it is approved without change.

At the very least the EIS must be amended to include alternative actions.

Hawaii's Thousand Friends
25 Maluniu Ave., Suite 102. • PMB 282 • Kailua, HI 96734

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July 23, 2007

Hawaii's Thousand Friends
25 Maluniu Ave., Ste. 102, PMB 282
Kailua, Hawai'i 96734

Dear Sirs:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Dated January 8, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. The main focus of your comments is the DEIS lack of discussion of alternatives other than the No Project Alternative.

As explained in the DEIS, the agreement between JDI and the State of Hawai'i established a required scope and scale of the project for which the impact analysis was provided. Several comments have addressed the fact that alternatives other than the No Project Alternative, were not addressed in the DEIS Section 2, Alternatives Analysis.

Kona Kai Ola is of the position that alternative actions, other than a No Project alternative, are not currently feasible without an amendment to the agreement with the State. Agency and public comments in response to the DEIS, as well as additional information generated, as a result of inquiry into issues raised by the comments, have been helpful in identifying alternative actions that will serve the State's goal of providing additional marina slips for the Kona area. These alternative actions also serve to reduce or mitigate anticipated effects of the proposed development.

Thus, agencies such as the Land Division of the Department of Land and Natural Resources, the U.S. Department of the Interior Fish and Wildlife Service, the Planning Department of the County of Hawai'i, and the Office of Environmental Quality Control (OEQC), as well as community organizations have commented that a reduced scale marina and related facilities should be considered. The OEQC has also asked that the alternative of a reduced scale project be evaluated under the assumption that DHHL may determine that a downsized project would be preferred.

In response to these comments on the DEIS and in consideration of measures to mitigate anticipated impacts, the EIS Section 2, Alternatives Analysis, has been revised to describe the following alternatives, which are discussed in more detail in the EIS:

- Alternative 1 is a project involving a 400-slip marina, 400 hotel units, 1,100 time-share units, and commercial and support facilities. This alternative would enhance water quality and avoid the need to widen the existing harbor entrance channel, as well as reduce traffic and socioeconomic impacts.
- Alternative 2 is an alternative that had been previously discussed, but not included in the proposed project that includes an 800-slip harbor and a golf course.
- Alternative 3 is the no-action alternative.

A comparison between impacts related to the proposed project concept and impacts related to Alternative 1 indicates that a reduction in the acreage and number of slips in the marina, as well as the reduction in hotel and time-share units, would generate less environmental, traffic, social and economic impacts. Although positive economic impacts would be reduced, Alternative 1 can be considered as a preferable alternative because of reduced environmental impacts. However, while it can be concluded that the 25-acre marina in Alternative 1 would be the preferred size, the DLNR agreement establishes the size of the marina at 45 acres and 800 slips. An amendment to the DLNR agreement is required in order to allow Alternative 1 to proceed. Hence, selection of Alternative 1 is an unresolved issue at this time.

The additional EIS text that includes the added EIS Section 2, Alternative Analysis, is contained in Attachment 1 of this letter.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

2 Alternatives Analysis

~~In typical land development projects, the initial planning process includes the exploration of alternatives to development objectives. In the EIS process, these alternatives are presented with a disclosure of reasons for the dismissal of non-preferred alternatives.~~

~~Kona Kai Ola does not follow this same pattern of alternatives evaluation.~~ As discussed in Section 1.4, the proposed Kona Kai Ola project is the result of agreements between JDI and the State DLNR and DHHL. The agreements and leases between the State and JDI stipulate the parameters of development for this site in terms of uses, quantities and size of many features, resulting in a limited range of land uses. Unlike a private property project, JDI is required to meet the criteria outlined in the agreements, thereby affording less flexibility in options and uses. From the developer's perspective, the agreements must also provide sufficient flexibility to allow for a development product that responds to market needs and provides a reasonable rate of return on the private investment.

The agreements between JDI and DLNR specify that the proposed harbor basin is to be 45 acres and accommodate 800 slips. This development proposal is the subject of this EIS. In response to DEIS comments, additional water quality studies and modeling were conducted. These studies determined that the water circulation in a 45-acre 800-slip marina would be insufficient to maintain the required standard of water quality. The models of water circulation suggest that a new 25-acre harbor basin could successfully maintain required water quality in the new harbor. Comments on the DEIS from DLNR, from other government agencies, the neighbors and the general community also called for the consideration of alternatives in the EIS, including a project with a smaller harbor basin and less density of hotel and time-share units.

In response to these comments on the DEIS, three alternatives are evaluated in this Final EIS and include Alternative 1, which is a plan with a 25-acre 400-slip harbor basin including a decrease in hotel and time-share units; Alternative 2, which is an alternative that had been previously discussed but not included in the proposed project, that includes an 800-slip harbor and a golf course; and Alternative 3, the no-project alternative. Each alternative is included in the EIS with an evaluation of their potential impacts. These project alternatives are presented to compare the levels of impacts and mitigation measures of the proposed project and alternative development schemes pursuant to requirements set forth in Chapter 343, HRS.

~~JDI is required to provide a new marina basin not less than 45 acres and a minimum of 800 new boat slips. Further, the agreements provide the following options for land uses at the project site:~~

- ~~Golf Course~~
- ~~Retail Commercial Facilities~~
- ~~Hotel Development Parcels~~
- ~~Marina Development Parcels~~
- ~~Community Benefit Development Parcels~~

~~JDI is not pursuing the golf course option and is proposing instead to create various water features throughout the project site. All other optional uses have been incorporated in Kona Kai Ola.~~

2.1 Project Alternatives

2.1.1 Alternative 1: 400-Slip Marina

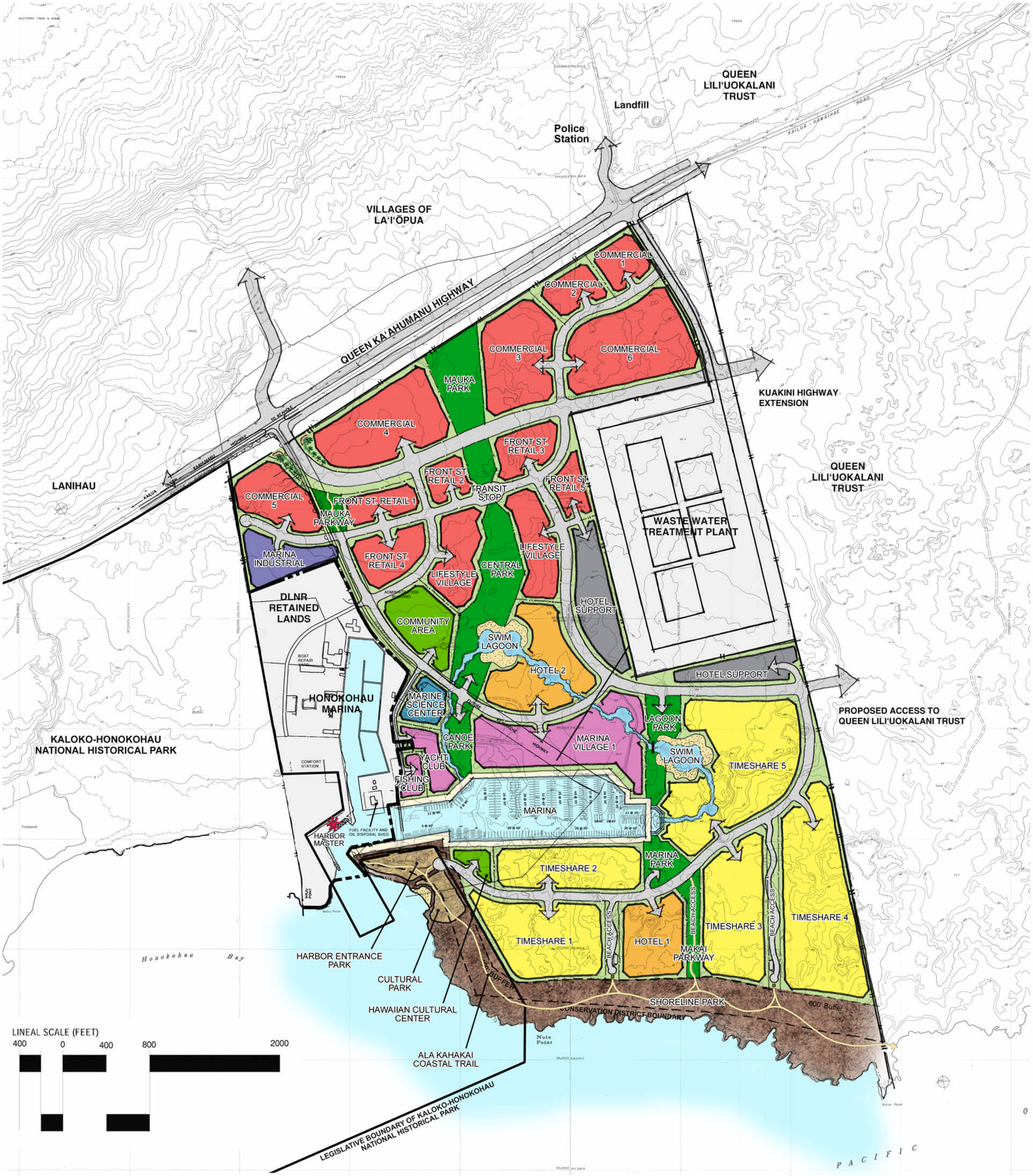
Studies conducted in response to DEIS comments found the construction and operation of an 800-slip marina may significantly impact the water quality within the marina and along the shoreline. Specifically, the Harbor Water Quality Modeling Study, as contained in Appendix U, found that the water circulation in a 45-acre 800-slip harbor was insufficient to maintain an acceptable level of water quality. Further, the existing harbor channel, which would serve both the existing and new harbors, could not adequately serve the increased boat traffic generated by an 800-slip marina during peak traffic. Mitigation measures to accommodate peak boat traffic included the widening of the existing channel, an action that would entail a complex process of Federal and State approvals and encounter significant environmental concern.

Concerns related to the proposed density of hotel and time-share units were also expressed in comments to the DEIS from members of the public, neighbors to the project site, especially the Kaniohale Community Association, and government agencies. Common themes in DEIS comments were related to impacts regarding traffic, project requirements of potable water and infrastructure systems, including sewer, drainage, utility and solid waste systems, and socioeconomic impacts.

In response to the water quality study results, and to the DEIS comments, an alternative plan was developed with a smaller marina with less boat slips, and a related decrease in hotel and time share units. Illustrated in Figure G, Alternative 1 reflects this lesser density project, and features a 400-slip marina encompassing 25 acres. For the purposes of the Alternative 1 analysis, JDI assumed 1,100 time-share units and 400 hotel rooms. Project components include:

- 400 hotel units on 34 acres
- 1,100 time-share units on 106 acres
- 143 acres of commercial uses
- 11 acres of marina support facilities
- 214 acres of parks, roads, open spaces, swim lagoons and community use areas

In addition, Alternative 1 would include the construction of a new intersection of Kealakehe Parkway with Queen Ka‘ahumanu Highway, and the extension of Kealakehe Parkway to join Kuakini Highway to cross the lands of Queen Lili‘uokalani Trust, and connecting with Kuakini Highway in Kailua-Kona. This is a significant off-site infrastructure improvement and is included in the agreements between the State and JDI.



Source: PBR HAWAII

Plan is conceptual only and subject to change

Figure G: Alternative 1: 400-Slip Marina

LEGEND

- TIME SHARE
- HOTEL
- RETAIL / COMMERCIAL
- MARINA RETAIL
- MARINA SUPPORT / COMMERCIAL
- MARINE SCIENCE CENTER
- COMMUNITY AREA / CULTURAL CENTER
- SWIM LAGOON
- MARINA
- UTILITIES
- PARKS & GREEN SPACE
- SHORELINE
- HARBOR ENTRANCE PARK / CULTURAL PARK

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Like the proposed project, Alternative 1 would have a strong ocean orientation, and project components that support this theme would include various water features including seawater lagoons and a marine science center. The new Alternative 1 harbor would include a yacht club, fishing club, a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. The coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use. Additional Alternative 1 community areas would include facilities and space for community use, including programs of the Kona Kai Ola Community Foundation, which supports community programs in health care, culture, education, and employment training for the local community, especially to native Hawaiians. Like the original proposed plan, Alternative 1 includes 40 percent of the land in parks, roads, open spaces, swim lagoons and community use areas.

2.1.2 Alternative 2: Golf Course Feature

Alternative 2 was among the alternatives discussed at a community charrette in September 2003. It includes a golf course, which is a permitted use in the DLNR agreement and DHHL lease. As Figure H illustrates, an 18-hole championship golf course would occupy 222 acres on the southern portion of the project site. As with the proposed project, Alternative 2 includes an 800-slip marina on a minimum of 45 acres.

To support the economic viability of the project, other Alternative 2 uses include:

- Golf course clubhouse on three acres
- 1,570 visitor units on 88 acres fronting the marina
- 118 acres of commercial uses
- 23 acres of community uses

Community uses in Alternative 2 include an amphitheater, a canoe facilities park, a community health center, a Hawaiian cultural center and fishing village, a marine science center and employment training center. The sea water lagoon features contained in the proposed project and Alternative 1 are not included in this alternative.

2.1.3 Alternative 3: No Action

In Alternative 3, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.

~~The economic viability and sustainability of the project is determined by the density and uses proposed. Because JDI is obligated to develop an 800-slip marina for the State, complete road improvements, and provide various public enhancement features at its own expense, the density proposed for the income generating features of the development must be sufficient to provide an acceptable level of economic return for JDI. The market study, which is discussed in Section 4.6, reviewed various development schemes and determined that the currently proposed density and mix is the optimum to meet the anticipated financing and development cost obligations for the public features associated with the development.~~

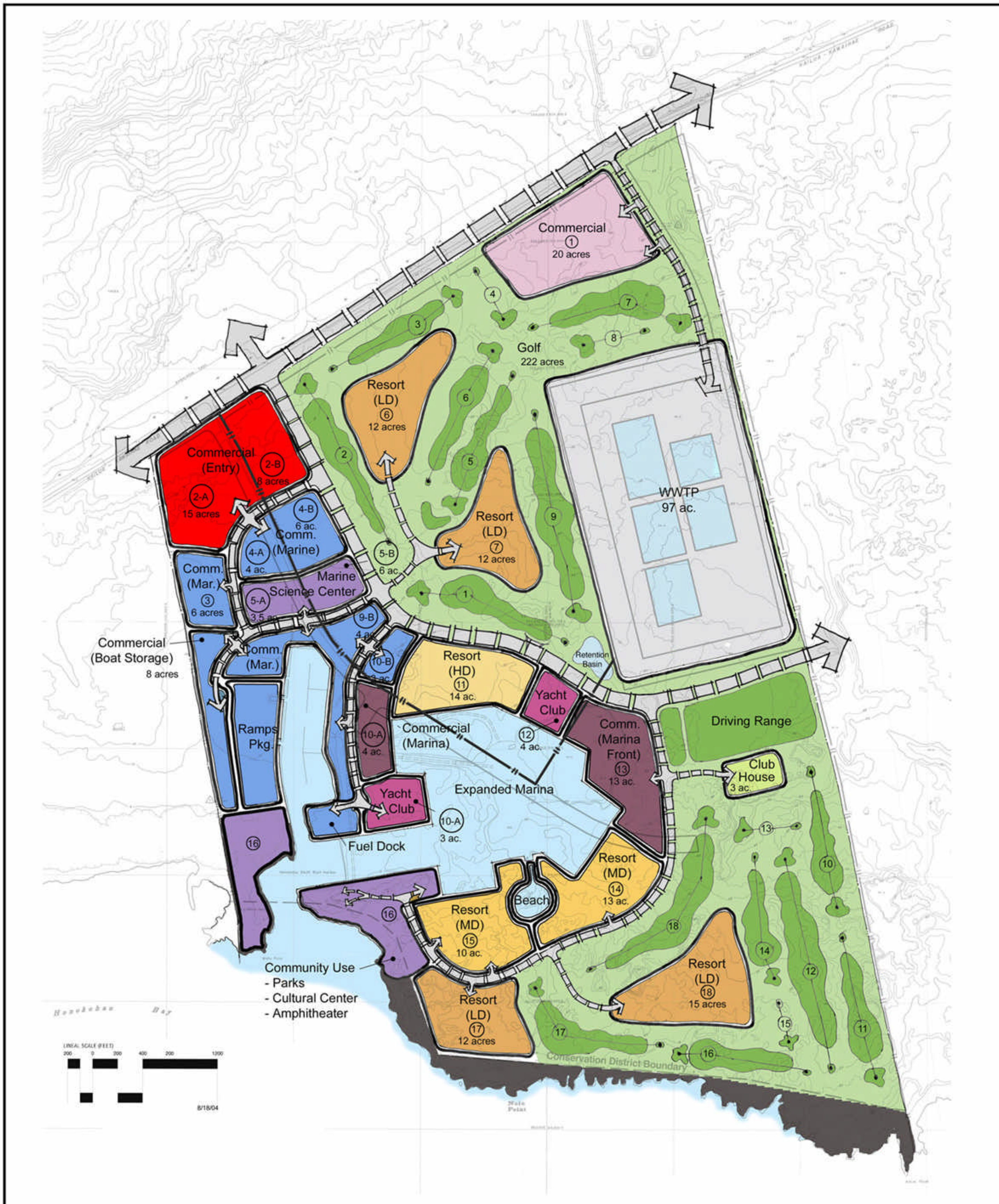


Figure H. Alternative 2: Golf Course Alternative

Legend

JACOBY DEVELOPMENT, INC.

2.2 Alternatives Analysis

As discussed in Section 2.1, the proposed Kona Kai Ola project (also referred to as "proposed project") is defined by development requirements related for a marina and the related uses that would be needed to generate a reasonable rate of return that covers development costs.

Beginning with Section 2.2.1, the alternative development concepts are comparatively assessed for potential impacts that may reasonably be expected to result from each alternative. Following is an overview of the primary observations of such assessment.

Alternative 1 includes half of the State-required boat slips and 60 percent of the proposed hotel and time-share units and, due to the decreased density, this alternative would generate significantly less environmental and socio-economic impacts. A harbor water quality model found the reduction of the volume of the new marina basin by about half (approximately 25 acres) significantly improved the water circulation and quality. Further, the reduced number of boat slips would generate less boat traffic, thereby reducing congestion and the need to mitigate impacts further by the widening of the existing harbor channel.

A project with fewer hotel and time-share units and increased commercial space with a longer (14 years) absorption period would change the mix of employment offered by the project, and slightly increase the overall employment count. The public costs/benefits associated with Alternative 1 would change, compared to the proposed project, with a general increase in tax collections, and a general decrease in per capita costs. Detailed discussion of Alternative 1 potential economic impacts are provided in Section 4.6.6. Comparisons of levels of impact are presented throughout this FEIS.

While this analysis might indicate that the 25-acre marina in Alternative 1 would be the more prudent choice, the DLNR agreement establishes the minimum size and slip capacity of the marina at 45 acres and 800 slips, respectively. Amendments to the DLNR agreement would be required in order to allow Alternative 1 to proceed as the preferred alternative. Hence, selection of the preferred alternative is an unresolved issue at the writing of this FEIS.

Alternative 2, the golf course alternative, was not previously considered to be the preferred alternative primarily because market conditions at the time of project development might not likely support another golf course. Further, DHHL has a strategy goal to have more revenue-generating activities on the commercial lease lands within the project area. In addition, concerns have been expressed as to environmental impacts of coastal golf courses, including the potential adverse impact on Kona's water supply if potable water is used for golf course irrigation.

While Alternative 3, the no-project alternative, would not generate adverse impacts related to development of these lands associated with the construction and long-term operations, it would also not allow for an expanded public marina that would meet public need and generate income for the public sector. Further, the no-project alternative would foreclose the opportunity to create a master-planned State-initiated development that would result in increased tax revenue, recreation options and community facilities. Crucial privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities, and public access would not be contributed.

~~Hence, the only valid alternative to the proposed project is the no-action alternative. In this alternative, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.~~

~~The no-project alternative would therefore not generate adverse impacts associated with the construction and long-term operations would not occur.~~

~~Likewise, the creation of a master-planned state-initiated development, resulting in increased employment, tax revenue, recreation options and community facilities, would not be created. Privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities and public access would not be contributed.~~

Further, the creation of revenue-producing businesses on the DHHL property to fund homestead programs would not occur, resulting in fewer potential benefits for Hawaiians.

Hence, the agreements and leases between the State and JDI indicate that the no-action alternative is not in the public interest~~has been rejected at this time~~.

2.2.1 Impact Comparison

Grading and Excavation

The proposed project requires grading and excavation. Both actions may impact groundwater due to rainfall runoff during construction. Alternative 1 would require a significantly smaller excavation for the marina basin and would therefore carry a lesser risk of potential adverse effects on water quality. Alternative 2 would require the same basin excavation as the proposed project, and would also include extensive grading and filling to build the golf course, the latter of which would generate additional impacts. Alternative 3 would result in no change to the geography, topography and geology.

Further discussion on grading and excavation is contained in Section 3.3.

Natural Drainage

Most precipitation infiltrates into the porous ground at the site, and no significant sheet flow is likely. Alternative 1 would generate similar levels of impacts on natural drainage as those of the proposed project and thus require similar mitigation measures. The golf course in Alternative 2 would not be as porous since the site would be graded, soil would be placed, and grass and other landscaping would be grown. Sheet flow and runoff can occur on a golf course, and drainage patterns might change. Alternative 3 would result in no change to the existing natural drainage pattern. Further discussion on natural drainage is contained in Section 3.4.

Air Quality

Air quality will be affected by construction activities, as well as pollutants from vehicular, industrial, natural, and agricultural sources. Alternative 1 would generate less construction air quality impacts than the proposed project due to the reduced amount of intensive groundwork associated with the smaller marina basin and fewer long-term impacts by reducing traffic 35 and 40 percent during, respectively, AM and PM peak traffic times. Construction of Alternative 2 would result in fugitive dust and exhaust from equipment and is expected to generate the same level of air quality impact as the proposed project. Alternative 3 would result in no change to existing air quality. Further discussion on air quality is contained in Section 3.5.

Terrestrial Environment

To provide additional habitat for shorebirds and some visiting seabirds, the project proposes to construct a brackishwater pond area suitable for avian fauna, including stilts, coots and ducks. While habitat expansion is beneficial, there is also a possibility that these species may be exposed to activity that may harm them. Alternative 1 would not include a brackish water pond, but will include 5 acres of seawater features, which is 74 percent less than the 19 acres of seawater features in the proposed project. While this would reduce beneficial impacts, it would also decrease exposure to potentially harmful activity. Alternative 2 does not include the brackish water pond features, but would include drainage retention basins that would attract avian fauna and expose them to chemicals used to maintain golf course landscaping. While Alternative 3 would result in no increase in potentially harmful activity, it would also not provide additional habitat for avian fauna. Further discussion on the terrestrial environment is contained in Section 3.7.

Groundwater

Groundwater at the project site occurs as a thin basal brackish water lens. It is influenced by tides and varies in flow direction and salt content. The existing Honokōhau Harbor acts as a drainage point for local groundwater. Any impact to groundwater flow from the proposed harbor is likely to be localized. The proposed marina basin will not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance.

There will be differences in the flow to the marina entrance between the proposed project and Alternative 1. Alternative 1, being smaller in size, will have less impact on groundwater flow than the proposed marina. Alternative 2 will have a similar impact to groundwater quality as the proposed project. Alternative 2 may also impact water quality by contributing nutrients and biocides to the groundwater from the golf course. Alternative 3 would result in no change in existing groundwater conditions. Further discussion on groundwater is contained in Section 3.8.1.

Surface Water

There are no significant natural freshwater streams or ponds at the site, but there are brackish anchialine pools. Surface water at the project site will be influenced by rainfall. Runoff typically percolates rapidly through the permeable ground. The proposed project will include some impermeable surfaces, which together with building roofs, will change runoff and seepage patterns.

Alternative 1 is a lower density project that is expected to have proportionally less impact on surface water and runoff patterns and less potential impact on water quality than the proposed project. Alternative 2 would have more impact on surface water quality than the proposed project due to fertilizers and biocides carried by runoff from the golf course. Alternative 3 would result in no change to surface water conditions. Further discussion on surface water is contained in Section 3.8.2.

Nearshore Environment and Coastal Waters

The potential adverse impacts to the marine environment from the proposed project are due to the construction of an 800-slip marina and the resulting inflow of higher salinity seawater and inadequate water circulation, both of which are anticipated to impair water quality to the extent of falling below applicable standards. One possible mitigation measure is to significantly reduce the size of the marina expansion.

The reduced marina size (from 45 to 25 acres) and reduced lagoon acreage in Alternative 1 are expected to result in a proportionate reduction in seawater discharging into the new harbor and increased water circulation. Alternative 2 includes the same marina basin size and is therefore subject to the same factors that are expected to adversely affect water quality.

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water quality in the proposed harbor depends on several components. These include salinity, nutrients, and sediments that come from the ocean, rainfall runoff, water features with marine animals, and dust. The smaller project offered as Alternative 1 is expected to produce a reduced amount of pollutants and reduce the risk of adverse impact upon water quality.

It is notable that the 45-acre marina basin planned in the proposed project and Alternative 2 only becomes viable from a water quality impact standpoint if the additional brackish groundwater inflow into the new marina exceeds 60 mgd. The resulting flushing from such inflow would be expected to better maintain water quality. However, it is unclear whether 60 mgd of brackish groundwater would be available. As proposed in Alternative 1, reduction of the volume of the new marina basin by 45 percent will significantly improve the flushing and water quality because the lower volume can be flushed by the available groundwater flow.

In addition, there could be higher rainfall runoff from the Alternative 2 golf course into the harbor, because the grassed golf course will be less porous than the natural surface. The golf course will also require relatively high levels of fertilizer, biocides, and irrigation, all of which could contribute to adverse water quality impacts.

Further discussion on nearshore environment and coastal waters is contained in Section 3.9.1.

Anchialine Pools

Anchialine pools are located north of Honokōhau Harbor, and south of the harbor on the project site. The marine life in these pools is sensitive to groundwater quality, and changes due to construction and operation of the project could degrade the viability of the pool ecosystem. In the southern complex, 3 anchialine pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction in the proposed project and Alternatives 1 and 2.

Predicting the extent of change in groundwater flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is therefore extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Due to the uncertainty of changes in groundwater flow and quality due to marina construction, the variability in impacts between the proposed project and Alternatives 1 and 2 is unknown at this time. Alternative 3 would result in no change in groundwater flow. While this would eliminate the potential for adverse impacts, Alternative 3 would also continue the pattern of existing degradation related to human activity and the introduction of alien species. Further discussion on anchialine pools is contained in Section 3.9.2.

Marine Fishing Impacts

The proposed marina will increase the number of boats in the area and it is reasonable to assume that a portion of these new boats will engage in fishing activities. The increase in boats in the area would be primarily related to the marlin and tuna / pelagic fishery, coral reefs due to extractive fisheries, and SCUBA activities. The pressure on fish and invertebrate stocks is expected to increase with or without the marina. Harbor expansion provides the opportunity to address existing conditions to consolidate, focus, and fund management and enforcement activities at one location.

Compared to the proposed project, Alternative 1 would result in a 21 percent decrease in boat traffic, thereby lessening the potential for marine fishing impacts. The level of impacts in Alternative 2 would be similar to that of the proposed project. Alternative 3 would result in no change in existing marine fishing conditions, and no opportunity to address already existing pressure on fish and invertebrate stocks. Further discussion on marine fishing impacts is contained in Section 3.9.3.

Cultural and Archaeological Resources

The proposed project will integrate cultural and archaeological resources in the overall development. Archaeological sites recommended for preservation will be preserved, and cultural practices will be encouraged. Kona Kai Ola includes a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. Proposed is a 400-foot shoreline setback that would serve as a buffer between the ocean and developed areas. This coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use.

Alternative 1 would contain all of the cultural archaeological features and the shoreline setback area would be 400 feet in the northern portion of the site and increase to 600 feet in the southern portion. Alternative 2 would preserve cultural and archaeological resources, but does not include a 400-foot shoreline setback. Alternative 3 would result in no change to existing cultural and archaeological resources and no addition of cultural and community facilities and activities. Further discussion on cultural and archaeological resources is contained in, respectively, Sections 4.1 and 4.2.

Noise

Project-generated noise is due to construction equipment and blasting, boats, marina activities, vehicle traffic, and the Kealakehe Wastewater Treatment Plant operations. Alternative 1 would generate less noise impacts due to reduced construction activities, fewer boats, less traffic and less on-site activity. Alternative 2 would also generate less noise due to reduced traffic and less on-site activity, but noise related to the excavation of the marina basin and an increase in the number of boats would be similar to that of the proposed project. Further discussion on noise impacts is presented in Section 4.4.

Socioeconomic Impacts

The proposed project will generate an increase in de facto population of an estimated 5,321 persons due to the increase in hotel and time-share units. The estimated de facto population increase in Alternative 1 is 37 percent less, at 3,363 persons, than the proposed project. The de facto population increase in Alternative 2 is similar to Alternative 1.

Employment in the commercial components will nearly double in Alternative 1, from a stabilized level of 1,429 full-time equivalent (FTE) positions in the proposed project to 2,740 in the Alternative 1.

Under Alternative 1, the total operating economic activity at Kona Kai Ola will increase due to the added commercial space more than off-setting the fewer visitor units, moving upward from $557.6 million per year to circa $814.3 million annually. The total base economic impact resulting from development and operation of Alternative 1 will similarly be higher by between 35 and 45 percent than that of the proposed project.

Alternative 1, which has a reduced marina size of 25 acres, and fewer hotel and time-share units, would have a meaningful market standing, create significant economic opportunities, and provide a net benefit to State and County revenues. From a market perspective, a smaller Kona Kai Ola would still be the only mixed use community in the Keahole to Kailua-Kona Corridor offering competitive hotel and time-share product.

The estimated absorption periods for marketable components of Alternative 1 are generally shorter than those for the same components in the proposed project. Marina slips under Alternative 1 are estimated to be absorbed within 2 years after groundbreaking, as compared with 9 years for absorption of slips in the proposed project. Hotel rooms under Alternative 1 are estimated to be absorbed within 4 years after groundbreaking, as compared with 7 years under the proposed project. Time-share units would be absorbed within 10 years under Alternative 1, while 15 years are projected under the proposed project. Due to the planned increase in commercial facilities under Alternative 1, the absorption period of commercial space is estimated at 14 years, as compared with 8 years for absorption of such facilities under the proposed project.

The State and County will still both receive a net benefit (tax receipts relative to public expenditures) annually on a stabilized basis under the Alternative 1. The County net benefits will be some $12.2 million per year under the Alternative 1 versus $14.9 million under the proposed project. The State net benefits will increase under the Alternative 1 to about $37.5 million annually, up substantially from the $11.4 million in the proposed project.

Due to the lower de facto population at build-out, the effective stabilized public costs for both the State and County will decline meaningfully under the Alternative 1, dropping from $7.7 million annually for the County and $36.5 million for the State, to $4.9 million and $23 million per year, respectively.

Alternative 3 would result in no increase in de facto population and improvement to economic conditions. Further discussion on social and economic impacts are contained in, respectively, Sections 4.5 and 4.6.

Vehicular Traffic

The proposed project will impact the nearby road network that currently is congested during peak traffic times. The proposed project includes roadway improvements that would reduce the impact and improve roadway conditions for the regional community.

Alternative 1 includes the same roadway system improvements as the proposed project, yet would reduce vehicular traffic by 35 percent when compared to the proposed project. Alternative 2 would have similar traffic conditions and roadway improvements as Alternative 1. Alternative 3 would result in no increase in traffic and no roadway improvements.

Marina Traffic Study

The increase in boat traffic due to the proposed 800-slip marina would cause entrance channel congestion during varying combinations of existing and new marina peak traffic flow. Worst case conditions of active sport fishing weekend and summer holiday recreational traffic result in traffic volumes exceeding capacity over a short afternoon period. Mitigation to address boat traffic in the proposed project include widening the entrance channel, traffic control, implementation of a permanent traffic control tower, or limiting vessel size.

Alternative 1 would result in a 21 percent reduction in boat traffic congestion under average existing conditions and ten percent reduction during peak existing conditions. The reduction to 400 slips also reduces the impacts of congestion at the entrance channel, thereby reducing the need for any modifications to the entrance channel.

Alternative 2 would have the same level of boat traffic as the proposed project. Alternative 3 would not meet the demand for additional boat slips and would not generate additional boat traffic. Further discussion on marina traffic is contained in Section 4.8.

Police, Fire and Medical Services

The proposed project will impact police, fire and medical services due to an increase in de facto population and increased on-site activity. Alternatives 1 and 2 would have similar levels of impact as the proposed project due to increased on-site activity. Further discussion on police, fire and medical services are contained, respectively, in Sections 4.10.1, 4.10.2 and 4.10.3.

Drainage and Storm Water Facilities

The proposed project will increase drainage flows, quantities, velocities, erosion, and sediment runoff.

Alternative 1 involves a reduction of the project density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces associated with hotel and time-share development and to the creation of more open space. However, roadway areas will increase by about 30 percent in Alternative 1. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings. The golf course in Alternative 2 may also change drainage characteristics from those of the proposed project and may not reduce impacts. Alternative 3 would result in no change in existing conditions and no improvements to drainage infrastructure. Further discussion on drainage and storm water facilities is contained in Section 4.10.5

Wastewater Facilities

The proposed development is located within the service area of the Kealakehe WWTP and a sewer system will be installed that connects to the WWTP. The sewer system will be comprised of a network of gravity sewers, force mains, and pumping stations which collect and convey wastewater to the existing Kealakehe WWTP. Project improvements will incorporate the usage of recycled / R1 water. Improvements implemented by the proposed project will also accommodate the needs of the regional service population.

Alternative 1 would generate approximately 10 percent less wastewater flow than the proposed project. Wastewater flow in Alternative 2 is undetermined. Alternative 3 would result in no additional flow, as well as no improvements that will benefit the regional community. Further discussion on wastewater facilities is contained in Section 4.10.6.

Potable Water Facilities

The proposed project average daily water demand is estimated at 1.76 million gallons per day. Existing County sources are not adequate to meet this demand and source development is required. The developer is working with DLNR and two wells have been identified that will produce a sustainable yield that will serve the project. These wells will also serve water needs beyond the project.

Alternative 1 would result in net decrease of about five percent of potable water demand. Alternative 2 may have a lower water demand than the proposed project as long as potable water is not used for irrigation. Alternative 3 would result in no additional flow, as well as no source development that will benefit the regional community. Further discussion on potable water facilities is contained in Section 4.10.8.

Energy and Communications

Regarding Alternative 1, preliminary estimates for electrical, telecommunications, and cable resulted in a net demand load that remains similar to the proposed project. Further discussion on energy and communications is contained in Section 4.10.9.1.

The proposed project will increase the demand for electrical energy and telecommunications. The demand would be reduced in Alternative 1 because the number of boat slips and units would decrease. Similarly, Alternative 2 would have fewer units than the proposed project and therefore reduce energy demands. Further reduction in energy demand for either alternative could be achieved by using seawater air conditioning (SWAC) and other energy reduction measures, as planned by the developer. Further discussion on energy and telecommunications is contained in Section 4.10.9.2.

Water Features and Lagoons

The proposed project includes a brackishwater pond, lagoons, and marine life exhibits supplied by clean seawater. The water features in Alternative 1 would significantly decrease by 74 percent from 19 acres in the proposed project to five acres in Alternative 1. This decrease in water features would result in a corresponding decrease in water source requirements and seawater discharge. Alternative 2 does not include the seawater features. Alternative 3 would result in no additional demand for water source requirements and seawater discharge.

2.2.2 Conformance with Public Plans and Policies

State of Hawai‘i

Chapter 343, Hawai‘i Revised Statutes

Compliance with this chapter is effected, as described in Section 5.1.1 in regard to the proposed project and the alternatives discussed.

- State Land Use Law, Chapter 205, Hawai‘i Revised Statutes

  The discussion in Section 5.1.2 is directly applicable to Alternative 1, the proposed project. Alternative 1 will involve a setback of 400 feet that increases to 600 feet along the southern portion of the project site’s shoreline area. Alternative 2 does not provide for such a setback, but may still require approvals from DLNR for cultural, recreational, and community uses and structures within the Conservation district.

- Coastal Zone Management Program, Chapter 205A, Hawai‘i Revised Statutes

  Recreational Resources:

  In addition to the discussion of consistency with the associated objective and policies, as described in Section 5.1.3, the reduction from the proposed project’s 800-slip marina to a 400-slip marina under Alternative 1 will still expand the region’s boating opportunities and support facilities. The existing harbor entrance will still be utilized under this alternative; however, potential risks relating to boat traffic and congestion in the marina entrance area will be reduced significantly. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities, and marine science center remain important recreational components under Alternative 1.

Alternative 2 includes a golf course component, which would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Alternative 2, like the proposed project, will expand the region's boating opportunities and support facilities through its 800-slip marina. However, the potential adverse impacts of increased boat traffic from the size of the marina are significant enough to offset the benefits of increased boating opportunities.

Coastal Ecosystems:

The discussion in Section 5.1.3 is directly applicable to Alternative 1.

Alternative 1 not only reduces the number of slips proposed by 50 percent, but it also reduces the size of the marina from 45 acres to 25 acres. The 25-acre marina will increase the body of water within the existing harbor, but to a significantly lesser extent than the proposed project's estimated increase, which is also applicable to the 45-acre size that is proposed for the marina under Alternative 2.

The findings of the Harbor Water Quality Modeling Study conclude that a reduction in the size of the harbor expansion is an alternative that will mitigate the risk of significant impacts upon water quality within the marina and existing harbor. Accordingly, the reduction in both the number of slips and the size of the marina basin under Alternative 1, in combination with proper facilities design, public education, and enforcement of harbor rules and regulations, would result in fewer long-term impacts to water quality and coastal ecosystems. Short-term (construction-related) impacts would likely remain the same although the reduction in the total acreage of excavation is expected to result in a shorter duration of such impacts.

In addition to its 800-slip marina and potential adverse impacts upon water quality and the marine environment, Alternative 2 includes a golf course component, which has the potential to impact coastal ecosystems by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Economic Uses

Although reduced in the number of slips, the smaller marina under Alternative 1 will nevertheless serve public demand for more boating facilities in West Hawai‘i and is consistent with the objective and policies and discussion set forth in Section 5.1.3. The economic impacts of Alternative 2, while comparable to those of the proposed project's marina development, are notably marginal as to the golf course component, based on the marketability analysis that indicates a condition of saturation within the region.

Coastal Hazards

The discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Tsunami risks mainly affect the large shoreline setback area that is proposed for the project and Alternative 1. Alternative 2 projects a transient accommodation site that is partially within the tsunami hazard zone and thus carries a higher hazard risk. However, the essential requirement for these alternatives, as well as the proposed project, is a well-prepared and properly implemented evacuation plan.

Beach Protection

Discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Alternative 1 and, to a lesser extent, Alternative 2, will retain the shoreline area in its natural condition.

Similar to the proposed project, Alternative 1 provides for a shoreline setback of considerable width within which no structure, except for possible culturally-related structures, would be allowed. Alternatives 1 and 2 will thus be designed to avoid erosion of structures and minimize interference with natural shoreline processes.

Marine Resources

The discussion in Section 5.1.3 is also applicable to Alternative 1 which is described to be an alternative that is specifically projected to mitigate anticipated adverse impacts on water quality and the marine environment that might otherwise result from the original harbor design and scale, which is also incorporated in Alternative 2 . The reduced marina size under Alternative 1 is projected to meet water quality standards and enable greater compliance with the objective and policies addressed in this section.

Alternative 2 includes a golf course component and thus the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Hawai'i State Plans, Chapter 226, Hawai'i Revised Statutes

Section 226-4 (State goals), 5 (Objectives and policies for population, and 6 (Objective and policies for economy in general):

The discussion in Section 5.1.4 is applicable to Alternatives 1 and 2, in addition to the proposed project. These development concepts generally conform to the goals, objectives, and policies set forth in these sections because they will provide some degree of economic viability, stability, and sustainability for future generations. Kona Kai Ola will convert essentially vacant land into a mixed-use development with a distinctive marina and boating element, providing a wide range of recreational, business, and employment opportunities to the community.

Section 226-8 Objective and policies for the economy – the visitor industry:

Alternatives 1 and 2 will be consistent with the State's economic objective and policies relating to the tourism industry for the same reasons that are discussed in regard to the proposed project in Section 5.1.4. They will incorporate JDI's commitment to sustainability principles in the planning and design of the development concepts in Alternatives 1 and 2. Although the total hotel and time-share unit count is reduced to approximately 1,500 in Alternatives 1 and 2, the transient accommodations component of these alternatives will still further the State's objective and policies for increased visitor industry employment opportunities and training, foster better visitor understanding of Hawai'i's cultural values, and contribute to the synergism of this mixed-use project concept that addresses the needs of the neighboring community, as well as the visitor industry.

Section 226-11 Objectives and policies for the physical environment: land-based, shoreline and marine resources:

Alternative 1 is expected to involve less potential adverse impacts upon these environmental resources than the proposed project. Likewise, and Alternative 2 would have less adverse impact because of its reduction in the size of the marina and in the total hotel and time-share unit count. Alternative 1 carries less potential risk to water quality and related impacts upon the marine environment and anchialine pool ecosystems. Although approximately three anchialine pools are expected to be destroyed, the great majority of pools will be preserved within and outside of the proposed 400-foot shoreline setback.

The golf course component in Alternative 2 has the potential to impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the marina basin and nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools by introducing the chemicals into the pond systems.

Section 226-12 Objective and policies for the physical environment: scenic, natural beauty, and historic resources:

The discussion in Section 5.1.4 is directly applicable to Alternative 1 and describes the compliance with the objective and policies addressed.

The golf course component of Alternative 2 would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area.

Just as with the proposed project, Alternatives 1 and 2 would also be designed to blend with the natural terrain and to honor and protect the cultural history, resources, and practices of these lands.

Section 226-13 Objectives and policies for the physical environment: land, air and water quality:

As stated above, because of the reduction in both the number of slips and the size of the marina basin, with proper facilities design, public education and enforcement of harbor rules and regulations, Alternative 1 is anticipated to cause fewer long-term impacts to water quality than either the proposed project or Alternative 2. Based on the findings of the Harbor Water Quality Modeling Study, water quality resulting from a reduced marina basin size as proposed under Alternative 1 is expected to be similar to existing conditions.

As previously noted, Alternative 2 has the potential to adversely impact water quality by increasing the nutrient loading in surface runoff and groundwater by introducing pesticides, herbicides and other chemicals common in golf course development and maintenance into the marina basin and nearshore waters surrounding the project site.

Section 226-14 Objectives and policies for facility systems - general:

Alternatives 1 and 2 will conform to the objective and policies of this section on the grounds that are discussed in regard to the proposed project in Section 5.1.4. The master-planning and phasing of the project concepts under these alternatives will be coordinated with associated public and private infrastructural planning and related private and public infrastructural financing. The cost of the marina construction and project-related infrastructure is to be borne by the developer, resulting in considerable savings for the public. In addition, the projected lease revenue from these public lands will provide additional public benefits by establishing a revenue stream for capital improvements and maintenance of a range of State facilities.

Section 226-15 Objectives and policies for facility systems - solid and liquid wastes:

In addition to the developer's commitment to sustainable development design, the project will involve upgrades to the County of Hawai'i's Kealakehe Wastewater Treatment Plant to meet current needs, as well as the project's future needs. This commitment is applicable to Alternatives 1 and 2, as well as the proposed project that is discussed in Section 5.1.4.

Section 226-16 Objectives and policies for facility systems – water:

The discussion of water conservation methods and the need to secure additional potable water sources in Section 5.1.4 is also applicable to Alternative 1 and demonstrates conformity to the objective and policies for water facilities. Alternative 2 involves greater irrigation demands in regard to its golf course component and greater potable water demands for human consumption than those for Alternative 1. Alternative 2 is expected to face more serious challenges in securing adequate and reliable sources of water.

Section 229-17 Objectives and policies for facility systems – transportation:

Alternatives 1 and 2 will conform to this objective and policies because they will present water transportation opportunities, including the possible use of transit water shuttles to Kailua-Kona, as described in regard to the proposed project in Section 5.1.4.

Section 226-18 Objectives and policies for facility systems – energy:

Alternatives 1 and 2 conform to these objective and policies through the use of energy efficient design and technology and commitment to the use and production of renewable energy to serve the project's needs. Solar energy production, solar hot water heating, and the use of deep cold seawater for cooling systems are currently identified as means of saving substantial electrical energy costs for the community and the developer.

Section 226-23 Objectives and policies for socio-cultural advancement – leisure:

Alternative 1 conforms to this objective and related policies for the reasons offered in Section 5.1.4 in regard to the proposed project. Alternative 1 will be of greater conformity with the policy regarding access to significant natural and cultural resources in light of the 400-600 foot shoreline setback that has been designed for this alternative.

Although it does not propose the considerable shoreline setback that is planned for Alternative 1, Alternative 2 is consistent with this objective and related policies in incorporating opportunities for shoreline-oriented activities, such as the walking trails. In addition, the golf course component adds a more passive recreation alternative to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Section 226-25 Objectives and policies for socio-cultural advancement-culture:

The discussion in Section 5.1.4 is relevant to Alternatives 1 and 2 and demonstrate their conformity the objective and policies of this section.

Both alternatives involve the preservation and protection of cultural features that have been identified by the Cultural Impact Assessment and archaeological studies for the project area. Both provide for public shoreline access, and both will continue the policy of close consultation with the local Hawaiian community and cultural and lineal descendants in the planning of cultural resource preservation and protection.

Section 226-103 Economic priority guidelines:

Alternatives 1 and 2 conform to these guidelines for the same reasons that are set forth in Section 5.1.4. They involve private investment in a public project that will create economic diversification through a mix of marina, industrial, commercial, visitor, and cultural facilities. This presents a wide range of entrepreneurial opportunities, long-term employment opportunities, and job training opportunities.

Section 226-104 Population growth and land resources priority guidelines:

As described in Section 5.1.4, the policy support for the proposed project also extends to the similar development concepts considered in Alternatives 1 and 2. Those alternatives conform to the guidelines of this section because they involve an urban development under parameters and within geographical bounds that are supported by the County's General Plan, a preliminary form of the Kona Community Development Plan, the County's Keahole to Kailua Regional Development Plan, and the reality of being located along the primary commercial/industrial corridor between Keahole Airport and Kailua-Kona. As with the proposed project, the development concepts of Alternatives 1 and 2 are essentially alternatives for the implementation and "in-filling" of the urban expansion area in North Kona.

DHHL Hawai'i Island Plan

This 2002 plan projects DHHL's Honokōhau makai lands for commercial use. As compared to the proposed project and Alternative 2, Alternative 1 presents an expanded commercial component that provides greater compliance with the plan, while addressing certain beneficiaries' concerns about the scale of the marina originally required in the Project. Alternative 2 also conforms to the recommended commercial uses in the makai lands but to a lesser degree than Alternative 1 because of its more limited commercial component. Like the proposed project, its marina size and number of slips raise environmental issues, as more specifically discussed in Part 3, and community concerns.

County of Hawai'i General Plan

HCGP Section 4 – Environmental Quality Goals, Policies and Courses of Action:

Alternative 1 is consistent with this section. It presents a reduction in both the number of slips and the size of the marina basin that, in combination with proper facilities design, public education and enforcement of harbor rules and regulations, would result in very few long term impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions.

Alternative 2 is the least consistent with this section. In addition to the potential significant impacts of its 800 slip marina basin, its golf course component has the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides and other chemicals common in golf course use and management into the nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools beyond their current conditions by introducing such substances into the pool systems.

HCGP Section 7 – Natural Beauty Goals and Policies:

Alternative 2 conforms to some degree with this section. Its golf course component would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area, as demonstrated in other makai golf courses within the region.

HCGP Section 8 – Natural Resources and Shoreline:

Alternative 1 is most consistent with the goals and policies of this section. It would require considerably less marina excavation than the proposed project and Alternative 2 and would reduce the potential risk of long-term adverse impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions with the degree of reduction in marina basin size that is proposed under Alternative 1. This reduction is also expected to reduce potential impacts upon anchialine pools and their ecosytems, as well as shoreline and marine resources that are affected by water quality. Alternative 1 also retains the shoreline preservation and protection concepts that are proposed in and described for the Project.

HCGP Section 10 – Public Facilities Goals and Policies:

The discussion in Section 5.2.1. in relation to the proposed project is applicable to Alternatives 1 and 2. Improvements to public facilities are are integral to the Kona Kai Ola development. The provision of additional boat slips and numerous road improvements, including a makai extension of Kuakini Highway south to Kailua-Kona are incorporated into plans for the project's development. In light of these elements, Alternatives 1 and 2 are consistent with the goals and policies of this section.

HCGP Section 11 – Public Utility Goals, Policies:

As with the proposed project, Alternatives 1 and 2 are consistent with the goals and policies of this section, based on the relevant grounds set forth in Section 5.2.1. The developer is committed to design, fund, and develop environmentally sensitive and energy efficient utility systems to the extent possible, as described previously in Part 5. Its master planning provides for the coordinated development of such systems with the objective of achieving significant savings for the public. As previously-mentioned example, the project development involves the upgrading of the Kealakehe Wastewater Treatment Plant.

HCGP Section 12 – Recreation:

Alternative 1 is consistent with the goals, policies, and courses of action for North Kona in this section.

Although the number of slips is reduced under Alternative 1, the region's boating opportunities and support facilities will still be expanded. The existing marina entrance would still be utilized under this alternative. However, concerns relating to increased activity leading to increased congestion in the marina entrance area would be mitigated to a certain extent. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities and marine science center remain important components of Alternative 1.

The golf course component of Alternative 2 would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola. Alternative 2 is also considered to be consistent with this section.

HCGP Section 13 and 13.2 – Transportation:

The reduced marina component under Alternative 1 will still provide transportation opportunities and provide for possible use of transit water shuttles to Kailua-Kona, although to a lesser degree than under the proposed project and Alternative 2 . However, in each scenario, internal people-movers are planned, and numerous roadway improvements are planned for coordination with public agencies, including but not limited to the construction of the Kuakini Highway extension between Honokōhau and Kailua-Kona. Accordingly, both Alternatives 1 and 2 are consistent with the goals, policies, and courses of action for North Kona under these sections of the General Plan.

HCGP Section 14.3 – Commercial Development:

For the reasons presented in the discussion under Section 226-104 of the State Plan, the planned commercial component under Alternatives 1 and 2 are consistent with this section.

HCGP Section 14.8 – Open Space:

Alternatives 1 and 2 are consistent with the goals and policies of this section. Alternative 1 provides a considerable (400-600 foot) shoreline setback along the entire ocean frontage of the project site as a means of protecting the area's scenic and open space resources, as well as natural and cultural resources. Although it does not incorporate the shoreline setback planned in Alternative 1, Alternative 2 provides a golf course component would contribute to the amount of open space that is currently proposed and allow additional view corridors to be created.

Community Development Plans

Community development plans are being formulated for different regions in the County in order to supplement the County's General Plan. The Kona Kai Ola project is located in the Kona Community Development Plan (CDP) area. Maps associated with the preliminary work phases

of the Kona CDP include the Kona Kai Ola project site within the "Preferred Urban Growth" boundary of the North Kona district. The Kona CDP process is guided by a Steering Committee composed of a broad cross-section of the community. The Steering Committee will eventually complete its work and recommend the CDP's adoption.

After the DEIS was published, the Kona CDP has progressed to the development of plans for the major urban growth corridor north of Kailua-Kona. The Kona CDP has produced a draft plan showing a transit oriented development that includes a midlevel public transit corridor along the mauka residential elevation, and a makai transit corridor that runs along a proposed new frontage road just makai and parallel to Queen Kaahumanu Highway. The development plan for Alternative 1 includes the Kuakini Highway as part of this proposed frontage road and transit line from Kailua Kona to the Kealakehe area, along with a transit stop at Kona Kai Ola. The Alternative 1 plan also includes a road that could be extended to be part of the proposed frontage road should it be approved and implemented. In addition, the Kona CDP has continued to emphasize the principles of smart growth planning with mixed use urban areas where people can live, work, play and learn in the same region. Kona Kai Ola has been specifically designed to be consistent with this policy in order to provide a stable employment base close to where people live in the mauka residential areas already planned for DHHL and HHFDC lands.

It should be noted that currently and over the years, the 1990 Keāhole to Kailua Development Plan (K-to-K Plan) guides land use actions by the public and private sectors. It is intended to carry out the General Plan goals and policies related to the development of the portion of North Kona area, including the Kona Kai Ola site. The "Preferred Growth Plan" of the Keāhole to Kailua Development Plan identifies the project site as a new regional urban center to include commercial, civic, and financial business related uses, an expanded "Harbor Complex," a shoreline road, and a shoreline park. The proposed project and the development concepts in Alternatives 1 and 2 are therefore consistent with the recommendations in the Keāhole to Kailua Development Plan.

Hawai‘i County Zoning

As shown on Figure AA, the project site is zoned "Open". Under Section 25-5-160 of the Hawai‘i County Code, "The O (Open) district applies to areas that contribute to the general welfare, the full enjoyment, or the economic well-being of open land type use which has been established, or is proposed. The object of this district is to encourage development around it such as a golf course and park, and to protect investments which have been or shall be made in reliance upon the retention of such open type use, to buffer an otherwise incompatible land use or district, to preserve a valuable scenic vista or an area of special historical significance, or to protect and preserve submerged land, fishing ponds, and lakes (natural or artificial tide lands)".

Some of the proposed uses at Kona Kai Ola are permitted uses in the Open zone such as:

- Heiau, historical areas, structures, and monuments;
- Natural features, phenomena, and vistas as tourist attractions;
- Private recreational uses involving no aboveground structure except dressing rooms and comfort stations;

- Public parks;
- Public uses and structures, as permitted under Section 25-4-11.

In addition to those uses permitted outright, the following uses are permitted after issuance of a use permit:

- Yacht harbors and boating facilities; provided that the use, in its entirety, is compatible with the stated purpose of the O district.
- Uses considered directly accessory to the uses permitted in this section shall also be permitted in the O district.

The proposed time-share and hotel units and commercial uses would not be consistent with the zoning designation of "Open". Project implementation therefore requires rezoning of portions of the project to the appropriate zoning category or use permits for certain uses.

Special Management Area

As shown in Figure AB, the entire project area up to the highway is within the coastal zone management zone known as the Special Management Area ("SMA"). At the County level, implementation of the CZM Program is through the review and administering of the SMA permit regulations. Kona Kai Ola complies with and implements the objectives and policies of the Coastal Zone Management (CZM) Program, and a full discussion is provided in Section 5.1.3. The development concepts in the proposed project and Alternatives 1 and 2 will be subject to applicable SMA rules and regulations.

February 6, 2007

Dayan Vithanage
Oceanit
828 Fort Street Mall, 6th Floor
Honolulu HI 96813

Subject: **Kona Kai Ola Draft Environmental Impact Statement**

I would like to provide a couple of public comments on Kona Kai Ola Draft Environmental Impact Statement.

First, the Kona community has needed and wanted the harbor to be expanded and its facilities upgraded for a very long time. As a former manager of charter boat operations for Kona Village Resort and presently the president of the Hawaiian International Billfish Tournament, I know of the acute shortage of mooring slips at the present Honokohau Harbor. The waiting list for a slip is long, sometimes taking years to obtain. Many boats are presently moored in open waters, such as Kailua Bay and are at great risk to their owners and crews. The additional moorings this marina will create will allow boats to be accommodated within a safe area. The West Hawaii boating community needs this harbor expansion at Honokohau.

The Draft Environmental Impact Statement address the community's need for more wet slips within an expanded marina and has a sound mitigation plan should any unforeseen problems occur during marina excavation.

Secondly, the Kona Kai Ola Draft Environmental Impact Statement describes the Kona Kai Ola harbor-front commercial village as being clearly based on long term County plans for the area, including the *Keahole to Kailua Development Plan*, which selected the project site as the community's preferred location for "a new, distinct regional center" as well as a "Harbor Complex" expanding on Honokohau Harbor, a connector road to Kailua Village and a shoreline park. The current plan for Kona Kai Ola is consistent with this vision.

Lastly, from what I've learned, Jacoby is a national leader in building communities that better the quality of people's lives and sustain the surrounding environment. They want to bring their experience and knowledge to Kona and apply it to meet local community needs.

Our community, of which I have been an active part of for over 40 years, deserves its chance for a well planned marina development that could very well turn out to be an environmental model for others to aspire to for generations to come.

Mahalo,

Fred Duerr

Fred Duerr
Retired General Manager of Kona Village Resort
President of the Hawaiian International Billfish Tournament

innovation through engineering & scientific excellence

July 23, 2007

Fred Duerr, President
Hawaiian International Billfish Tournament
P.O. Box 29638
Honolulu, Hawai'i 96820

Dear Mr. Duerr:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Dated February 6, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement.

First, we concur with your assessment of need related to harbor expansion and upgrading. There is an existing demand for additional boat slips and marina facilities. This concern is often expressed in our community outreach program. By meeting this demand through the Kona Kai Ola project, the State is acting in the public interest.

Second, we agree that the Kona Kai Ola project is consistent with the vision contained in Hawai'i County plans. As discussed in EIS Section 5, Kona Kai Ola complies with Hawai'i County laws and policies and contributes to the community vision for the region's future as expressed in public plans.

Further, we appreciate your comments regarding JDI's experience as a leader in community building. Kona Kai Ola reflects JDI's commitment to development that sustains and enhances the physical, cultural, social and economic environments.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Dayan Vithanage

From: Stephanie Place [stephp@hicommfcu.com]
Sent: Friday, July 13, 2007 2:29 PM
To: Dayan Vithanage
Cc: Wilson, Ross, Jr.; Craig V Kahui
Subject: KCA Resolution
Attachments: Resolution_re_Kona_Kai_Ola_by_the_Kaniohale_Community_Association_Board_of_Directors.doc

Dayan Vithanage
Oceanit
Oceanit Center
828 Fort Street Mall, 6th Floor
Honolulu, Hawai'i 96813

Re: Kona Kai Ola Project

Dear Mr. Vithanage:

As requested by Mr. Ross Wilson, this is to inform you of the action taken by the Board of Directors of the Kaniohale Community Association at its meeting on June 6, 2007, in regards to the Kona Kai Ola project. The following is a quote from the Board meeting minutes of June 6, 2007:

> "D. Tarnas reviewed the revised plans of Jacoby's Kona Kai Ola project. He said that because of the comments from the Association and other groups, they have reduced the density of the project. On a motion by S. Place and second by R. Ai, the Board approved the following resolution:
>
> > "Resolved:
> >
> > "That the Kaniohale Community Association (KCA) Board supports the proposed reduced density version of the Kona Kai Ola Project as described in the attached resolution.
> >
> > "That the KCA Board supports the Kona Kai Ola project for the reasons outlined in the attached resolution.
> >
> > "That the KCA Board will support the Kona Kai Ola Project in taking into consideration the unresolved issues.
> >
> > "That the KCA Board will have ongoing dialogue with the developers of the Kona Kai Ola Project."

A copy of the resolution referred to in the above minutes is attached.

Should you have any questions or concerns, please contact me at (808) 930-7603 or at stephp@hicommfcu.com.

Sincerely,

Stephanie Place, Secretary
Board of Directors
Kaniohale Community Association

Resolution of the Kaniohale Community Association Board of Directors

Based on presentations and discussions with representatives of Jacoby Development, Inc. (JDI) about the Kona Kai Ola project, proposed by JDI in partnership with Department of Hawaiian Home Lands (DHHL) and Department of Land and Natural Resources (DLNR), the Kaniohale Community Association Board of Directors (the Board) learned that Kona Kai Ola planners of Jacoby Development/DHHL/DLNR are being asked through the DEIS comment process by agencies, including DLNR itself, and the public, to look at different alternatives in the Final EIS.

One such alternative being evaluated for its financial feasibility and potential environmental impact is a smaller marina (from 800 slips to 400 slips) with a reduced number of hotel and timeshare units from 2500 units to 1500 units.

At the regularly scheduled meeting of the Board on April 4, 2007, the Board met and discussed this project plan. This discussion resulted in a consensus among the Board members to support a reduced scale version of the Kona Kai Ola project with a smaller marina and reduced number of hotel and timeshare units.

As this process to plan Kona Kai Ola proceeds, the Kaniohale Community Association Board of Directors expresses its support for Kona Kai Ola project in its reduced density version and ask project planners to prepare a plan for this alternative project and bring it back to the Board for review and further input.

The Board further asks DHHL, DLNR and Jacoby Development to consider and respond to the remaining unresolved issues.

As neighbors in the Kealakehe ahupua`a, the Kaniohale Community Association welcomes the involvement of this partnership of Jacoby Development, Inc., Department of Hawaiian Home Lands, and Department of Land and Natural Resources, in cooperative efforts to plan and implement steps to achieve a sustainable ahupua`a and a healthy community.

Numerous outcomes were identified by Board members resulting from reducing the scale of the project to 400 slips from the original 800-slip project. *("+" for positive outcome and "-" for negative outcome).* These outcomes include the following:

- Reduces density of project. (+)
- Creates more open space. (+)
- Reduces traffic problems. (+)
- Improves water quality in the marina. (+)
- Reduces demand on regional infrastructure. (+)
- Reduces congestion problems of vessels at harbor entrance channel. (+)
- Reduces the negative impacts of too many boats fishing. (+)
- Reduces revenues to DHHL and DLNR. (-)
- Reduces numbers of jobs. (-)

Board members identified various things they support in the Kona Kai Ola project including the following:

- Provides place for us, our children and grandchildren to work, play and learn close to where we live. This is for our *mo`opuna.* This is for our *ahupua`a*.
- The project generates revenue to DHHL to build more housing for Hawaiians.
- Improvements to land belong to DHHL after lease is pau. It's a long term DHHL asset.
- Commercial business opportunities and employment opportunities should be offered to Hawaiians first
- Kuakini Highway extension in first phase of project.
- The regional shuttle service to *ahupua`a* and region.
- Public access to shoreline, marina and parks with lots of parking, restrooms, showers and picnic places and gathering places.
- Walking trails and bike paths throughout the project, including in the shoreline park, around the marina and connecting all the different public parks, commercial areas and community areas. Places along trails and in parks to stop and sit and talk story.
- The shoreline park should have plenty of parking, restrooms, showers, trails, picnic areas and gathering areas. It needs to be maintained clean and safe, and in high surf may need to be closed.
- Alula Beach is within the cultural park area and improved trail access provided for *kūpuna* and others for traditional cultural practices.
- Cultural programs are very important, and the cultural park and cultural center planning and programs need to include lineal and cultural descendants of the area.

- Community facilities should complement, not duplicate the facilities and services at the proposed Community Center at the Villages at La`i`opua.
- Use latest technology and smart design to make the whole project and all the buildings efficiently use energy and water, and reduce production of solid waste and wastewater.
- Use renewable energy sources, like solar, co-generation, wind, sea water air conditioning, and others.
- Conserve potable water. All the hotel, commercial, timeshare buildings and the marina need to be very efficient in their use of potable water.
- Use the latest technology to upgrade the wastewater treatment plant to produce a better quality reuse water which can be used for irrigation.
- The buildings and activities need to minimize production of solid waste to the landfill. Composting and recycling is necessary.
- The transit system should use alternative fueled vehicles.
- Project designs must include sufficient facilities for safety and security, including police, Coast Guard, DOCARE, security, harbor master, etc... and also provide sufficient support staff for good security and safety throughout the whole project.
- Prepare for disasters including tsunami evacuation, earthquake, hurricanes, etc....
- Prevent any non-point source pollution from industrial and all other activities and uses, including during storm events and tsunamis.
- Support community programs for La`i`opua residents through the Kona Kai Ola Community Foundation.

The Board identified some remaining unresolved issues for consideration by Kona Kai Ola project planners and for further discussion with our Board, including:

- Increase the size of the shoreline park with an increased setback of 1000' and connect it to the south across Keahuolu and on to Old Kona Airport State Park.
- All intersections leading to Honokohau Harbor must be designed for easy access by trucks with trailer boats. Reconsider the proposed realignment of Kealakehe Parkway intersection because it could make it harder for trucks with trailers to enter and exit the existing harbor.

July 23, 2007

Ms. Stephanie Place, Secretary
Board of Directors
Kaniohale Community Association
Email: stephp@hicommfcu.com

Dear Ms. Place:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Dated July 13, 2007

Thank you for sending information relating the Kaniohale Community Association (KCA) Board of Directors' review and dialogue relating to the Kona Kai Ola development project. We acknowledge the KCA Board of Directors' resolution in supporting a reduce density version of project alternatives.

The agreement between JDI and the State of Hawai'i established a required scope and scale of the project for which the impact analysis was provided. Several comments have addressed the fact that alternatives other than the No Project Alternative were not addressed in the DEIS Section 2, Alternatives Analysis.

While we are of the position that alternative actions other than a No Project alternative are not currently feasible absent an amendment to the agreement with the State, the agency and public comments and additional information generated as a result of inquiry into issues raised by the comments have been helpful in identifying alternative actions that will serve the State's goal of providing additional marina slips for the Kona area and that will serve to reduce or mitigate anticipated effects of the proposed development.

Thus, agencies such as the Land Division of the Department of Land and Natural Resources, the U.S. Department of the Interior Fish and Wildlife Service, the Planning Department of the County of Hawai'i, and the Office of Environmental Quality Control (OEQC), as well as community organizations have commented that a reduced scale marina and related facilities should be considered. The OEQC has also asked that the alternative of a reduced scale project be evaluated under the assumption that DHHL may determine that a downsized project would be preferred.

In response to these comments on the DEIS and in consideration of measures to mitigate anticipated impacts, the EIS Section 2, Alternatives Analysis, has been revised to describe the following alternatives, which are discussed in more detail in the EIS:

- Alternative 1 is a project involving a 400-slip marina, 400 hotel units, 1,100 time-share units, and commercial and support facilities. This alternative would enhance water quality and avoid the need to widen the existing harbor entrance channel, as well as reduce traffic and socioeconomic impacts.

- Alternative 2 is an alternative that had been previously discussed, but not included in the proposed project that includes an 800-slip harbor and a golf course, and
- Alternative 3 is the no-action alternative.

A comparison between impacts related to the proposed project concept and impacts related to Alternative 1 indicates that a reduction in the acreage and number of slips in the marina, as well as the reduction in hotel and time-share units, would generate less environmental, social and economic impacts. Although positive economic impacts would be reduced, Alternative 1 can be considered as a preferable alternative because of reduced environmental impacts. However, while it can be concluded that the 25-acre marina in Alternative 1 would be the preferred size, the DLNR agreement establishes the size of the marina at 45 acres and 800 slips. An amendment to the DLNR agreement is required in order to allow Alternative 1 to proceed. Hence, selection of Alternative 1 is an unresolved issue at this time.

The additional EIS text that includes the added EIS Section 2, Alternative Analysis, is contained in Attachment 1 of this letter.

The developer will continue to work with agencies and the community on addressing unresolved issues.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

2 Alternatives Analysis

~~In typical land development projects, the initial planning process includes the exploration of alternatives to development objectives. In the EIS process, these alternatives are presented with a disclosure of reasons for the dismissal of non-preferred alternatives.~~

~~Kona Kai Ola does not follow this same pattern of alternatives evaluation.~~ As discussed in Section 1.4, the proposed Kona Kai Ola project is the result of agreements between JDI and the State DLNR and DHHL. The agreements and leases between the State and JDI stipulate the parameters of development for this site in terms of uses, quantities and size of many features, resulting in a limited range of land uses. Unlike a private property project, JDI is required to meet the criteria outlined in the agreements, thereby affording less flexibility in options and uses. From the developer's perspective, the agreements must also provide sufficient flexibility to allow for a development product that responds to market needs and provides a reasonable rate of return on the private investment.

The agreements between JDI and DLNR specify that the proposed harbor basin is to be 45 acres and accommodate 800 slips. This development proposal is the subject of this EIS. In response to DEIS comments, additional water quality studies and modeling were conducted. These studies determined that the water circulation in a 45-acre 800-slip marina would be insufficient to maintain the required standard of water quality. The models of water circulation suggest that a new 25-acre harbor basin could successfully maintain required water quality in the new harbor. Comments on the DEIS from DLNR, from other government agencies, the neighbors and the general community also called for the consideration of alternatives in the EIS, including a project with a smaller harbor basin and less density of hotel and time-share units.

In response to these comments on the DEIS, three alternatives are evaluated in this Final EIS and include Alternative 1, which is a plan with a 25-acre 400-slip harbor basin including a decrease in hotel and time-share units; Alternative 2, which is an alternative that had been previously discussed but not included in the proposed project, that includes an 800-slip harbor and a golf course; and Alternative 3, the no-project alternative. Each alternative is included in the EIS with an evaluation of their potential impacts. These project alternatives are presented to compare the levels of impacts and mitigation measures of the proposed project and alternative development schemes pursuant to requirements set forth in Chapter 343, HRS.

~~JDI is required to provide a new marina basin not less than 45 acres and a minimum of 800 new boat slips. Further, the agreements provide the following options for land uses at the project site:~~

- ~~Golf Course~~
- ~~Retail Commercial Facilities~~
- ~~Hotel Development Parcels~~
- ~~Marina Development Parcels~~
- ~~Community Benefit Development Parcels~~

~~JDI is not pursuing the golf course option and is proposing instead to create various water features throughout the project site. All other optional uses have been incorporated in Kona Kai Ola.~~

2.1 Project Alternatives

2.1.1 Alternative 1: 400-Slip Marina

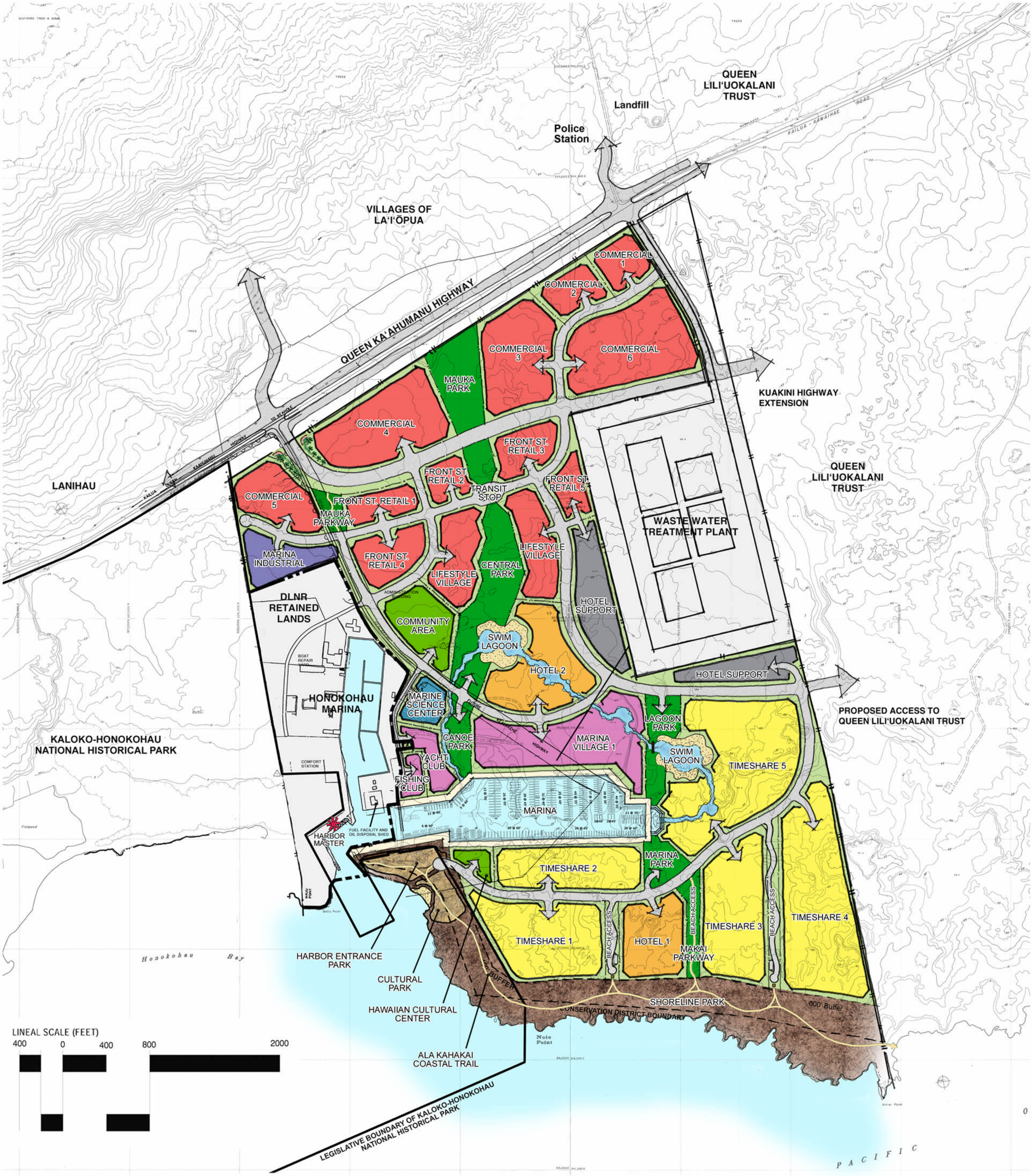
Studies conducted in response to DEIS comments found the construction and operation of an 800-slip marina may significantly impact the water quality within the marina and along the shoreline. Specifically, the Harbor Water Quality Modeling Study, as contained in Appendix U, found that the water circulation in a 45-acre 800-slip harbor was insufficient to maintain an acceptable level of water quality. Further, the existing harbor channel, which would serve both the existing and new harbors, could not adequately serve the increased boat traffic generated by an 800-slip marina during peak traffic. Mitigation measures to accommodate peak boat traffic included the widening of the existing channel, an action that would entail a complex process of Federal and State approvals and encounter significant environmental concern.

Concerns related to the proposed density of hotel and time-share units were also expressed in comments to the DEIS from members of the public, neighbors to the project site, especially the Kaniohale Community Association, and government agencies. Common themes in DEIS comments were related to impacts regarding traffic, project requirements of potable water and infrastructure systems, including sewer, drainage, utility and solid waste systems, and socioeconomic impacts.

In response to the water quality study results, and to the DEIS comments, an alternative plan was developed with a smaller marina with less boat slips, and a related decrease in hotel and time share units. Illustrated in Figure G, Alternative 1 reflects this lesser density project, and features a 400-slip marina encompassing 25 acres. For the purposes of the Alternative 1 analysis, JDI assumed 1,100 time-share units and 400 hotel rooms. Project components include:

- 400 hotel units on 34 acres
- 1,100 time-share units on 106 acres
- 143 acres of commercial uses
- 11 acres of marina support facilities
- 214 acres of parks, roads, open spaces, swim lagoons and community use areas

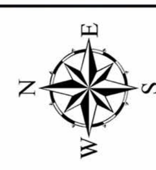
In addition, Alternative 1 would include the construction of a new intersection of Kealakehe Parkway with Queen Ka'ahumanu Highway, and the extension of Kealakehe Parkway to join Kuakini Highway to cross the lands of Queen Lili'uokalani Trust, and connecting with Kuakini Highway in Kailua-Kona. This is a significant off-site infrastructure improvement and is included in the agreements between the State and JDI.



Source: PBR HAWAII

Plan is conceptual only and subject to change

Figure G: Alternative 1: 400-Slip Marina



LEGEND

TIME SHARE	MARINA SUPPORT / COMMERCIAL	UTILITIES
HOTEL	MARINE SCIENCE CENTER	PARKS & GREEN SPACE
RETAIL / COMMERCIAL	COMMUNITY AREA / CULTURAL CENTER	SHORELINE
MARINA RETAIL	SWIM LAGOON	HARBOR ENTRANCE PARK / CULTURAL PARK
	MARINA	

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JDI
JACOBY DEVELOPMENT, INC.

Like the proposed project, Alternative 1 would have a strong ocean orientation, and project components that support this theme would include various water features including seawater lagoons and a marine science center. The new Alternative 1 harbor would include a yacht club, fishing club, a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. The coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use. Additional Alternative 1 community areas would include facilities and space for community use, including programs of the Kona Kai Ola Community Foundation, which supports community programs in health care, culture, education, and employment training for the local community, especially to native Hawaiians. Like the original proposed plan, Alternative 1 includes 40 percent of the land in parks, roads, open spaces, swim lagoons and community use areas.

2.1.2 Alternative 2: Golf Course Feature

Alternative 2 was among the alternatives discussed at a community charrette in September 2003. It includes a golf course, which is a permitted use in the DLNR agreement and DHHL lease. As Figure H illustrates, an 18-hole championship golf course would occupy 222 acres on the southern portion of the project site. As with the proposed project, Alternative 2 includes an 800-slip marina on a minimum of 45 acres.

To support the economic viability of the project, other Alternative 2 uses include:

- Golf course clubhouse on three acres
- 1,570 visitor units on 88 acres fronting the marina
- 118 acres of commercial uses
- 23 acres of community uses

Community uses in Alternative 2 include an amphitheater, a canoe facilities park, a community health center, a Hawaiian cultural center and fishing village, a marine science center and employment training center. The sea water lagoon features contained in the proposed project and Alternative 1 are not included in this alternative.

2.1.3 Alternative 3: No Action

In Alternative 3, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.

~~The economic viability and sustainability of the project is determined by the density and uses proposed. Because JDI is obligated to develop an 800-slip marina for the State, complete road improvements, and provide various public enhancement features at its own expense, the density proposed for the income generating features of the development must be sufficient to provide an acceptable level of economic return for JDI. The market study, which is discussed in Section 4.6, reviewed various development schemes and determined that the currently proposed density and mix is the optimum to meet the anticipated financing and development cost obligations for the public features associated with the development.~~

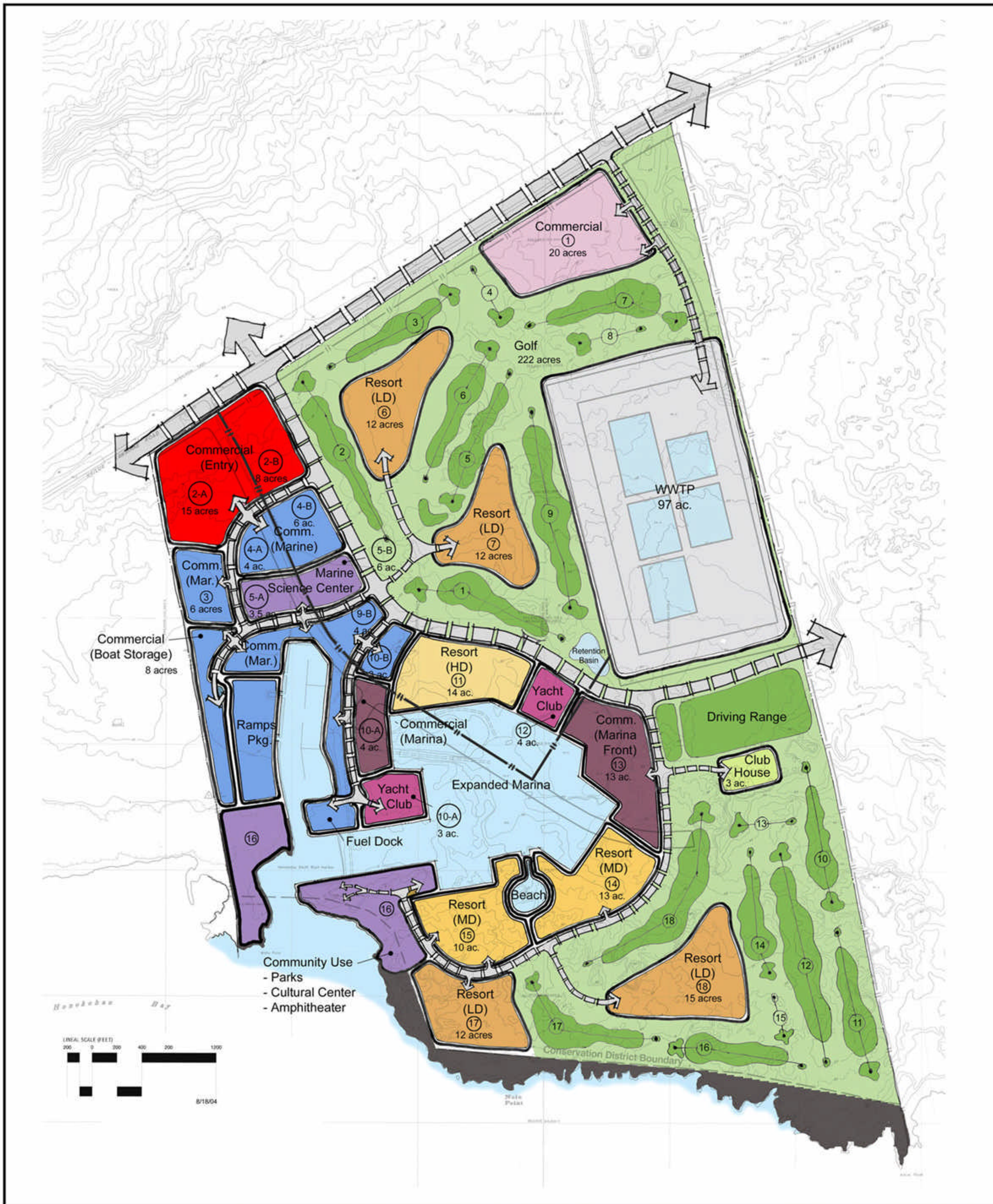

Figure H. Alternative 2: Golf Course Alternative

Legend

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2.2 Alternatives Analysis

As discussed in Section 2.1, the proposed Kona Kai Ola project (also referred to as “proposed project”) is defined by development requirements related for a marina and the related uses that would be needed to generate a reasonable rate of return that covers development costs.

Beginning with Section 2.2.1, the alternative development concepts are comparatively assessed for potential impacts that may reasonably be expected to result from each alternative. Following is an overview of the primary observations of such assessment.

Alternative 1 includes half of the State-required boat slips and 60 percent of the proposed hotel and time-share units and, due to the decreased density, this alternative would generate significantly less environmental and socio-economic impacts. A harbor water quality model found the reduction of the volume of the new marina basin by about half (approximately 25 acres) significantly improved the water circulation and quality. Further, the reduced number of boat slips would generate less boat traffic, thereby reducing congestion and the need to mitigate impacts further by the widening of the existing harbor channel.

A project with fewer hotel and time-share units and increased commercial space with a longer (14 years) absorption period would change the mix of employment offered by the project, and slightly increase the overall employment count. The public costs/benefits associated with Alternative 1 would change, compared to the proposed project, with a general increase in tax collections, and a general decrease in per capita costs. Detailed discussion of Alternative 1 potential economic impacts are provided in Section 4.6.6. Comparisons of levels of impact are presented throughout this FEIS.

While this analysis might indicate that the 25-acre marina in Alternative 1 would be the more prudent choice, the DLNR agreement establishes the minimum size and slip capacity of the marina at 45 acres and 800 slips, respectively. Amendments to the DLNR agreement would be required in order to allow Alternative 1 to proceed as the preferred alternative. Hence, selection of the preferred alternative is an unresolved issue at the writing of this FEIS.

Alternative 2, the golf course alternative, was not previously considered to be the preferred alternative primarily because market conditions at the time of project development might not likely support another golf course. Further, DHHL has a strategy goal to have more revenue-generating activities on the commercial lease lands within the project area. In addition, concerns have been expressed as to environmental impacts of coastal golf courses, including the potential adverse impact on Kona’s water supply if potable water is used for golf course irrigation.

While Alternative 3, the no-project alternative, would not generate adverse impacts related to development of these lands associated with the construction and long-term operations, it would also not allow for an expanded public marina that would meet public need and generate income for the public sector. Further, the no-project alternative would foreclose the opportunity to create a master-planned State-initiated development that would result in increased tax revenue, recreation options and community facilities. Crucial privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities, and public access would not be contributed.

~~Hence, the only valid alternative to the proposed project is the no-action alternative. In this alternative, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.~~

~~The no-project alternative would therefore not generate adverse impacts associated with the construction and long-term operations would not occur.~~

~~Likewise, the creation of a master-planned state-initiated development, resulting in increased employment, tax revenue, recreation options and community facilities, would not be created. Privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities and public access would not be contributed.~~

Further, the creation of revenue-producing businesses on the DHHL property to fund homestead programs would not occur, resulting in fewer potential benefits for Hawaiians.

Hence, the agreements and leases between the State and JDI indicate that the no-action alternative is not in the public interest~~has been rejected at this time~~.

2.2.1 Impact Comparison

Grading and Excavation

The proposed project requires grading and excavation. Both actions may impact groundwater due to rainfall runoff during construction. Alternative 1 would require a significantly smaller excavation for the marina basin and would therefore carry a lesser risk of potential adverse effects on water quality. Alternative 2 would require the same basin excavation as the proposed project, and would also include extensive grading and filling to build the golf course, the latter of which would generate additional impacts. Alternative 3 would result in no change to the geography, topography and geology.

Further discussion on grading and excavation is contained in Section 3.3.

Natural Drainage

Most precipitation infiltrates into the porous ground at the site, and no significant sheet flow is likely. Alternative 1 would generate similar levels of impacts on natural drainage as those of the proposed project and thus require similar mitigation measures. The golf course in Alternative 2 would not be as porous since the site would be graded, soil would be placed, and grass and other landscaping would be grown. Sheet flow and runoff can occur on a golf course, and drainage patterns might change. Alternative 3 would result in no change to the existing natural drainage pattern. Further discussion on natural drainage is contained in Section 3.4.

Air Quality

Air quality will be affected by construction activities, as well as pollutants from vehicular, industrial, natural, and agricultural sources. Alternative 1 would generate less construction air quality impacts than the proposed project due to the reduced amount of intensive groundwork associated with the smaller marina basin and fewer long-term impacts by reducing traffic 35 and 40 percent during, respectively, AM and PM peak traffic times. Construction of Alternative 2 would result in fugitive dust and exhaust from equipment and is expected to generate the same level of air quality impact as the proposed project. Alternative 3 would result in no change to existing air quality. Further discussion on air quality is contained in Section 3.5.

Terrestrial Environment

To provide additional habitat for shorebirds and some visiting seabirds, the project proposes to construct a brackishwater pond area suitable for avian fauna, including stilts, coots and ducks. While habitat expansion is beneficial, there is also a possibility that these species may be exposed to activity that may harm them. Alternative 1 would not include a brackish water pond, but will include 5 acres of seawater features, which is 74 percent less than the 19 acres of seawater features in the proposed project. While this would reduce beneficial impacts, it would also decrease exposure to potentially harmful activity. Alternative 2 does not include the brackish water pond features, but would include drainage retention basins that would attract avian fauna and expose them to chemicals used to maintain golf course landscaping. While Alternative 3 would result in no increase in potentially harmful activity, it would also not provide additional habitat for avian fauna. Further discussion on the terrestrial environment is contained in Section 3.7.

Groundwater

Groundwater at the project site occurs as a thin basal brackish water lens. It is influenced by tides and varies in flow direction and salt content. The existing Honokōhau Harbor acts as a drainage point for local groundwater. Any impact to groundwater flow from the proposed harbor is likely to be localized. The proposed marina basin will not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance.

There will be differences in the flow to the marina entrance between the proposed project and Alternative 1. Alternative 1, being smaller in size, will have less impact on groundwater flow than the proposed marina. Alternative 2 will have a similar impact to groundwater quality as the proposed project. Alternative 2 may also impact water quality by contributing nutrients and biocides to the groundwater from the golf course. Alternative 3 would result in no change in existing groundwater conditions. Further discussion on groundwater is contained in Section 3.8.1.

Surface Water

There are no significant natural freshwater streams or ponds at the site, but there are brackish anchialine pools. Surface water at the project site will be influenced by rainfall. Runoff typically percolates rapidly through the permeable ground. The proposed project will include some impermeable surfaces, which together with building roofs, will change runoff and seepage patterns.

Alternative 1 is a lower density project that is expected to have proportionally less impact on surface water and runoff patterns and less potential impact on water quality than the proposed project. Alternative 2 would have more impact on surface water quality than the proposed project due to fertilizers and biocides carried by runoff from the golf course. Alternative 3 would result in no change to surface water conditions. Further discussion on surface water is contained in Section 3.8.2.

Nearshore Environment and Coastal Waters

The potential adverse impacts to the marine environment from the proposed project are due to the construction of an 800-slip marina and the resulting inflow of higher salinity seawater and inadequate water circulation, both of which are anticipated to impair water quality to the extent of falling below applicable standards. One possible mitigation measure is to significantly reduce the size of the marina expansion.

The reduced marina size (from 45 to 25 acres) and reduced lagoon acreage in Alternative 1 are expected to result in a proportionate reduction in seawater discharging into the new harbor and increased water circulation. Alternative 2 includes the same marina basin size and is therefore subject to the same factors that are expected to adversely affect water quality.

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water quality in the proposed harbor depends on several components. These include salinity, nutrients, and sediments that come from the ocean, rainfall runoff, water features with marine animals, and dust. The smaller project offered as Alternative 1 is expected to produce a reduced amount of pollutants and reduce the risk of adverse impact upon water quality.

It is notable that the 45-acre marina basin planned in the proposed project and Alternative 2 only becomes viable from a water quality impact standpoint if the additional brackish groundwater inflow into the new marina exceeds 60 mgd. The resulting flushing from such inflow would be expected to better maintain water quality. However, it is unclear whether 60 mgd of brackish groundwater would be available. As proposed in Alternative 1, reduction of the volume of the new marina basin by 45 percent will significantly improve the flushing and water quality because the lower volume can be flushed by the available groundwater flow.

In addition, there could be higher rainfall runoff from the Alternative 2 golf course into the harbor, because the grassed golf course will be less porous than the natural surface. The golf course will also require relatively high levels of fertilizer, biocides, and irrigation, all of which could contribute to adverse water quality impacts.

Further discussion on nearshore environment and coastal waters is contained in Section 3.9.1.

Anchialine Pools

Anchialine pools are located north of Honokōhau Harbor, and south of the harbor on the project site. The marine life in these pools is sensitive to groundwater quality, and changes due to construction and operation of the project could degrade the viability of the pool ecosystem. In the southern complex, 3 anchialine pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction in the proposed project and Alternatives 1 and 2.

Predicting the extent of change in groundwater flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is therefore extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Due to the uncertainty of changes in groundwater flow and quality due to marina construction, the variability in impacts between the proposed project and Alternatives 1 and 2 is unknown at this time. Alternative 3 would result in no change in groundwater flow. While this would eliminate the potential for adverse impacts, Alternative 3 would also continue the pattern of existing degradation related to human activity and the introduction of alien species. Further discussion on anchialine pools is contained in Section 3.9.2.

Marine Fishing Impacts

The proposed marina will increase the number of boats in the area and it is reasonable to assume that a portion of these new boats will engage in fishing activities. The increase in boats in the area would be primarily related to the marlin and tuna / pelagic fishery, coral reefs due to extractive fisheries, and SCUBA activities. The pressure on fish and invertebrate stocks is expected to increase with or without the marina. Harbor expansion provides the opportunity to address existing conditions to consolidate, focus, and fund management and enforcement activities at one location.

Compared to the proposed project, Alternative 1 would result in a 21 percent decrease in boat traffic, thereby lessening the potential for marine fishing impacts. The level of impacts in Alternative 2 would be similar to that of the proposed project. Alternative 3 would result in no change in existing marine fishing conditions, and no opportunity to address already existing pressure on fish and invertebrate stocks. Further discussion on marine fishing impacts is contained in Section 3.9.3.

Cultural and Archaeological Resources

The proposed project will integrate cultural and archaeological resources in the overall development. Archaeological sites recommended for preservation will be preserved, and cultural practices will be encouraged. Kona Kai Ola includes a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. Proposed is a 400-foot shoreline setback that would serve as a buffer between the ocean and developed areas. This coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use.

Alternative 1 would contain all of the cultural archaeological features and the shoreline setback area would be 400 feet in the northern portion of the site and increase to 600 feet in the southern portion. Alternative 2 would preserve cultural and archaeological resources, but does not include a 400-foot shoreline setback. Alternative 3 would result in no change to existing cultural and archaeological resources and no addition of cultural and community facilities and activities. Further discussion on cultural and archaeological resources is contained in, respectively, Sections 4.1 and 4.2.

Noise

Project-generated noise is due to construction equipment and blasting, boats, marina activities, vehicle traffic, and the Kealakehe Wastewater Treatment Plant operations. Alternative 1 would generate less noise impacts due to reduced construction activities, fewer boats, less traffic and less on-site activity. Alternative 2 would also generate less noise due to reduced traffic and less on-site activity, but noise related to the excavation of the marina basin and an increase in the number of boats would be similar to that of the proposed project. Further discussion on noise impacts is presented in Section 4.4.

Socioeconomic Impacts

The proposed project will generate an increase in de facto population of an estimated 5,321 persons due to the increase in hotel and time-share units. The estimated de facto population increase in Alternative 1 is 37 percent less, at 3,363 persons, than the proposed project. The de facto population increase in Alternative 2 is similar to Alternative 1.

Employment in the commercial components will nearly double in Alternative 1, from a stabilized level of 1,429 full-time equivalent (FTE) positions in the proposed project to 2,740 in the Alternative 1.

Under Alternative 1, the total operating economic activity at Kona Kai Ola will increase due to the added commercial space more than off-setting the fewer visitor units, moving upward from $557.6 million per year to circa $814.3 million annually. The total base economic impact resulting from development and operation of Alternative 1 will similarly be higher by between 35 and 45 percent than that of the proposed project.

Alternative 1, which has a reduced marina size of 25 acres, and fewer hotel and time-share units, would have a meaningful market standing, create significant economic opportunities, and provide a net benefit to State and County revenues. From a market perspective, a smaller Kona Kai Ola would still be the only mixed use community in the Keahole to Kailua-Kona Corridor offering competitive hotel and time-share product.

The estimated absorption periods for marketable components of Alternative 1 are generally shorter than those for the same components in the proposed project. Marina slips under Alternative 1 are estimated to be absorbed within 2 years after groundbreaking, as compared with 9 years for absorption of slips in the proposed project. Hotel rooms under Alternative 1 are estimated to be absorbed within 4 years after groundbreaking, as compared with 7 years under the proposed project. Time-share units would be absorbed within 10 years under Alternative 1, while 15 years are projected under the proposed project. Due to the planned increase in commercial facilities under Alternative 1, the absorption period of commercial space is estimated at 14 years, as compared with 8 years for absorption of such facilities under the proposed project.

The State and County will still both receive a net benefit (tax receipts relative to public expenditures) annually on a stabilized basis under the Alternative 1. The County net benefits will be some $12.2 million per year under the Alternative 1 versus $14.9 million under the proposed project. The State net benefits will increase under the Alternative 1 to about $37.5 million annually, up substantially from the $11.4 million in the proposed project.

Due to the lower de facto population at build-out, the effective stabilized public costs for both the State and County will decline meaningfully under the Alternative 1, dropping from $7.7 million annually for the County and $36.5 million for the State, to $4.9 million and $23 million per year, respectively.

Alternative 3 would result in no increase in de facto population and improvement to economic conditions. Further discussion on social and economic impacts are contained in, respectively, Sections 4.5 and 4.6.

Vehicular Traffic

The proposed project will impact the nearby road network that currently is congested during peak traffic times. The proposed project includes roadway improvements that would reduce the impact and improve roadway conditions for the regional community.

Alternative 1 includes the same roadway system improvements as the proposed project, yet would reduce vehicular traffic by 35 percent when compared to the proposed project. Alternative 2 would have similar traffic conditions and roadway improvements as Alternative 1. Alternative 3 would result in no increase in traffic and no roadway improvements.

Marina Traffic Study

The increase in boat traffic due to the proposed 800-slip marina would cause entrance channel congestion during varying combinations of existing and new marina peak traffic flow. Worst case conditions of active sport fishing weekend and summer holiday recreational traffic result in traffic volumes exceeding capacity over a short afternoon period. Mitigation to address boat traffic in the proposed project include widening the entrance channel, traffic control, implementation of a permanent traffic control tower, or limiting vessel size.

Alternative 1 would result in a 21 percent reduction in boat traffic congestion under average existing conditions and ten percent reduction during peak existing conditions. The reduction to 400 slips also reduces the impacts of congestion at the entrance channel, thereby reducing the need for any modifications to the entrance channel.

Alternative 2 would have the same level of boat traffic as the proposed project. Alternative 3 would not meet the demand for additional boat slips and would not generate additional boat traffic. Further discussion on marina traffic is contained in Section 4.8.

Police, Fire and Medical Services

The proposed project will impact police, fire and medical services due to an increase in de facto population and increased on-site activity. Alternatives 1 and 2 would have similar levels of impact as the proposed project due to increased on-site activity. Further discussion on police, fire and medical services are contained, respectively, in Sections 4.10.1, 4.10.2 and 4.10.3.

Drainage and Storm Water Facilities

The proposed project will increase drainage flows, quantities, velocities, erosion, and sediment runoff.

Alternative 1 involves a reduction of the project density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces associated with hotel and time-share development and to the creation of more open space. However, roadway areas will increase by about 30 percent in Alternative 1. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings. The golf course in Alternative 2 may also change drainage characteristics from those of the proposed project and may not reduce impacts. Alternative 3 would result in no change in existing conditions and no improvements to drainage infrastructure. Further discussion on drainage and storm water facilities is contained in Section 4.10.5

Wastewater Facilities

The proposed development is located within the service area of the Kealakehe WWTP and a sewer system will be installed that connects to the WWTP. The sewer system will be comprised of a network of gravity sewers, force mains, and pumping stations which collect and convey wastewater to the existing Kealakehe WWTP. Project improvements will incorporate the usage of recycled / R1 water. Improvements implemented by the proposed project will also accommodate the needs of the regional service population.

Alternative 1 would generate approximately 10 percent less wastewater flow than the proposed project. Wastewater flow in Alternative 2 is undetermined. Alternative 3 would result in no additional flow, as well as no improvements that will benefit the regional community. Further discussion on wastewater facilities is contained in Section 4.10.6.

Potable Water Facilities

The proposed project average daily water demand is estimated at 1.76 million gallons per day. Existing County sources are not adequate to meet this demand and source development is required. The developer is working with DLNR and two wells have been identified that will produce a sustainable yield that will serve the project. These wells will also serve water needs beyond the project.

Alternative 1 would result in net decrease of about five percent of potable water demand. Alternative 2 may have a lower water demand than the proposed project as long as potable water is not used for irrigation. Alternative 3 would result in no additional flow, as well as no source development that will benefit the regional community. Further discussion on potable water facilities is contained in Section 4.10.8.

Energy and Communications

Regarding Alternative 1, preliminary estimates for electrical, telecommunications, and cable resulted in a net demand load that remains similar to the proposed project. Further discussion on energy and communications is contained in Section 4.10.9.1.

The proposed project will increase the demand for electrical energy and telecommunications. The demand would be reduced in Alternative 1 because the number of boat slips and units would decrease. Similarly, Alternative 2 would have fewer units than the proposed project and therefore reduce energy demands. Further reduction in energy demand for either alternative could be achieved by using seawater air conditioning (SWAC) and other energy reduction measures, as planned by the developer. Further discussion on energy and telecommunications is contained in Section 4.10.9.2.

Water Features and Lagoons

The proposed project includes a brackishwater pond, lagoons, and marine life exhibits supplied by clean seawater. The water features in Alternative 1 would significantly decrease by 74 percent from 19 acres in the proposed project to five acres in Alternative 1. This decrease in water features would result in a corresponding decrease in water source requirements and seawater discharge. Alternative 2 does not include the seawater features. Alternative 3 would result in no additional demand for water source requirements and seawater discharge.

2.2.2 Conformance with Public Plans and Policies

State of Hawai'i

Chapter 343, Hawai'i Revised Statutes

Compliance with this chapter is effected, as described in Section 5.1.1 in regard to the proposed project and the alternatives discussed.

- State Land Use Law, Chapter 205, Hawai'i Revised Statutes

  The discussion in Section 5.1.2 is directly applicable to Alternative 1, the proposed project. Alternative 1 will involve a setback of 400 feet that increases to 600 feet along the southern portion of the project site's shoreline area. Alternative 2 does not provide for such a setback, but may still require approvals from DLNR for cultural, recreational, and community uses and structures within the Conservation district.

- Coastal Zone Management Program, Chapter 205A, Hawai'i Revised Statutes

  Recreational Resources:

  In addition to the discussion of consistency with the associated objective and policies, as described in Section 5.1.3, the reduction from the proposed project's 800-slip marina to a 400-slip marina under Alternative 1 will still expand the region's boating opportunities and support facilities. The existing harbor entrance will still be utilized under this alternative; however, potential risks relating to boat traffic and congestion in the marina entrance area will be reduced significantly. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities, and marine science center remain important recreational components under Alternative 1.

Alternative 2 includes a golf course component, which would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Alternative 2, like the proposed project, will expand the region's boating opportunities and support facilities through its 800-slip marina. However, the potential adverse impacts of increased boat traffic from the size of the marina are significant enough to offset the benefits of increased boating opportunities.

Coastal Ecosystems:

The discussion in Section 5.1.3 is directly applicable to Alternative 1.

Alternative 1 not only reduces the number of slips proposed by 50 percent, but it also reduces the size of the marina from 45 acres to 25 acres. The 25-acre marina will increase the body of water within the existing harbor, but to a significantly lesser extent than the proposed project's estimated increase, which is also applicable to the 45-acre size that is proposed for the marina under Alternative 2.

The findings of the Harbor Water Quality Modeling Study conclude that a reduction in the size of the harbor expansion is an alternative that will mitigate the risk of significant impacts upon water quality within the marina and existing harbor. Accordingly, the reduction in both the number of slips and the size of the marina basin under Alternative 1, in combination with proper facilities design, public education, and enforcement of harbor rules and regulations, would result in fewer long-term impacts to water quality and coastal ecosystems. Short-term (construction-related) impacts would likely remain the same although the reduction in the total acreage of excavation is expected to result in a shorter duration of such impacts.

In addition to its 800-slip marina and potential adverse impacts upon water quality and the marine environment, Alternative 2 includes a golf course component, which has the potential to impact coastal ecosystems by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Economic Uses

Although reduced in the number of slips, the smaller marina under Alternative 1 will nevertheless serve public demand for more boating facilities in West Hawai‘i and is consistent with the objective and policies and discussion set forth in Section 5.1.3. The economic impacts of Alternative 2, while comparable to those of the proposed project's marina development, are notably marginal as to the golf course component, based on the marketability analysis that indicates a condition of saturation within the region.

Coastal Hazards

The discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Tsunami risks mainly affect the large shoreline setback area that is proposed for the project and Alternative 1. Alternative 2 projects a transient accommodation site that is partially within the tsunami hazard zone and thus carries a higher hazard risk. However, the essential requirement for these alternatives, as well as the proposed project, is a well-prepared and properly implemented evacuation plan.

Beach Protection

Discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Alternative 1 and, to a lesser extent, Alternative 2, will retain the shoreline area in its natural condition.

Similar to the proposed project, Alternative 1 provides for a shoreline setback of considerable width within which no structure, except for possible culturally-related structures, would be allowed. Alternatives 1 and 2 will thus be designed to avoid erosion of structures and minimize interference with natural shoreline processes.

Marine Resources

The discussion in Section 5.1.3 is also applicable to Alternative 1 which is described to be an alternative that is specifically projected to mitigate anticipated adverse impacts on water quality and the marine environment that might otherwise result from the original harbor design and scale, which is also incorporated in Alternative 2 . The reduced marina size under Alternative 1 is projected to meet water quality standards and enable greater compliance with the objective and policies addressed in this section.

Alternative 2 includes a golf course component and thus the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Hawai‘i State Plans, Chapter 226, Hawai‘i Revised Statutes

Section 226-4 (State goals), 5 (Objectives and policies for population, and 6 (Objective and policies for economy in general):

The discussion in Section 5.1.4 is applicable to Alternatives 1 and 2, in addition to the proposed project. These development concepts generally conform to the goals, objectives, and policies set forth in these sections because they will provide some degree of economic viability, stability, and sustainability for future generations. Kona Kai Ola will convert essentially vacant land into a mixed-use development with a distinctive marina and boating element, providing a wide range of recreational, business, and employment opportunities to the community.

Section 226-8 Objective and policies for the economy – the visitor industry:

Alternatives 1 and 2 will be consistent with the State's economic objective and policies relating to the tourism industry for the same reasons that are discussed in regard to the proposed project in Section 5.1.4. They will incorporate JDI's commitment to sustainability principles in the planning and design of the development concepts in Alternatives 1 and 2. Although the total hotel and time-share unit count is reduced to approximately 1,500 in Alternatives 1 and 2, the transient accommodations component of these alternatives will still further the State's objective and policies for increased visitor industry employment opportunities and training, foster better visitor understanding of Hawai‘i's cultural values, and contribute to the synergism of this mixed-use project concept that addresses the needs of the neighboring community, as well as the visitor industry.

Section 226-11 Objectives and policies for the physical environment: land-based, shoreline and marine resources:

Alternative 1 is expected to involve less potential adverse impacts upon these environmental resources than the proposed project. Likewise, and Alternative 2 would have less adverse impact because of its reduction in the size of the marina and in the total hotel and time-share unit count. Alternative 1 carries less potential risk to water quality and related impacts upon the marine environment and anchialine pool ecosystems. Although approximately three anchialine pools are expected to be destroyed, the great majority of pools will be preserved within and outside of the proposed 400-foot shoreline setback.

The golf course component in Alternative 2 has the potential to impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the marina basin and nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools by introducing the chemicals into the pond systems.

Section 226-12 Objective and policies for the physical environment: scenic, natural beauty, and historic resources:

The discussion in Section 5.1.4 is directly applicable to Alternative 1 and describes the compliance with the objective and policies addressed.

The golf course component of Alternative 2 would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area.

Just as with the proposed project, Alternatives 1 and 2 would also be designed to blend with the natural terrain and to honor and protect the cultural history, resources, and practices of these lands.

Section 226-13 Objectives and policies for the physical environment: land, air and water quality:

As stated above, because of the reduction in both the number of slips and the size of the marina basin, with proper facilities design, public education and enforcement of harbor rules and regulations, Alternative 1 is anticipated to cause fewer long-term impacts to water quality than either the proposed project or Alternative 2. Based on the findings of the Harbor Water Quality Modeling Study, water quality resulting from a reduced marina basin size as proposed under Alternative 1 is expected to be similar to existing conditions.

As previously noted, Alternative 2 has the potential to adversely impact water quality by increasing the nutrient loading in surface runoff and groundwater by introducing pesticides, herbicides and other chemicals common in golf course development and maintenance into the marina basin and nearshore waters surrounding the project site.

Section 226-14 Objectives and policies for facility systems - general:

Alternatives 1 and 2 will conform to the objective and policies of this section on the grounds that are discussed in regard to the proposed project in Section 5.1.4. The master-planning and phasing of the project concepts under these alternatives will be coordinated with associated public and private infrastructural planning and related private and public infrastructural financing. The cost of the marina construction and project-related infrastructure is to be borne by the developer, resulting in considerable savings for the public. In addition, the projected lease revenue from these public lands will provide additional public benefits by establishing a revenue stream for capital improvements and maintenance of a range of State facilities.

Section 226-15 Objectives and policies for facility systems - solid and liquid wastes:

In addition to the developer's commitment to sustainable development design, the project will involve upgrades to the County of Hawaiʻi's Kealakehe Wastewater Treatment Plant to meet current needs, as well as the project's future needs. This commitment is applicable to Alternatives 1 and 2, as well as the proposed project that is discussed in Section 5.1.4.

Section 226-16 Objectives and policies for facility systems – water:

The discussion of water conservation methods and the need to secure additional potable water sources in Section 5.1.4 is also applicable to Alternative 1 and demonstrates conformity to the objective and policies for water facilities. Alternative 2 involves greater irrigation demands in regard to its golf course component and greater potable water demands for human consumption than those for Alternative 1. Alternative 2 is expected to face more serious challenges in securing adequate and reliable sources of water.

Section 229-17 Objectives and policies for facility systems – transportation:

Alternatives 1 and 2 will conform to this objective and policies because they will present water transportation opportunities, including the possible use of transit water shuttles to Kailua-Kona, as described in regard to the proposed project in Section 5.1.4.

Section 226-18 Objectives and policies for facility systems – energy:

Alternatives 1 and 2 conform to these objective and policies through the use of energy efficient design and technology and commitment to the use and production of renewable energy to serve the project's needs. Solar energy production, solar hot water heating, and the use of deep cold seawater for cooling systems are currently identified as means of saving substantial electrical energy costs for the community and the developer.

Section 226-23 Objectives and policies for socio-cultural advancement – leisure:

Alternative 1 conforms to this objective and related policies for the reasons offered in Section 5.1.4 in regard to the proposed project. Alternative 1 will be of greater conformity with the policy regarding access to significant natural and cultural resources in light of the 400-600 foot shoreline setback that has been designed for this alternative.

Although it does not propose the considerable shoreline setback that is planned for Alternative 1, Alternative 2 is consistent with this objective and related policies in incorporating opportunities for shoreline-oriented activities, such as the walking trails. In addition, the golf course component adds a more passive recreation alternative to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Section 226-25 Objectives and policies for socio-cultural advancement-culture:

The discussion in Section 5.1.4 is relevant to Alternatives 1 and 2 and demonstrate their conformity the objective and policies of this section.

Both alternatives involve the preservation and protection of cultural features that have been identified by the Cultural Impact Assessment and archaeological studies for the project area. Both provide for public shoreline access, and both will continue the policy of close consultation with the local Hawaiian community and cultural and lineal descendants in the planning of cultural resource preservation and protection.

Section 226-103 Economic priority guidelines:

Alternatives 1 and 2 conform to these guidelines for the same reasons that are set forth in Section 5.1.4. They involve private investment in a public project that will create economic diversification through a mix of marina, industrial, commercial, visitor, and cultural facilities. This presents a wide range of entrepreneurial opportunities, long-term employment opportunities, and job training opportunities.

Section 226-104 Population growth and land resources priority guidelines:

As described in Section 5.1.4, the policy support for the proposed project also extends to the similar development concepts considered in Alternatives 1 and 2. Those alternatives conform to the guidelines of this section because they involve an urban development under parameters and within geographical bounds that are supported by the County's General Plan, a preliminary form of the Kona Community Development Plan, the County's Keahole to Kailua Regional Development Plan, and the reality of being located along the primary commercial/industrial corridor between Keahole Airport and Kailua-Kona. As with the proposed project, the development concepts of Alternatives 1 and 2 are essentially alternatives for the implementation and "in-filling" of the urban expansion area in North Kona.

DHHL Hawai'i Island Plan

This 2002 plan projects DHHL's Honokōhau makai lands for commercial use. As compared to the proposed project and Alternative 2, Alternative 1 presents an expanded commercial component that provides greater compliance with the plan, while addressing certain beneficiaries' concerns about the scale of the marina originally required in the Project. Alternative 2 also conforms to the recommended commercial uses in the makai lands but to a lesser degree than Alternative 1 because of its more limited commercial component. Like the proposed project, its marina size and number of slips raise environmental issues, as more specifically discussed in Part 3, and community concerns.

County of Hawai'i General Plan

HCGP Section 4 – Environmental Quality Goals, Policies and Courses of Action:

Alternative 1 is consistent with this section. It presents a reduction in both the number of slips and the size of the marina basin that, in combination with proper facilities design, public education and enforcement of harbor rules and regulations, would result in very few long term impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions.

Alternative 2 is the least consistent with this section. In addition to the potential significant impacts of its 800 slip marina basin, its golf course component has the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides and other chemicals common in golf course use and management into the nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools beyond their current conditions by introducing such substances into the pool systems.

HCGP Section 7 – Natural Beauty Goals and Policies:

Alternative 2 conforms to some degree with this section. Its golf course component would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area, as demonstrated in other makai golf courses within the region.

HCGP Section 8 – Natural Resources and Shoreline:

Alternative 1 is most consistent with the goals and policies of this section. It would require considerably less marina excavation than the proposed project and Alternative 2 and would reduce the potential risk of long-term adverse impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions with the degree of reduction in marina basin size that is proposed under Alternative 1. This reduction is also expected to reduce potential impacts upon anchialine pools and their ecosytems, as well as shoreline and marine resources that are affected by water quality. Alternative 1 also retains the shoreline preservation and protection concepts that are proposed in and described for the Project.

HCGP Section 10 – Public Facilities Goals and Policies:

The discussion in Section 5.2.1. in relation to the proposed project is applicable to Alternatives 1 and 2. Improvements to public facilities are are integral to the Kona Kai Ola development. The provision of additional boat slips and numerous road improvements, including a makai extension of Kuakini Highway south to Kailua-Kona are incorporated into plans for the project's development. In light of these elements, Alternatives 1 and 2 are consistent with the goals and policies of this section.

HCGP Section 11 – Public Utility Goals, Policies:

As with the proposed project, Alternatives 1 and 2 are consistent with the goals and policies of this section, based on the relevant grounds set forth in Section 5.2.1. The developer is committed to design, fund, and develop environmentally sensitive and energy efficient utility systems to the extent possible, as described previously in Part 5. Its master planning provides for the coordinated development of such systems with the objective of achieving significant savings for the public. As previously-mentioned example, the project development involves the upgrading of the Kealakehe Wastewater Treatment Plant.

HCGP Section 12 – Recreation:

Alternative 1 is consistent with the goals, policies, and courses of action for North Kona in this section.

Although the number of slips is reduced under Alternative 1, the region's boating opportunities and support facilities will still be expanded. The existing marina entrance would still be utilized under this alternative. However, concerns relating to increased activity leading to increased congestion in the marina entrance area would be mitigated to a certain extent. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities and marine science center remain important components of Alternative 1.

The golf course component of Alternative 2 would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola. Alternative 2 is also considered to be consistent with this section.

HCGP Section 13 and 13.2 – Transportation:

The reduced marina component under Alternative 1 will still provide transportation opportunities and provide for possible use of transit water shuttles to Kailua-Kona, although to a lesser degree than under the proposed project and Alternative 2 . However, in each scenario, internal people-movers are planned, and numerous roadway improvements are planned for coordination with public agencies, including but not limited to the construction of the Kuakini Highway extension between Honokōhau and Kailua-Kona. Accordingly, both Alternatives 1 and 2 are consistent with the goals, policies, and courses of action for North Kona under these sections of the General Plan.

HCGP Section 14.3 – Commercial Development:

For the reasons presented in the discussion under Section 226-104 of the State Plan, the planned commercial component under Alternatives 1 and 2 are consistent with this section.

HCGP Section 14.8 – Open Space:

Alternatives 1 and 2 are consistent with the goals and policies of this section. Alternative 1 provides a considerable (400-600 foot) shoreline setback along the entire ocean frontage of the project site as a means of protecting the area's scenic and open space resources, as well as natural and cultural resources. Although it does not incorporate the shoreline setback planned in Alternative 1, Alternative 2 provides a golf course component would contribute to the amount of open space that is currently proposed and allow additional view corridors to be created.

Community Development Plans

Community development plans are being formulated for different regions in the County in order to supplement the County's General Plan. The Kona Kai Ola project is located in the Kona Community Development Plan (CDP) area. Maps associated with the preliminary work phases

of the Kona CDP include the Kona Kai Ola project site within the "Preferred Urban Growth" boundary of the North Kona district. The Kona CDP process is guided by a Steering Committee composed of a broad cross-section of the community. The Steering Committee will eventually complete its work and recommend the CDP's adoption.

After the DEIS was published, the Kona CDP has progressed to the development of plans for the major urban growth corridor north of Kailua-Kona. The Kona CDP has produced a draft plan showing a transit oriented development that includes a midlevel public transit corridor along the mauka residential elevation, and a makai transit corridor that runs along a proposed new frontage road just makai and parallel to Queen Kaahumanu Highway. The development plan for Alternative 1 includes the Kuakini Highway as part of this proposed frontage road and transit line from Kailua Kona to the Kealakehe area, along with a transit stop at Kona Kai Ola. The Alternative 1 plan also includes a road that could be extended to be part of the proposed frontage road should it be approved and implemented. In addition, the Kona CDP has continued to emphasize the principles of smart growth planning with mixed use urban areas where people can live, work, play and learn in the same region. Kona Kai Ola has been specifically designed to be consistent with this policy in order to provide a stable employment base close to where people live in the mauka residential areas already planned for DHHL and HHFDC lands.

It should be noted that currently and over the years, the 1990 Keāhole to Kailua Development Plan (K-to-K Plan) guides land use actions by the public and private sectors. It is intended to carry out the General Plan goals and policies related to the development of the portion of North Kona area, including the Kona Kai Ola site. The "Preferred Growth Plan" of the Keāhole to Kailua Development Plan identifies the project site as a new regional urban center to include commercial, civic, and financial business related uses, an expanded "Harbor Complex," a shoreline road, and a shoreline park. The proposed project and the development concepts in Alternatives 1 and 2 are therefore consistent with the recommendations in the Keāhole to Kailua Development Plan.

Hawai'i County Zoning

As shown on Figure AA, the project site is zoned "Open". Under Section 25-5-160 of the Hawai'i County Code, "The O (Open) district applies to areas that contribute to the general welfare, the full enjoyment, or the economic well-being of open land type use which has been established, or is proposed. The object of this district is to encourage development around it such as a golf course and park, and to protect investments which have been or shall be made in reliance upon the retention of such open type use, to buffer an otherwise incompatible land use or district, to preserve a valuable scenic vista or an area of special historical significance, or to protect and preserve submerged land, fishing ponds, and lakes (natural or artificial tide lands)".

Some of the proposed uses at Kona Kai Ola are permitted uses in the Open zone such as:

- Heiau, historical areas, structures, and monuments;
- Natural features, phenomena, and vistas as tourist attractions;
- Private recreational uses involving no aboveground structure except dressing rooms and comfort stations;

- Public parks;
- Public uses and structures, as permitted under Section 25-4-11.

In addition to those uses permitted outright, the following uses are permitted after issuance of a use permit:

- Yacht harbors and boating facilities; provided that the use, in its entirety, is compatible with the stated purpose of the O district.
- Uses considered directly accessory to the uses permitted in this section shall also be permitted in the O district.

The proposed time-share and hotel units and commercial uses would not be consistent with the zoning designation of "Open". Project implementation therefore requires rezoning of portions of the project to the appropriate zoning category or use permits for certain uses.

Special Management Area

As shown in Figure AB, the entire project area up to the highway is within the coastal zone management zone known as the Special Management Area ("SMA"). At the County level, implementation of the CZM Program is through the review and administering of the SMA permit regulations. Kona Kai Ola complies with and implements the objectives and policies of the Coastal Zone Management (CZM) Program, and a full discussion is provided in Section 5.1.3. The development concepts in the proposed project and Alternatives 1 and 2 will be subject to applicable SMA rules and regulations.

Kuakini
Governor of Hawaii
Hawaiian Civic Club
Of Kona

February 6, 2007

Dayan Vithanage
Oceanit
828 Fort Street Mall, 6th Floor
Honolulu HI 96813

Subject: **Kona Kai Ola Draft Environmental Impact Statement**

As president of Kuakini Hawaiian Civic Club, a former Lai o Pua home owner and its community association's past president, thank you for the opportunity to provide public comment on Kona Kai Ola Draft Environmental Impact Statement.

The Hawaiian Homes neighborhood of Lai o Pua will benefit from this project with an opportunity to find meaningful work and to make a good living, close to home. The revenue generated from the lease with Department of Hawaiian Home Lands through commercial income, will put Hawaiians into homes, fulfilling their dream of homeownership too, not just newcomers. And that's good for Hawaiians.

The draft EIS address the plan to protect the shoreline, protecting the cultural and archaeological areas as a cultural park and encourages cultural practices. This project will make certain that proper cultural protocols are followed in the design and will work closely with cultural descendants to develop a management plan. And this too is good for Hawaiians.

Jacoby Development's marina project is a long-term project spread out over 15 years long but it also answers many short-term problems of the community. According to the draft EIS, they want to build a new road in the first phase of the project, upgrade the outdated regional wastewater treatment plant and address issues that improve Hawaiian's quality of life.

Mahalo,

Gene Leslie
President

75-5815 Mamalahoa Hwy.
Holualoa, Hawaii 96725

oceanit
innovation through engineering & scientific excellence

July 23, 2007

Gene Leslie, President
Kuakini Hawaiian Civic Club of Kona
75-5815 Mamalahoa Hwy.
Holualoa, Hawaiʻi 96725

Dear Mr. Leslie:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Dated February 6, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement.

We concur with your statements regarding the positive impacts of Kona Kai Ola on the Villages of Laʻi ʻOpua community and on the Hawaiian people. As discussed in EIS Section 1.4.1, it is anticipated that project-generated revenue will help finance DHHL housing programs on other DHHL land, including the Villages at Laʻi ʻOpua, that require expensive infrastructure for water, sewer and roads. Further, Kona Kai Ola will provide an employment base in proximity to the residents of the Villages at Laʻi ʻOpua.

As you noted, the project will include a Hawaiian cultural center. Other project features also support the Hawaiian culture, and these include the support of the Ala Kahakai National Historic Trail system, the mitigation of possible project impacts on anchialine pools, the treatment of archaeological resources as identified by the archaeological consultant, and the incorporation of recommendations of the cultural consultant.

Regarding the timing of infrastructure, we concur with your statement that, while the project will be implemented over a 15-year period, measures to mitigate project impacts will also benefit the general community. For example, in Phase 1 of the project, JDI will not only provide access to the commercial parcel, but also address regional traffic issues through the improvements of the roadway system. JDI plans to improve the intersection of the Queen Kaʻahumanu Highway and the Kealakehe WWTP Access Road. The Kealakehe WWTP Access Road is planned to be realigned and widened to an 80-foot road right-of-way (ROW) that will serve the Commercial Parcel No. 1 and eventually intersect with the proposed Kuakini Highway Extension to the west. Such improvements will ensure that project minimizes its own impacts while improving existing conditions.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

KULA NAI'A
WILD DOLPHIN RESEARCH FOUNDATION, INC.
P.O. Box 6870, Kamuela, HI 96743; Voice/Fax: 808/883-1178; kulanaia@yahoo.com

Jacoby Development, Inc.
Attention: Scott Condra
171 17th St., Ste. 1550
Atlanta, GA 30363

Comments on the Kona Kai Ola Draft Environmental Impact Statement
Kealakehe, North Kona District, Island of Hawaii

Dear Mr. Condra: Feb 4, 2007

As scientists that have studied the spinner dolphin population off the Kona coast for the last 18 years we feel compelled to comment on this Draft Environmental Impact Statement (DEIS) as we find that it is inadequate in addressing mitigation measures and that it completely fails to propose alternatives.

The DEIS provides no study or literature review on the Hawaiian spinner dolphin (*Stenella longirostris*) to assess potential impacts from increased vessel traffic, tourism, construction noise, nor degraded water quality on this protected species. The DEIS does not state that spinner dolphins are protected under the Marine Mammal Protection Act and that "take" (i.e. to harass, hunt, capture or kill or attempt to do so) is unlawful. This lack of information and impact assessment is unconscionable since Hawaiian spinner dolphins have been studied extensively along the Kona Coast (Table 1). In fact, the Kona population of spinner dolphins is one of the most extensively studied of any dolphin population in the world.

	Field Dates in Kona
Norris & Dohl (1980)	1968 - 1972
Norris et. al. (1994)	1979 - 1981
Östman (1994)	1989 - 1992
Driscoll (1995)	1989 - 1992
Forest (2001)	1993 - 1994
Timmel (2005)	2000 - 2001
Courbis (2004)	2002
Östman-Lind et. al. (2004)	2003

Table 1: Spinner dolphin research projects on the Kona Coast, showing field dates in Kona (publication dates are in parentheses).

The DEIS perpetuates a common misconception that spinner dolphins "…at times intentionally congregate near the harbor channel **to take advantage by bow-riding outgoing vessels.**" (emphasis added). In fact spinner dolphins are nocturnal, active at night and resting during the day, with Honokohau Bay being one of only six primary resting areas identified on the Kona Coast (Östman 1994). It is likely that the dolphins used this bay as a traditional resting area long before the existing harbor was built and they still use it today ***in spite*** of the current level of boat traffic, not because the vessels are there. Honokohau Bay is protected from the South swell by Kaiwi Point, making it an ideal resting area for spinner dolphins, who rest in protected bays and coves along the costs of most islands in the Hawaiian island chain (Norris and Dohl 1980). It is the second most frequently used resting area for spinner dolphins along the north Kona Coast (Hookena to Kiholo Bay), as measured by frequency of use (Fig. 1). Between 1989 and 1991 the average milling school size was 42.3 (st.dev. = 30.6; n = 22; range 6 – 135; Östman unpublished).

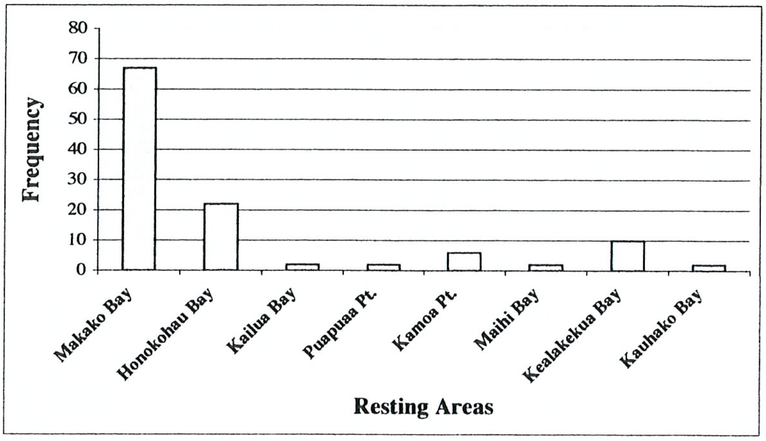

Figure 1: Location of 113 resting spinner dolphin schools between 1989 and 1991.

During boat surveys conducted between May 1989 and November 1991 spinner dolphin schools were observed milling in Honokohau Bay on 22 occasions. They were first sighted between 0718 and 1157 hours and spent an average 2.4 ± 1.6 hours in the bay (range 2 min – 5.25 hours; Östman-Lind unpublished). However, since the boat surveys originated in Honokohau harbor and then covered extensive areas of coastline before returning to the harbor at the end of each survey, this sighting record does not fully describe the frequency nor the actual length of time the dolphins spent resting in the bay, but rather provides an underestimate of use.

The potential for a huge increase in the number of boats entering and exiting the harbor area is especially troubling today, after the huge increase in swim-with-dolphin activity focused on spinner dolphins in the last 15 years. We have documented how the spinner dolphin population on the Kona Coast has drastically modified their behavior over the same time span, now spending their days in more but significantly smaller schools. This in itself may affect their ability to rest during the day, but in addition, they are also being chased out of their traditional resting areas, such as Makako Bay just north of Keahole Point, by the swim-with industry. In this light, Honokohau Bay may have become an even more important resting area in the last 15 years, since swimmers are discouraged from swimming with the dolphins right in the harbor entrance area. Thus, ironically, this resting area may be one of the last areas where the dolphins can still get even a little rest. The increased number of boats present in the harbor will likely include numerous dolphin swim companies, thereby increasing the pressures on the resting dolphin schools even further.

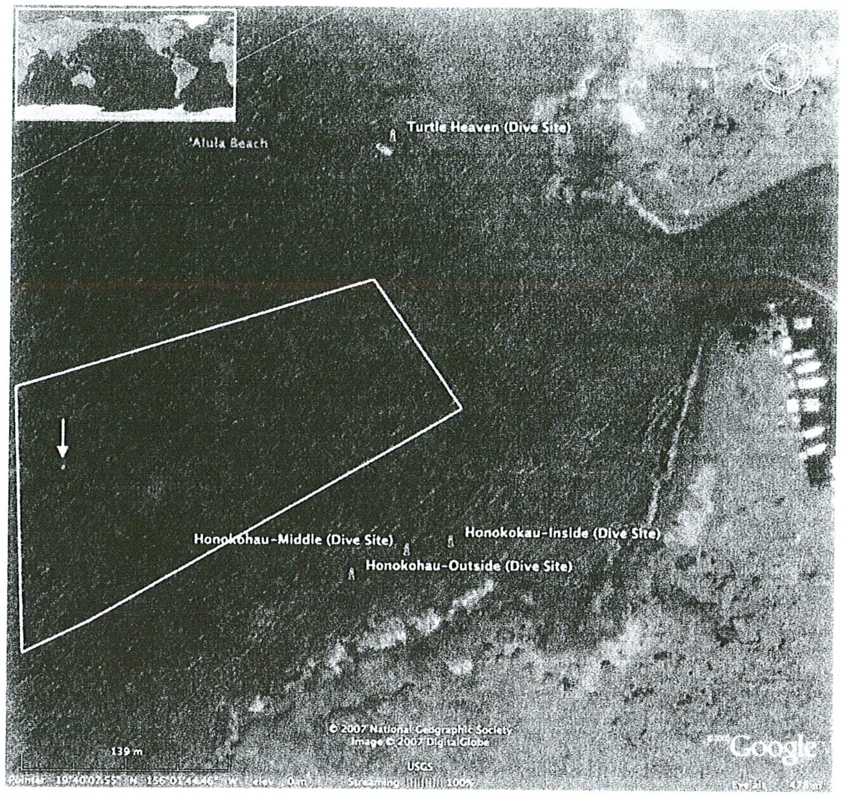

Figure 2. Honokohau Bay spinner dolphin resting area, approximately outlined by the white rhomboid. The Green Buoy (arrow) is some 500 yards offshore of the harbor mouth.

In all of the primary resting areas where we have observed spinner dolphins across the Hawaii island chain, the dolphins use a small, preferred part of a bay or a cove as their core resting area, where they spend most of their time. In Honokohau Bay this core resting area unfortunately overlap with the boat channel between the harbor mouth and the Green Buoy (Fig. 2). Not enough is known about how the boat traffic is affecting the dolphins at this time. It is quite possible that an increase in boat traffic, such as what is being proposed with this current harbor expansion, could be the proverbial straw that broke the camels back, potentially causing the dolphins to abandon this resting area completely.

In addition, other dolphin species sighted in this bay include spotted dolphins (*Stenella attenuata*), pygmy killer whales (*Feresa attenuata*) and bottlenose dolphins (*Tursiops truncatus*). Pilot whales (*Globicephala macrorhynchus*) have been sighted repeatedly just offshore (Östman 1994, Östman et al. 2004, Östman and Driscoll unpublished). These species may be affected in a variety of ways by the planned harbor expansion, none of which are addressed in this DEIS. Other endangered and protected species of particular concern that also are not adequately addressed include humpback whales (*Megaptera novaeangliae*), Hawaiian monk seals (*Monachus schauinslandi*) and both green (*Chelonia mydas*), and hawksbill (*Eretmochelys imbricata*) sea turtles.

This DEIS further neglects to address the increase in anthropogenic noise that will result from the proposed expansion nor does it provide an adequate literature review of this important topic. This will be another important source of potential harassment both during the construction phase and subsequent operation. In the last several years a number of studies looked specifically at acoustic harassment due to anthropogenic noise. One such study focused on the noise created by recreational boating traffic and its impact on bottlenose dolphins in the Intracoastal Waterway of North Carolina. The research project found that the levels of anthropogenic noise recorded during the daytime hours in the study area had the potential to impact dolphin behavior (including mother-calf interactions, feeding, and habitat use) (Haviland 2002). She concluded that it is possible that anthropogenic noise could cause the disruption of behaviors critical to survival and reproduction. The data suggest that dolphins may be avoiding the Intracoastal Waterway (ICW) during times of increased boat traffic. After adjusting for survey effort, bottlenose dolphins were seen less often than expected on weekends (times of heavy boat traffic) than on weekdays throughout the study period. Haviland (2002) further states:

> "Janik (1996) showed that dolphin-watching boats caused bottlenose dolphins to decrease the frequency of their surfacings. Van Parijs and Corkeron (2001) found that Pacific humpback dolphin (*Sousa chinensis*) acoustic communication was significantly affected by boat traffic averaging only one boat per hour. With boat traffic averaging an alarming 36 boats per hour during weekends in the Wilmington Inter-Coastal Waterway, it seems likely that vessel traffic may affect bottlenose dolphin behavior and acoustic communication in this area as well….."
>
> "Acoustic harassment of bottlenose dolphins can occur in several ways: if whistles or parts of whistles are masked by anthropogenic noise, group cohesion and mother-calf interactions could be compromised. For instance, among Pacific humpback dolphins (*Sousa chinensis*), whistle rates of groups containing mother-calf pairs increased more than those without mother-calf pairs after disruption by a boat (Van Parijs and Corkeron, 2001). The increased whistling was hypothesized by Van Parijs and Corkeron (2001) to be due to the acute need mothers have for maintaining contact with their offspring. Elevated received sound pressure levels at the frequencies prevalent in bottlenose dolphin whistles were recorded in the ICW during daytime hours. Thus, bottlenose dolphins utilizing the ICW during times of heavy boat traffic may have a more difficult time communicating than when the ICW is relatively free of anthropogenic noise inputs….."
>
> "This study provides evidence that recreational boat noise is a major factor contributing to environmental noise levels. At times, bottlenose dolphins can be exposed to an almost continual bombardment of anthropogenic noise in a very narrow, constricted portion of their habitat. Future research is needed to evaluate the potential long-term impacts of this noise and to adequately define acoustic harassment, in terms of sound level, frequency range, and length of exposure to sounds of varying intensity, as those dynamics pertain to bottlenose dolphins."

A more recent study on the effects of watercraft noise on the acoustic behavior of bottlenose dolphins, in Sarasota Bay, Florida also found clear evidence that recreational boat noise affects the whistling rates of dolphins (Buckstaff 2004). One major conclusion from this study was that dolphins both increase their whistle rate and swim in tighter groups on being approached by boats. The author compares this to a social defense response to predation. Buckstaff (2004) concludes that "Not only is there a threat of collision, but the behavioral mechanisms to respond to this threat, such as the energy and time required to produce the signal also impose costs (Tyack 2000)."

As noted above not only are spinner dolphins routinely sighted in Honokohau Bay, but so are several other species of dolphins including bottlenose and spotted dolphins. All of these species and the several other marine protected species in the area will face various potential impacts as a result of the tremendous increase in vessel traffic in the harbor area. The complete lack of any attempt to address this critical area of potential impacts by this DEIS is a tremendous oversight.

Finally, the potential impacts to Hawaiian spinner dolphins from the proposed action are also not discussed in Section 3.9.5.2 Anticipated Impacts and Recommended Mitigation. In considering the impact of blasting and pile driving, the document offers an acoustic monitoring program that will "adjust" the construction schedule when marine animals are present. This offers insufficient detail on the criterion for detection and how activities will be altered. Appendix Q of the DEIS suggests that the best method for insuring that no marine mammals are impacted by the construction noise will be to post a "look out at a vantage point near the harbor to insure that no marine mammals are within a quarter of a mile" during blasting. This is a completely inadequate method for insuring that no marine mammals or other protect species are harmed by excessive noise during the construction. It is nonsensical to establish an environmental assessment program for marine protected species which assumes that they will all swim around constantly at the surface and in full view of a single vantage point on land. Nor it is clear what would happen if a humpback whale breached or a monk seal or spinner dolphin surfaced close to shore 30 seconds before a major blast was scheduled. This section certainly does not indicate an honest attempt at determining what the likely impacts will be and to proactively address the risks and dangers of blasting and heavy construction activity which will have a duration of months and possibly years. In fact, the entire Appendix Q is written a desultory manner with an almost cavalier tone as to the seriousness of this issue.

Furthermore, the National Marine Fisheries Service has defined a broadband sound pressure level of 160 dB re 1 μPa- criterion for the threshold of responsiveness. This is the area around a source in which an observable behavioral response to the noise occurs and is considered the onset of Level B harassment for impulsive sounds (NMFS 2000). Recent research involving acoustic monitoring of construction and underwater demolition of coastal marine structures in Sarasota Florida found that some sound source levels reached 160 db re 1 μPa (Dr. Randall Wells, Mote Marine Lab, personal comm.). Because NMFS has defined a broadband sound pressure level of 160 dB re 1 μPa- criterion for the threshold of responsiveness, special permits for incidental take/harassment of marine protected species should be required for this project. Therefore this DEIS clearly does not adequately address the potential for harassment.

In conclusion, it is our professional opinions that this document is woefully inadequate in addressing the potential impacts of the proposed project, it is inadequate in addressing mitigation measures and completely fails to propose alternatives as required under Hawaii Revised Statutes Chapter 343 Section 2. Because the DEIS provides no study or literature review on the Hawaiian spinner dolphin (*Stenella longirostris*) to assess potential impacts from increased traffic, tourism, construction noise, nor degraded water quality on this protected species we view it as deeply flawed. Because the only proposed alternative is the no-action alternative, we must support the no-action alternative.

Literature Cited

Buckstaff, K. 2004. Effects of Watercraft Noise on the Acoustic Behavior of Bottlenose Dolphins, Tursiops truncatus, in Sarasota Bay, Florida. Marine Mammal Science, 20, 709-725.

Courbis S, 2004. Behavior of Hawaiian spinner dolphins (*Stenella longirostris*) in response to vessels/swimmers. San Francisco State University. Thesis.

Driscoll, A. 1995. The whistles of Hawaiian spinner dolphins, *Stenella longirostris*. University of California Santa Cruz. Thesis.

Forest A.M, 2001. The Hawaiian spinner dolphin, *Stenella longirostris* : effects of tourism College Station, Texas: Texas A&M University. Thesis.

Haviland, G.M. (2002). "Recreational boating traffic and environmental noise in the Wilmington, North Carolina Intracoastal Waterway: Possible implications for bottlenose dolphins," M.S. Thesis. University of North Carolina, Wilmington, NC 28403.

Janik, V.M. (1996). "Changes in surfacing patterns of bottlenose dolphins in response to boat traffic," Marine Mammal Science, 12, 597-602.

National Marine Fisheries Service (NMFS), 2000. Environmental assessment on the effects of controlled exposure of sound on the behavior of various species of marine mammals.

Norris, K. S. and T. P. Dohl. 1980. Behavior of the Hawaiian spinner dolphin, *Stenella longirostris*. Fish. Bull. 77: 821-49.

Norris, K. S., B. Würsig, R. S. Wells, M. Würsig, S. Brownlee, C. Johnson and J. Solow. 1994. The Hawaiian spinner dolphin. Berkeley: University of California Press.

Östman, J. 1994. Social organization and social behavior of Hawaiian spinner dolphins (*Stenella longirostris*). University of California Santa Cruz. 114 p. Dissertation.

Östman-Lind, J., A. D. Driscoll-Lind and S. H. Rickards (2004) Delphinid abundance, distribution and habitat use off the western coast of the Island of Hawai'i. Admin Report. No. LJ-04-05C to NMFS, SWFSC.

Timmel, G.B. (2005) Effects of human traffic on the movement patterns of Hawaiian spinner dolphins, *Stenella longirostris,* in Kealakekua Bay, Hawaii. San Francisco State University. Thesis.

Tyack, P.L. 2000 Functional aspects of cetacean communication. Pp 270-307 *in* Mann, J., R.C. Connor, P.L. Tyack and H. Whitehead (Eds.). Cetacean Societies: Field studies of dolphins and whales. Chicago: Univ. Press

Van Parijs, S.M., Corkeron, P.J. (2001). "Boat traffic affects the acoustic behavior of Pacific humpback dolphins, *Sousa chinensis*," Journal of the Marine Biological Association of the United Kingdom, 81, 553-538.

Sincerely,

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July 23, 2007

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Ania Driscoll-Lind, M.S.
Kula Nai'a Foundation
P.O. Box 6870
Kamuela, Hawai'i 96743

Dear Messrs. Östman-Lind and Driscoll-Lind:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Dated February 4, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Each of your comments is italicized, followed by our response.

In response to DEIS comments, Marine Acoustics, Inc., (MAI) was retained to conduct three studies, as follows:

- Description of Marine Mammal and Sea Turtles
- Ambient Noise Measurements and Estimation Study
- Acoustic Analysis of Potential Impacts

Collectively, these studies have significantly increased the EIS discussion on the affected marine environment and noise impacts that may be generated by the proposed project. Information sources are accurately represented, and modeling techniques provide a reliable indication of possible project-related impacts.

These studies respond to your comments and we are attaching Section 3.9.4, Marine Mammals and Sea Turtles (Attachment 1), and including all three studies as an attachment to this letter (Attachment 2 – Appendix S, Marine Mammal and Sea Turtle Species by MAI; Attachment 3 – Appendix T-2 Ambient Noise Measurements and Estimation Study by MAI; Attachment 4 – Appendix T-3 Acoustic Analysis of Potential Impacts by MAI).

Regarding your comments on alternatives, the alternatives analysis has been expanded in response to DEIS comments. As explained in the DEIS, the agreement between JDI and the State of Hawai'i established a required scope and scale of the project for which the impact analysis was provided. Several comments have addressed the fact that alternatives other than the No Project Alternative were not addressed in the DEIS Section 2, Alternatives Analysis.

We are of the position that alternative actions other than a No Project alternative are not currently feasible without an amendment to the agreement with the State. Agency and public comments in response to the DEIS, as well as additional information generated as a result of inquiry into issues raised by the comments, have been helpful in identifying alternative actions that will serve the State's goal of providing additional marina slips for the Kona area.

These alternative actions also serve to reduce or mitigate anticipated effects of the proposed development.

Thus, agencies such as the Land Division of the Department of Land and Natural Resources, the U.S. Department of the Interior Fish and Wildlife Service, the Planning Department of the County of Hawai'i, and the Office of Environmental Quality Control (OEQC), as well as community organizations have commented that a reduced scale marina and related facilities should be considered. The OEQC has also asked that the alternative of a reduced scale project be evaluated under the assumption that DHHL may determine that a downsized project would be preferred.

In response to these comments on the DEIS and in consideration of measures to mitigate anticipated impacts, the EIS Section 2, Alternatives Analysis, has been revised to describe the following alternatives, which are discussed in more detail in the EIS:

- Alternative 1 is a project involving a 400-slip marina, 400 hotel units, 1,100 time-share units, and commercial and support facilities. This alternative would enhance water quality and avoid the need to widen the existing harbor entrance channel, as well as reduce traffic and socioeconomic impacts.
- Alternative 2 is an alternative that had been previously discussed, but not included in the proposed project that includes an 800-slip harbor and a golf course.
- Alternative 3 is the no-action alternative.

A comparison between impacts related to the proposed project concept and impacts related to Alternative 1 indicates that a reduction in the acreage and number of slips in the marina, as well as the reduction in hotel and time-share units, would generate less environmental, traffic, social and economic impacts. Although positive economic impacts would be reduced, Alternative 1 can be considered as a preferable alternative because of reduced environmental impacts. However, while it can be concluded that the 25-acre marina in Alternative 1 would be the preferred size, the DLNR agreement establishes the size of the marina at 45 acres and 800 slips. An amendment to the DLNR agreement is required in order to allow Alternative 1 to proceed. Hence, selection of Alternative 1 is an unresolved issue at this time. The additional EIS text that includes the added EIS Section 2, Alternative Analysis, is contained in Attachment 5 of this letter.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

The increased level of fisheries knowledge has spawned an atmosphere of stewardship in the general charter-boat fishing community. With catch and release programs returning upwards of 40 percent of the Kona catch back to the ocean there is an obvious awareness that the value of catching the fish is often far greater than the value of selling it. It is ~~recommended~~ proposed that facilities and programs to foster continued stewardship, fisheries science, tracking of all fish catch, and educational programs be implemented in the design of the new marina facilities.

The proposed marina, marina support facilities, public marina promenade, fishing club, and marine science center will provide a venue for implementing the following efforts:

- Efforts to promote tag and release will be fostered through public education and the implementation of more "Catch and Release – Only" tournaments.
- Promote management through catch limits to possibly include slot weight catch limits, ~~ie.~~i.e. must tag & release animals between 250–950 pounds
- Promote various other stewardship measures relating to fisheries conservation.

~~3.9.5~~3.9.4 Marine Mammals and Sea Turtles

In addition to water quality, which is discussed in Section 3.9.1.3, other environmental impacts that may affect marine mammals and sea turtles include noise and vessel collisions. The following sections describe existing conditions, potential impacts and suggested mitigations to prevent negative impacts to marine mammals and sea turtles from noise and vessel collisions.

~~3.9.5.1~~3.9.4.1 ~~Existing Conditions~~Affected Environment

A number of marine mammal and turtle species are found in Hawaiian waters near the Kona Kai Ola project site. Detailed information on the abundance, behavior, threats to the species, hearing ability and vocalization data is provided for all species in Appendix S. Data on the most prevalent endangered species and species of particular interest are summarized here.

Humpback Whales: The population of h~~H~~umpback whales (*Megaptera novaeangliae*) around Hawai'i was estimated to be between ~~are mammals and belong to the baleen whale suborder, *mysticeti*. An estimated~~ 4,500-6,500 in 2000 ~~whales migrate between subpolar Alaska and Hawai'i each year~~ (Mobley et al 2001). The population growth rate between 1993 and 2000 is estimated to be seven percent indicating that the population is recovering from its dramatic reduction due to commercial whaling. It is worth noting that this is considered a high rate of increase for a mammalian species.

The highest densities of animals are found within the 100 fathom isobath. ~~and seek refuge in shallow waters close to shore.~~ Most humpbacks off Hawai'i are found north of Honokōhau in the waters of the Hawaiian Islands Humpback Whale National Marine Sanctuary. Nevertheless, they are commonly seen off Honokōhau in winter months. Humpbacks are not deep diving animals. Whales in Hawai'i typically dive to less than 100 feet, although occasional deeper dives are possible (Hamilton et al. 1997)The whales breed and give birth while in Hawai'i during the winter months, and migrate north to feed each spring.

~~Humpback whales found in Hawai‘i’s waters are part of a global population of Humpback whales that was reduced by over 250,000 individuals, or 90 percent, due to hunting (Johnson et al 1984). In 1966, the International Whaling Commission instituted a moratorium on all hunting of whales globally, and populations have begun to rebound. The North Pacific population of humpback whales, with a population of approximately 15,000 prior to hunting, is recovering from an estimated low of 1,000 individuals (Rice 1978, Johnson et al 1984). Humpback whales are also protected under the Federal Endangered Species Act. It is estimated that Hawai‘i’s population of Humpback whales is growing by 7% annually (Mobley et al 2001).~~

Congress designated the Hawaiian Islands Humpback Whale National Marine Sanctuary (HINMS) on November 4, 1992, and was followed by the Governor of Hawai‘i’s formal approval in 1997. The Sanctuary’s purpose includes protecting humpback whales and their habitat within the Sanctuary, educating the public about the relationship of humpback whales to the Hawaiian Islands marine environment, managing the human uses of the Sanctuary, and providing for the identification of marine resources and ecosystems of national significance for possible inclusion in the Sanctuary. The sanctuary is approximately four nautical miles north of Honokōhau Harbor.

~~While waters surrounding the main Hawaiian islands constitute one of the world’s most important North Pacific humpback whale habitats (Calambokidis et al. 1997), the Sanctuary actually encompasses five noncontiguous marine protected areas across the Main Hawaiian Islands, totaling 1370 square miles. Almost half of this area surrounds the islands of Maui, Lāna‘i and Moloka‘i. Smaller areas are designated on the North shore of Kaua‘i, North and Southeast shores of O‘ahu, and Hawai‘i’s Kona Coast. On Hawai‘i’s Kona Coast, the Sanctuary encompasses the entire northwest-facing coast, consisting of submerged lands and waters seaward of the shoreline to the 100-fathom (183 meter) isobath from ‘Upolu Point southward to Keāhole Point, which is approximately four nautical miles north of Honokōhau Harbor.~~

Whales have very sensitive hearing, so any loud underwater sound has ~~may have~~ the potential to disturb these animals. ~~Vessel collisions are also a concern with whales.~~ Playback experiments have estimated that humpback whales will respond to biologically meaningful sound at levels as low as 102 dB re 1 µPa, a level that is similar to background ambient noise (Frankel et al. 1995). Increases in vessel numbers will lead to an increase in noise from operating boats. However, even at its greatest predicted increase, the median sound level from active boats is not expected to raise sound levels to an intensity that would be considered an impact (Level B take) to marine mammal population (See Appendices T-2 and T-3). Humpback whale song ranges from 20 Hz to over 10,000 Hz, with most acoustic energy typically concentrated in the 100-1000 Hz range. This vocal production and the anatomy of their inner ear indicate that these animals are most sensitive to low-frequency sound (Ketten 1992).

Numerous studies have shown that human activity can affect humpback whale behavior, including vessel activity (Bauer 1986; Norris 1994; Corkeron 1995; McCauley et al. 1996; Scheidat et al. 2004), oceanographic research (Frankel and Clark 2000; Frankel and Clark 2002), and sonar (Miller et al. 2000; Fristrup et al. 2003). If the humpback whale population continues to expand at its present rate (8%/year) it can be expected that greater numbers of whales will extend into waters off the Kona Coast. This is likely to increase the demand for whale watching vessels from the new harbor and this increase will have a negative impact on the whale population expansion. The increase in both the number of vessels and number of whales increases the chance for collisions.

Vessel collisions are also a major concern. The majority of whale strikes occur~~red~~ where whales and boats are most common, such as in ~~and boats watching are common as in~~ shallow waters between Lānaʻi and Maui. In a recent study, three of ~~conducted by NMFS on~~ 22 ~~27~~ recorded whale-vessel collisions ~~strikes~~ in the main Hawaiian Islands ~~, only two were recorded~~ occurred off the Kona coast. (Lammers et al. 2003). That study also found that 14 of the 22 collisions were reported between 1995 and 2003. This observed increase may result from more awareness of the issue, or from the greater number of both whales and vessels in Hawaiian waters. In Hawaiʻi, data from 1972 to 1996 reveal at least six entanglements of humpback whales in commercial fishing equipment (Mazzuca et al. 1998). These data also indicate an increasing trend of entanglement since 1992 and a three-fold increase in death and entanglement occurrences related to human activity in 1996.

It is highly unlikely that humpback whales will approach to within the Level A or Level B impact "take" zones created by the explosive blasts of harbor construction. However, the sounds generated by these explosions will be within the frequency hearing range of humpback whales and could potentially be heard by whales between Kona and Maui. Modeling predicts that the maximum sound level two miles offshore the site is less than 150 dB re1 μPa, which is less than the threshold for Level B impacts. As the explosions are planned to occur daily for up to 9 months, the cumulative impact of this noise must be considered if construction is anticipated when whales are expected in the area (December 15 – March 30).~~In one instance, a fishing boat was pulling in a catch and was lifted by a whale. In the other instance, a whale was struck by a dive boat heading towards its diving spot.~~

Dolphins: A number of dolphin species are found in the waters near Honokōhau Harbor. Detailed information on all of these can be found in Appendix S. Spinner dolphins (*Stenella longirostris*) are regularly seen in shallow water and in close proximity to the project site. ~~Spinner dolphins (*Stenella longirostris*), often inhabit waters within Honokōhau Bay and at times intentionally congregate near the harbor channel to take advantage by bow-riding outgoing vessels. "Spinners" common name stems from their habit of leaping clear of the water and twirling in the air.~~ They are the smallest dolphins typically seen in Hawaiʻi, with a mature size of 6 feet in length and 160 pounds.

Spinners school in pods of a few animals to ~~100~~ 180 or more, with pod sizes of 1-20 being most common (Östman-Lind et al. 2004). They ~~and show community behavior when~~ feed~~ing in~~ on mesopelagic fish, squid and shrimp in deep water at night, and rest in nearshore shallow waters during the day (Norris and Dohl 1980; Benoit-Bird et al. 2001). ~~when they come near shore to play and rest. On the Island of Hawaiʻi, Kealakekua Bay is one location of almost daily spinner visits, but they frequent many other bays along the coast and regularly rest in Honokōhau Bay.~~ There are seven primary resting areas along the Kona coast of Hawaiʻi, including Honokōhau Bay, where spinners are regularly seen near the harbor entrance (Östman-Lind et al. 2004). There is some evidence that the spinner dolphins may be resident to the area (Östman-Lind et al. 2004), making them more susceptible to repeated disturbance.

The hearing ability of spinner dolphins has not been measured. However, hearing of the related striped dolphin (*Stenella coeruleoalba*) was measured between 500 Hz and 160 kHz, with maximum sensitivity at 64 kHz (Kastelein et al. 2003). The hearing response of this single dolphin was less sensitive below 32 kHz than other dolphins. ~~As all marine mammals have very sensitive hearing, any loud underwater sounds have the potential to disturb dolphins as well. Given the sporting habit of spinners and other dolphins of bow-riding ships and small boat wakes, they are apparently not overtly impacted by vessel traffic noises.~~

Despite their limited sensitivity to low frequency sound, spinner dolphins have been shown to be impacted by human activity. Examples include interruption of resting activity and increases in the number of higher energy behaviors (Luna-Valiente and Bazúa-Durán 2006). Numerous studies describe changes in distribution (Haviland-Howell et al. in press) and short-term behavioral changes of dolphins in response to vessel traffic (Bejder et al. 1999; Scarpaci et al. 2000; Gregory and Rowden 2001; Nowacek et al. 2001; Van Parijs and Corkeron 2001; Ritter 2002; Lusseau 2003; Ng and Leung 2003). However, it has been established that for at least one population of bottlenose dolphins, these repeated short-term effects translate into long-term detrimental effects on the affected population (Bejder et al. 2006a; Bejder et al. 2006b).

In Hawaiʻi, some entanglements of spinner dolphins have been observed (Nitta and Henderson 1993; Rickards et al. 2001) but no estimate of annual human-caused mortality and serious injury is available. A habitat issue of increasing concern is the potential effect of swim-with-dolphin programs and other tourism activities focused on spinner dolphins around the main Hawaiian Islands (Östman-Lind et al. 2004).

Hawaiian Monk Seals: Endangered Hawaiian Monk Seals (*Monachus schauinslandi*, Hawaiian Name: ʻIlio holo I ka uaua)~~ are on the endangered species list~~ . ~~They~~ are rare, but not unknown along the Kona Coast. ~~Fortunately, monk seals are air breathing and spend the majority of their time above water where they are easily observed. If a monk seal is reported observed in the area, Kona Kai Ola would work with relevant agencies to protect the seal.~~ Most monk seals are found in the Northwest Hawaiian Islands, but recent aerial surveys estimated that there are 52 seals in the main Hawaiian Islands (Baker and Johanos 2004). There have been 13 sightings between 2003 and 2006 in the vicinity of Kaloko-Honokōhau National Historical Park (NOAA protected species division data) indicating regular, albeit low-level use of these areas by monk seals. ~~One~~Two birth on the Island of Hawaiʻi have~~s~~ been reported (Baker and Johanos 2004).

The best population estimates for Hawaiian monk seals (as of 2003) was 1,244 (Carretta et al. 2004). However the population is currently showing a decline that has been continuing since the 1950s (Antonelis et al. 2006).

Underwater hearing in the Hawaiian monk seal has been measured between 300 Hz to 40 kHz. Their most sensitive hearing is at 12 to 28 kHz, which is a narrower range compared to other phocids. Above 30 kHz, their hearing sensitivity drops markedly (Thomas et al. 1990).

Monk seals are very intolerant of human activity and are easily disturbed. When the U.S. military inhabited Sand Island and the Midway Islands and Kure Atoll, the monk seals disappeared until after the military left. Monk seals prefer to be solitary animals (Reeves et al., 2002).

Sea Turtles: Five species of sea turtles are known to frequent Hawaiian waters, with Hawaiian green sea turtles (*Chelonia mydas*) by far the most abundant at 97% of the total numbers, hawksbill turtles (*Eretmochelys imbricata*, 1.7% of total), olive ridley turtles (*Lepidochelys olivacea*, 0.8%), and occasional sightings of leatherback (*Dermochelys coriacea*) and loggerhead sea turtles (*Caretta caretta*, Chaloupka, et al, 2006, from stranding reports). Green sea turtles are the most plentiful large marine herbivore in the world and have experienced a very successful population recovery in Hawaiian waters since 1974 when harvest was outlawed in Hawai‘~~i~~i, and 1978 when they became protected under the Endangered Species Act (Balazs, et al. 2004). Both green sea turtles and hawksbills are known to breed and nest on beaches within the main Hawaiian Islands, and have a 25-30 year generation time with a life span of 60-70 years (Balazs et al 2004). Total population numbers of green sea turtles in the Hawaiian archipelago have not been estimated, but the population has at least tripled since the 1970s and may now be approaching the carrying capacity of the islands (Chaloupka, et al. 2006).

Bartol et al. (1999) measured the hearing of juvenile loggerhead sea turtles using auditory evoked potentials to low-frequency tone bursts found the range of hearing to be from at least 250 to 750 Hz. The frequency range that was presented to the turtles was from 250 Hz to 1000 Hz (Bartol et al. 1999).

Most recently, Bartol and Ketten (2006) used auditory evoked potentials to determine the hearing capabilities of subadult green sea turtles and juvenile Kemp’s ridleys. Subadult Hawaiian green sea turtles detected frequencies between 100 and 500 Hz, with their most sensitive hearing between 200 and 400 Hz. However, two juvenile green turtles tested in Maryland had a slightly expanded range of hearing when compared to the subadult greens tested in Hawai‘i. These juveniles responded to sounds ranging from 100 to 800 Hz, with their most sensitive hearing range from 600 to 700 Hz. The two juvenile Kemp’s ridleys had a more restricted range (100 to 500 Hz) with their most sensitive hearing falling between 100 and 200 Hz (Bartol and Ketten 2006).

Adult ~~G~~green turtles are primarily herbivorous often seen on reefs as deep as 100+ feet but much more common in shallower waters. Foraging behavior of green turtles is well documented and in Hawai‘i is typically characterized by numerous short dives (4 to 8 min) in shallow water (typically less than 3 m) with short surface intervals (less than 5 sec) (Rice et al. 1999).Resting periods are characterized by longer dives (over 20 min) in deeper water (4 to 40 m) with surface intervals averaging 2.8 min (Rice et al. 1999). The amount of time that turtles spend foraging versus resting is still largely unknown. Green turtles in Hawai‘i frequently use small caves and crevices in the sides of reefs as resting areas, and spend significant amounts of time on the tops of reefs (Balazs et al. 1987). Green turtles are known to be resident in Kiholo Bay, Hawai‘i (Balazs et al. 2000), and presumably other areas as well, potentially increasing their susceptibility to vessel collision and/or repeated disturbance. Two turtle “cleaning stations” have been reported near the mouth of Honokōhau Harbor. ~~During periods of calm water green sea turtles are often seen over very shallow reef flats where the choicest of algae are to be found. While some turtles may "rest" upon the surface, it is much more common to find them in small caves or wedged between coral heads where they are less subject to shark attacks. Green sea turtles may occasionally be seen far at sea (they nest in French Frigate Shoals in the NW Hawaiian Islands), but they are much more prevalent over the shallow shoreline areas where they forage for food.~~

Vessel collisions and potential noise impacts are a concern with regard to turtles. In a study of 3,861 turtle strandings in the main Hawaiian Islands from 1982 – 2003 (Chaloupka, et al. 2006), boat strikes accounted for only about 2.7 percent of the cases and were almost always fatal (95 percent). Entanglement in gill nets accounted for about six percent of strandings and also had a high rate of mortality (75 perce~~d~~nt). Hook and line entanglement (seven percent of strandings) was much less likely to result in the death of the turtle (52 percent mortality). At least 20 green sea turtles have stranded in Honokōhau Harbor or along the boundaries of Kaloko- Honokōhau National Historical Park. ~~Of all 3,861 strandings recorded in the Main Hawaiian Islands since 1982 only three occurred within 10 miles north or south of Honokōhau Harbor (Balazs, personal communication from NMFS database).~~

Recent increases in longline fisheries may be a serious source of mortality. Greens comprised 14% of the annual observed take of all species of turtles by the Hawai‘i-based longline fishery between 1990 to 1994 (NMFS 1998a). Over the period of 1994 to 1999, it was estimated that an annual average of 40 green sea turtles were caught by the Hawai‘i-based longline fishery (McCracken 2000).

Recent proliferation of a tumorous disease known as fibropapillomatosis (Herbst 1994) may reverse improvements in the status of the Hawaiian stock (NMFS 1998a), although recent modeling suggests that population levels continue to increase despite the disease (Chaloupka and Balazs 2005). The disease is characterized by grayish tumors of various sizes, particularly in the axial regions of the flippers and around the eyes. This debilitating condition can be fatal and neither a cause nor a cure has been identified.

Hawksbill turtles (Eretmochelys imbricate) are observed less often than green sea turtles near Honokōhau. About 20-30 female hawksbills nest annually in the Main Hawaiian Islands (NMFS 1998b). In 20 years of netting and hand-capturing turtles at numerous nearshore sites in Hawai'i, only eight hawksbills (all immatures) have been encountered at capture sites including Kiholo Bay and Ka'u (Hawai'i), Palo'ou (Moloka'i) and Makaha (O'ahu) (NMFS 1998b). It was only recently discovered that hawksbills appear to be specialist sponge carnivores (Meylan 1988). Previously they had been classified as opportunistic feeders on a wide variety of marine invertebrates and algae.

Increasing human populations and the concurrent destruction of habitat are also a major concern for the Pacific hawksbill populations (NMFS 1998b). Hawksbill turtles appear to be rarely caught in pelagic fisheries (McCracken, 2000). However, incidental catches of hawksbill turtles in Hawai'i do occur, primarily in nearshore gillnets (NMFS 1998b). The primary threats to hawksbills in Hawai'i are increased human presence, beach erosion and nest predation (*e.g.*, by mongooses) (NMFS 1998b).

~~3.9.5.2~~3.9.4.2 Anticipated Impacts and ~~Recommended~~ Proposed Mitigation

A complete analysis of the in-air and in-water potential acoustic impacts from the construction of the Kona Kai Ola small boat harbor was completed by Marine Acoustics, Inc.(MAI) and is included in this document as Appendix T-3. In conducting this analysis, the best available scientific, environmental, geologic, and meteorological data were obtained and used to calculate the acoustic transmission loss (TL) and subsequently to predict the received levels (RLs) at the five receiver sites. State of the art acoustic propagation models were employed in this analysis to determine in-air and in-water TL. MAI used the Acoustic Integration Model© (AIM©) to assess the impact of the predicted acoustic sound field on the species of marine mammals that could conceivably occur near the Kona Kai Ola project site.

The conclusion of that report determined that the criteria for Level A impacts to marine mammals for either in-air or in-water conditions at the receiver sites were never exceeded for the model source and receiver locations for non-blasting activities. However, these thresholds could be exceeded by the explosive blasting used to create the new harbor. For both in-air or in-water acoustic propagation, this only occurred when an animal was within about 200 meters (656 ft) of the explosion, This condition could only occur when the explosive source was at locations farthest north in the new harbor and closest to the existing harbor. This condition mandates that a safety range out to at least 200 meters (656 ft) of the source be shown to be clear of all marine mammals and sea turtle prior to each blast to preclude potential Level A takes.

The MAI report indicated that the in-air RLs for the explosive sources would exceed the assumed 100 dBA threshold for Level B harassment of pinnipeds (seals) for ranges out to about 0.4 nm (i.e., 800 yds [731 m]). This threshold is nominally for pinnipeds, but it should be extended to surface resting marine mammals and basking or beached sea turtles. Therefore, an in-air safety buffer of at least 731m from any explosive source is proposed, that should be maintained and found clear of marine mammals and basking or beached sea turtles prior to any blasts. It should be noted that although a receiver site was not modeled specifically in the existing harbor, that area is often within the range of this safety buffer and that extra care should be taken to ensure that no marine mammals or sea turtle are in the existing harbor prior to any blast. Analysis of the most restrictive Level B in-water explosive threshold shows that it is only exceeded when an animal is closer than 300 m (984 ft) from the explosive source.

Although the possibility exists for Level B impacts to marine mammals, based purely on the sound fields produced by the explosive blasts, analysis is the marine mammal distribution and movement as predicted by the AIM model, indicates that this is very unlikely situation. Therefore, it is expected that there will be much less than 0.5 Level B takes, with or without mitigation. But the mitigation safety buffer must still be enforced to preclude the unlikely possibility of marine mammals or sea turtle being near the explosive sources when they are used.

It should be recognized that several mitigation measures are already built into the proposed project. For example, the proposed practice to maintain a rock "dam" separating the construction site from the existing harbor reduces acoustic energy propagating to area potentially containing marine mammals or sea turtles. Also, this dam precludes animals from entering the construction area. This dam or land-bridge will be in place for all drilling and dredging activities, except for the removal of the land bridge itself.

Several other possible methods of mitigation are available to the Kona Kai Ola project, and feasibility, practicality, and benefit will be discussed with the National Marine Fisheries Service (NMFS) during consultation, and may be implemented subsequent to that consultation. The first possible mitigation technique is to acoustically monitor the potentially impacted areas during construction to: a) assess the accuracy of the modeling and b) to interact proactively with construction personnel to ensure that the identified threshold levels are not exceeded. Although the best available science and data was used to model the acoustics of the area, numerous conservative assumptions needed to be built into the modeling. By monitoring the actual levels received, in-situ corrections/updates to modeled parameters could potentially reduce the built--in conservativeness and reduce the potentially impacted areas. For example, the modeling assumes that all of the small voids in the bedrock are water-filled and therefore impart minimum attenuation on the acoustic signal as it propagates through. If even a small percentage of the voids are gas-filled, this attenuation would increase greatly and the impacted area would be reduced.

Another possible mitigation technique would be to augment the land-based visual observer, who it is assumed would verify that the area was clear the animals, with boat-based observers. This would increase the effectiveness of recognizing the presence of marine mammals and sea turtles in the potentially affected areas.

Additionally, interactions with the construction teams to alter the blasting methods modeled could potentially mitigate and reduce acoustic impacts to marine animals. A blasting expert will be consulted to develop a discontinuous non-linear blasting plan that will optimize cancellation of the explosion pressure wave into the marine environment. Examples of possible changes include: reducing charge size, reducing the depth drilled and blasted during any blast, reducing the number of blast holes or the volume of each blast, etc. The combination of these techniques with acoustic monitoring could potentially allow a large portion of the northern third of the harbor to be excavated with little or no potential impact to marine animals.

Interactions with NMFS during the consultation period will be used to examine these or any other techniques which may be identified. Also, the project is requesting help in identifying any possible method known to NMFS to establish and maintain turtle exclusion areas, especially in the existing harbor, without harassing the turtles. It may become apparent during those consultations that even with the identified buffer zones and mitigation techniques that an Incidental Harassment Authorization (IHA) is required, especially for the northern third of the proposed harbor.

Marine Acoustics, Inc. also completed a study of the expected ambient noise levels in Honokōhau Bay as a result of the increased vessel traffic from the expanded harbor. This report is included in this document as Appendix T-2. That report concluded that the average maximum daytime ambient noise levels would be expected to increase about 9.7 dB across the frequency spectrum from 100 Hz – 2 kHz, with the quadrupling of the vessels using the expanded harbor (i.e., the proposed action). Although significant, this increase would occur primarily during daylight hours, and the predicted median ambient noise would still be below 100 dB for all frequencies. The other significant factor is that there will be a quadrupling of the number of localized (i.e., small) individual sound fields in the area. These sound fields surround the individual boat that are contributing to the overall ambient noise. Noise levels in excess of 120 dB extend out to about 550 m (1804 ft) from these boats, with even high levels at closer ranges. Short of actual collisions with animals, Level A impacts are unlikely for noise levels typically generated by small boats. The Level B threshold nominally extends to approximately ten meters around each boat (depending on equipment such as size of motor, conditions of propeller and other equipment). Therefore potential Level B impacts to marine mammals and sea turtles would only occur within this range. Therefore, the chance for potential Level B impacts is small.

Completion of the harbor expansion project will increase the vessel traffic crossing the Hawaiian Islands Humpback Whale National Marine Sanctuary, the southern boundary of which is approximately four nautical miles north of Honokōhau Harbor. At a time when the whale population is growing, an increase of vessel traffic may increase the likelihood of vessel-whale collisions. Related to vessel traffic, an increase in whale watching activities is also likely. Vessels participating in these activities directly seek out higher whale population densities, increasing the likelihood of collisions, but also having the potential for disrupting whale behaviors such as resting, courting, mating or birthing.

As noted earlier, however, of the ~~27~~ 22 recorded whale strikes in the main Hawaiian Islands, only ~~two~~ three were recorded off the Kona coast. Sanctuary managers may need to implement additional regulations for private and/or commercial activities directly involving whale encounters. Mariner education programs, already in place as part of Sanctuary operations, will help to mitigate possible impacts due to increased boaters, and the proposed marine science center will complement Sanctuary educational programs.

~~Impacts to turtles may occur during construction of the marina. Since most of the marina will be excavated in a land-locked condition, turtles will not be subject to any potential harm from excavation. Experience during construction of the Ko Olina lagoons, and the expansion of the Barber's Point Harbor on O‘ahu indicate that turtles abandoned their offshore (30-100 ft depth) resting habitats and concentrated in very near shore waters adjacent to the harbor and, at times, even within the active construction areas as soon as blasting and excavation began. Although no turtle injuries or mortalities were reported during either of those harbor construction activities, this should serve as a cautionary example for future coastal construction activities.~~

An increased level of impacts to turtles from increased boating and fishing activities may occur. ~~The level of impact documented by National Marine Fisheries Service is limited to only three turtle mortalities confirmed, since 1982, from a total of 3,861 strandings throughout the Main Hawaiian Islands~~. Of the 3,861 turtle strandings recorded from the Main Hawaiian Islands since 1982, 75% were mortalities, and of these about 4% (~est. 116, from Figure 3 of Chaloupka, et.al.) were from boat strikes and 3 of these occurred within 10 miles of Honokōhau Harbor. Data from NPS staff at the adjacent Kaloko-Honokōhau National Historical Park show a total of 20 strandings within the parking (19) and harbor (1) between 2000 and 2006 with one attributed to boat strike and 6 to fishing gear entanglement. Eleven additional gear entanglements and one additional boat strike were also recorded but not listed as strandings. Human caused impacts from fishing and boat strikes are anticipated to increase as turtle populations continue to increase and boating /fishing activities increase with the expanding harbor.

~~It would appear that anthropomorphic impact to turtles from boat strikes and fishing activities is very low along the Kona Coast adjacent to the existing harbor. It is likely that this is due in part to the relatively steep ocean bottom that limits the habitat of the turtles to the very nearshore areas away from the areas of heavy boat traffic~~. Recognition by the general public that sea turtles are protected ~~also~~ puts a heavy social pressure on fishermen who may inadvertently catch a sea turtle, and is likely a factor in the recovery of this species. Although no adverse impacts to turtles have been documented within the existing harbor, the close proximity of boats and turtles in this environment is cause for concern.

~~During land-based construction of the marina, no mitigation is necessary as previous experience has shown that turtles are not adversely impacted by these activities.~~ Once the land bridge is open, ~~however,~~ it is highly likely that turtles will be attracted into the new harbor and be subject to potential harm from in-water construction of piers or other facilities. During this period of time and until the harbor is operational, ~~it is recommended that a~~ mesh barrier will be ~~is~~ erected across the new harbor channel to exclude turtles from the inner basin. The mesh size needs to be selected in consultation with ~~regulatory~~ NMFS ~~agencies~~ to make sure it does not entangle turtles.

As the new harbor area will ~~likely~~possibly attract turtles to the basin (similar to the existing harbor) and an increase in boat traffic is expected in the harbor channel there will be an increased possibility of turtle strikes within the channel and new harbor area. To minimize this possibility it is ~~recommended~~ proposed that educational signs be erected around the harbor describing the turtles and warning boaters to be cautious while traversing harbor channels. The slow no-wake lane in the entrance channel should also be strictly enforced and the State should consider extending the slow no-wake zone further out to the first green buoy.

~~As all marine mammals have very sensitive hearing, any loud underwater sounds have the potential to disturb these creatures. Potential underwater acoustics may impact marine mammals and sea turtles during construction activities, such as blasting and pile driving. Appendix Q contains a study of underwater noise impacts during the construction and operation of the proposed project.~~

~~To mitigate impacts related to noise generated by construction activities, such as blasting and pile driving, a program to monitor sound levels and the presence of marine mammals and sea turtles will be implemented. Construction activities will be adjusted if whales, monk seals, dolphins or sea turtles are in the vicinity. Further, keeping the land bridge closed to the ocean until all major pile driving and blasting are completed will further avoid adverse impacts.~~

~~Increased boat traffic will result in increased low intensity sounds in the harbor area and along transit routes. The ecological role played by anthropomorphic sound in the marine environment has recently received heightened awareness. Evidence from declassified Department of Defense ocean recordings off of San Diego show that background sound levels off-shore of the harbor have increased approximately ten-fold in 30 years. Much of this increase in sound level has been ascribed to large ship traffic. While intense sound levels can adversely impact marine mammals and potentially other species, this level of sound pressure has not been shown to be produced by the small boats envisioned to occupy the new marina.~~

~~Adverse impacts of lower intensity noise, such as from small boat engines, have been very difficult to quantify. No definitive information is available to determine the level of impact produced by increase in small boat generated noise on fish, marine mammals and sea turtles. Given the sporting habit of spinners and other dolphins of bow-riding ships and small boat wakes, they are apparently not overtly impacted by vessel traffic noises.~~

~~However, boat-generated noises can be reduced by slowing boats to "slow no-wake" in the main traffic lane of the entrance channel. The State could also consider extending the "slow no-wake" lane out to the first green buoy. Appropriate signage to enforce these requirements is recommended.~~

~~3.9.6~~3.9.5 Ciguatera

Attachment 2

Affected Environment: Description of Marine Mammal and Sea Turtle Species Occurring Off the West Coast of Hawai'i, Site of the Kona Kai Ola Project

Prepared For:
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MAI-642-U-07-053
24 June 2007

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Research – Operations – Engineering – Design - Analysis

Marine Acoustics Inc. Technical Report

Affected Environment: Description of Marine Mammal and Sea Turtle Species Occurring Off the West Coast of Hawai'i, Site of the Kona Kai Ola Project

Prepared By:

Dr. Adam S. Frankel
Susan Richards

24 June 2007

Introduction

These descriptions are provided for all turtle and marine mammal species that could conceivably occur near the site of the Kona Kai Ola project. While the probability of occurrence of some species is very low, the descriptions are provided for completeness. This section will summarize data on abundance and behavior, which affects how the animal samples the environment (and the sound field produced by Kona Kai Ola). Descriptions of hearing ability (when known) and vocalization range are provided to document the probable sound frequency range and susceptibility to potential acoustic disturbance. Other threats to the species are summarized.

This document was written for inclusion in the Kona Kai Ola Environmental Impact Statement (EIS) as a separate appendix and is intended to provide detailed descriptions of marine mammals and sea turtles that are too large for inclusion in the EIS, but are necessary to support the analyses contained in the EIS.

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1.0 Sea Turtles

Sea Turtle Hearing Capabilities and Sound Production

Data on sea turtle sound production and hearing are few. Therefore these are presented in this summary section rather than as species-specific information in each of the following species descriptions. There is little known about the mechanism of sound detection by turtles, including the pathway by which sound gets to the inner ear and the structure and function of the inner ear of sea turtles (Bartol and Musick 2003). However, assumptions have been made based on research on other species of turtles. Based on the structure of the inner ear, there is some evidence to suggest that marine turtles primarily hear sounds in the low frequency (LF) range and this hypothesis is supported by the limited amount of physiological data on turtle hearing. Bartol and Musick (2003) state that the amount of pressure needed to travel through the bone channel of the ear increases with an increase in frequency. For this reason, it is believed that turtles are insensitive to high frequencies and that they primarily hear in a LF range. A description of the ear and hearing mechanisms can be found in Bartol and Musick (2003). The few studies completed on the auditory capabilities of sea turtles also suggest that they could be capable of hearing LF sounds, particularly as adults. These investigations examined adult green, loggerhead, and Kemp's ridley sea turtles (Ridgway et al. 1969; Mrosovsky 1972; O'Hara and Wilcox 1990; Bartol et al. 1999). There have been no published studies to date of olive ridley, hawksbill, or leatherback sea turtles (Ridgway et al. 1969; O'Hara and Wilcox 1990; Bartol et al. 1999 Bartol and Ketten 2006).

Underwater sound was recorded in one of the major coastal foraging areas for juvenile sea turtles (mostly loggerhead, Kemp's ridley and green sea turtles) in the Peconic Bay Estuary system in Long Island, NY (Samuel et al. 2005). The recording season of the underwater environment coincided with the sea turtle activity season in an inshore area where there is considerable boating and recreational activity, especially during July-September. During this time period, received levels (RLs) at the data collection hydrophone system in the 200-700 Hz band ranged from 83 dB (night) up to 113 dB (weekend day). The sea turtles are undoubtedly exposed to high levels of noise, most of which is anthropogenic. Results suggest that continued exposure to existing high levels of anthropogenic noise in vital sea turtle habitats and any increase in noise could affect sea turtle behavior and ecology (Samuel et al., 2005). However, there were no data collected on any behavioral changes in the sea turtles due to anthropogenic noise or otherwise during this study.

Ridgway et al. (1969) used airborne and direct mechanical stimulation to measure the cochlear response in three juvenile green sea turtles. The study concluded that the maximum sensitivity for one animal was 300 Hz, and for another 400 Hz. At the 400 Hz frequency, the turtle's hearing threshold was about 64 dB in air (re: 20 μPa). At 70 Hz, it was about 70 dB (re: 20 μPa) in air. Sensitivity decreased rapidly in the lower and higher frequencies. From 30 to 80 Hz, the rate of sensitivity declined approximately 35 dB. However, these studies were done in air, up to a maximum of 1 kHz, and thresholds were not meaningful since they only measured responses of the ear; moreover, they were not calibrated in terms of pressure levels.

Bartol et al. (1999) measured the hearing of juvenile loggerhead sea turtles using auditory evoked potentials to LF tone bursts and found the range of hearing to be from at least 250 to 750 Hz. The lowest frequency tested was 250 Hz and the highest was 1000 Hz.

More recently, Streeter and colleagues (pers. comm., 2005) were able to train a female green sea turtle to respond to acoustic signals. The results from this study showed a hearing range of at least 100 to 500 Hz (the maximum frequency that could be used in the study, as opposed to what may be a wider hearing range) with hearing thresholds of 120-130 dB RL. However, there are several important caveats to these results. First, the study was done in a relatively noisy oceanarium. Thus, the thresholds reported may have been masked by the background noise and the "absolute thresholds" (the lowest detectable signal within a noisy environment) may be several dB lower than the reported results. Second, data are for a single animal who is well into middle age (over 50 years old) and who had lived in an oceanarium all its life. While there are no data on effects of age on sea turtle hearing, data for a variety of mammals (including humans) show there is a substantial decrement in hearing with age, and this may have also happened in this animal. This too may have resulted in thresholds being higher than in younger animals (as used by Ridgway et al., 1969). Finally, the data are for one animal and so nothing is known about variability in hearing, or whether the data for this animal are typical of the species.

Most recently, Bartol and Ketten (2006) used auditory evoked potentials to determine the hearing capabilities of subadult green sea turtles and juvenile Kemp's ridleys. Subadult Hawaiian green sea turtles detected frequencies between 100 and 500 Hz, with their most sensitive hearing between 200 and 400 Hz. However, two juvenile green turtles tested in Maryland had a slightly expanded range of hearing when compared to the subadult greens tested in Hawai'i. These juveniles responded to sounds ranging from 100 to 800 Hz, with their most sensitive hearing range from 600 to 700 Hz. The two juvenile Kemp's ridleys had a more restricted range (100 to 500 Hz) with their most sensitive hearing falling between 100 and 200 Hz.

Green Turtle (*Chelonia mydas*):

Green turtles are globally distributed and generally found in tropical and subtropical waters along continental coasts and islands between 30° North and 30° South (NMFS and USFWS 1998a). In the central Pacific, they occur around most tropical islands, including the Hawaiian Islands.

Greens are the most common species of sea turtle found in Hawaiian waters (Balazs 1983). Both the nesters and the turtles resident at various foraging grounds throughout the Hawaiian Archipelago are from the same genetic stock (Leroux et al. 2003), although rarely turtles from the east Pacific stock that nests along the Pacific coast of Mexico are recorded in Hawaiian waters (Balazs, 1976; Dutton, 2003). Green sea turtles in Hawai'i were once seriously depleted, but have demonstrated a substantial long-term increase in abundance following cessation of harvesting since protection began in 1978 (Balazs & Chaloupka 2004; Balazs & Chaloupka 2006). At some locations in Hawai'i prominent changes in the adaptive behavior of the turtles have occurred concomitant with this recovery trend. These include shifts in near shore foraging from night to daytime, exceptional tolerance to humans, emergence ashore for resting or basking, and formation of underwater cleaning stations (Balazs 1996).

Green turtles make the transition from pelagic to benthic habitats at around 5-10 years of age (Dutton 2004). The diets of post-hatchlings and juveniles living in pelagic habitats appear to be entirely carnivorous (e.g., invertebrates and fish eggs), but records are only known from the occasional turtles encountered (for review see Bjorndal 1985). Adult green turtles are unique among sea turtles in that they are herbivorous, feeding primarily on macroalgae and sea grasses (e.g. *Halophila hawaiiatza* in Hawai'i) and spend most of their lives in shallow bays and nearshore areas where these plants are present (Balazs, 1980; Bjorndal, 1985; Balazs et al., 1987).

Foraging behavior of green turtles is well documented and in Hawai'i is typically characterized by numerous short dives (4 to 8 min) in shallow water (typically less than 3 m) with short surface intervals (less than 5 sec) (Balazs, 1980; Rice et al. 1999). Resting periods are characterized by longer dives (over 20 min) in deeper water (4 to 40 m) with surface intervals averaging 2.8 min (Rice et al. 1999). The amount of time that turtles spend foraging versus resting is still largely unknown. Green turtles in Hawai'i frequently use small caves and crevices in the sides of reefs as resting areas, and spend significant amounts of time on the tops of reefs (Balazs et al., 1987).

Green sea turtles in the Atlantic swam faster in open ocean travel (mean = 61 km/day) (2.54 km/h) than along the coast (mean = 25 km/day) (1.05 km/h) (Hays et al. 2002). Green turtles migrating in Hawaiian waters had a mean speed of 1.7 km/h (Balazs and Ellis 2000).

The green turtle is the only marine turtle species reported basking on land. Terrestrial basking in the main Hawaiian Islands has increased dramatically since 1994 (Quaintance et al. 2003). It is believed to be carried out for thermoregulation and also possibly for protection from the tiger shark (*Galeocerdo cuvieri*) a major predator of the green turtle (Balazs et al., 1987). Rice et al. (1999) conducted studies at Punalu'u on the island of Hawai'i and found that basking (averaging 130 min) was typically initiated in the middle of the day, yet continued into the night.

The nesting season for the Hawaiian stock of green turtles is May through July (Balazs and Chaloupka 2004). Nesting occurs throughout the Hawaiian archipelago, but over 90% occurs at French Frigate Shoals, Northwestern Hawaiian Islands (NWHI), where 200-700 females are estimated to nest annually (NMFS and USFWS 1998a). Adult turtles migrate to French Frigate Shoals from foraging pastures up to 1300 km away (Balazs 1994) located throughout the Hawaiian Archipelago (Balazs 1976, 1983b) and Johnston Atoll, immediately to the South, where algal foraging pastures occur (Balazs 1985a).

Primary threats to green sea turtles in Hawai'i include nest predation, directed take, fisheries incidental take, boat collisions and disease. Recent increases in longline fisheries may be a serious source of mortality. Greens comprised 14% of the annual observed take of all species of turtles by the Hawai'i-based longline fishery from 1990 to 1994 (NMFS and USFWS 1998a). Over the period of 1994 to 1999, it was estimated that

an annual average of 40 green sea turtles were caught in the Hawai'i-based longline fishery (McCracken 2000).

Recent proliferation of a tumorous disease known as fibropapillomatosis (Balazs et al. 1992; Balazs and Pooley 1991) threatens to eliminate improvements in the status of the Hawaiian stock (NMFS and USFWS 1998a). The disease is characterized by grayish tumors of various sizes, particularly in the axial regions of the flippers and around the eyes. This debilitating condition can be fatal and neither a cause nor a cure has been identified.

The green turtle is listed as "threatened" under the Endangered Species Act (ESA) throughout its Pacific Range, except for breeding populations in Florida and on the Pacific coast of Mexico, which are classified as "endangered". It is listed as "endangered" worldwide by the International Union for the Conservation of Nature and Natural Resources (IUCN), and the species appears on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (CITES 2005).

Hawksbill Turtle (*Eretmochelys imbricata*):

Hawksbill turtles are globally distributed in tropical and subtropical waters, generally occurring from 30° North to 30° South within the Atlantic, Pacific, and Indian Oceans and associated bodies of water (NMFS and USFWS 1998b). Hawksbills were once common in the nearshore waters from Mexico to Ecuador. Today, however, they are rare to nonexistent in most localities and are virtually unknown along coastal waters of the U.S. Pacific (NMFS and USFWS 1998b). In the Hawaiian Islands their range is limited to the main islands where they are present in relatively few numbers (Balazs 1983). About 20-30 female hawksbills nest annually in the Main Hawaiian Islands (NMFS and USFWS 1998b). In 20 years of netting and hand-capturing turtles at numerous nearshore sites in Hawai'i, only eight hawksbills (all immatures) have been encountered at capture sites including Kiholo Bay and Ka'u (Hawai'i), Palo'ou (Moloka'i) and Makaha (O'ahu) (NMFS and USFWS 1998b).

Hawksbills are primarily near-shore reef dwellers. They make the transition from pelagic to benthic habitats at around 5 years of age (Dutton 2004). It was only recently discovered that hawksbills appear to be specialist sponge carnivores (Meylan 1988). Hawksbills forage in coral reefs and other hard-bottom habitats in open bays and coastal zones throughout the tropics and, to a lesser extent, the subtropics, including Florida, the Gulf of Mexico, the USVI, Puerto Rico, Hawai'i, and the U.S. Pacific territories (Plotkin 1995).

Juvenile hawksbills in coral reef habitats display an alternating pattern of short, shallow (less than 5 m) foraging dives followed by deeper (6- to 9-m), longer resting dives (Houghton et al. 2003; Van Dam and Diez 1996). Two tagged female hawksbill in Hawai'i had dive times of about 50 minutes and showed an prolonged residency pattern in the Hamakua region (Balazs et al. 2000). Hawksbills are known to migrate along the coast of the islands and between islands (e.g. Hawai'i and Maui) (Ellis et al. 2000).

Within the Central Pacific, nesting is widely distributed but scattered and in very low numbers. In Hawai'i, about 20 to 30 female hawksbills nest annually, only on main island beaches (NMFS and USFWS 1998b), between July and November (Plotkin 1995), primarily along the east coast of the island of Hawai'i. Beaches on Hawai'i with recorded hawksbill nesting include Kamehame, Punalu'u, Horseshoe, Ninole, Kawa Pohue and within Hawai'i Volcanoes National Park (NMFS and USFWS 1998b).

Hawksbills appear to be rarely caught in pelagic fisheries (McCracken, 2000). Incidental catches of hawksbill turtles in Hawai'i occur, primarily in nearshore gillnets (NMFS and USFWS 1998b). The primary threats to Hawksbills in Hawai'i are increased human presence, beach erosion and nest predation (e.g., by mongooses) (NMFS and USFWS 1998b). Illegal harvest for local consumption is also reported from Hawai'i where an unquantified number of hawksbills are taken for domestic black markets (NMFS 1992).

The hawksbill is threatened with extinction throughout its range (NMFS and USFWS 1998b). Hawksbill turtles are listed as "critically endangered" under the IUCN, "endangered" throughout their range under the ESA, and is included in Appendix I of CITES (CITES 2005). With the exception of the Kemp's ridley, the hawksbill is considered by many to be the most endangered of all the marine turtles (Plotkin 1995).

Leatherback turtle (*Dermochelys coriacea*)

Leatherback turtles are the most migratory and wide ranging of sea turtle species. They are distributed widely between 71° North and 42° South in the Pacific and all other major oceans and tend to be almost entirely pelagic (Dutton 2004). They are highly migratory, exploiting convergence zones and upwelling areas in the open ocean, along continental margins, and in archipelagic waters (Dutton 2004). Leatherbacks regularly occur in the offshore waters of the State of Hawai'i where they are sighted by fishermen and sometimes become entangled in fishing gear; these animals may represent individuals in transit from one part of the Pacific to another (Balazs 1983).

They feed primarily on cnidarians and tunicates (Plotkin 1995; NMFS and USFWS 1998c), mostly in deeper waters, but have also been observed at the surface (Eisenberg and Frazier 1983). Leatherback turtles tend to dive, often to great depths, in a cycle that follows the daily rising and sinking of the dense layer of plankton and jellyfish on which they feed (Eckert et al. 1989b). The deepest dive recorded was to 1,230m (4,035 ft), but they usually dive to depths around 250m (820 ft) (Hays et al. 2004). Long distance (> 100 km) intra-seasonal movement sometimes occurs among nesting beaches; for example, between French Guiana and Surinam (Pritchard 1973) and between St. Croix and Puerto Rico (Eckert et al. 1989a).

Female leatherbacks had sustained swim speeds of 0.56-0.84 m/s (2.0-3.0 km/h), with maximum speeds of 1.9-2.8 m/s (6.8-10.0 km/h) (Eckert 2002). Mean dive depths were 93.0 m (SD= 72.8), with dive times of 3.4 minutes (SD = 7.9) and mean surface times were 3.4 minutes (SD = 1.9) (Eckert 2002). The maximum dive depth was 490 m, and on average, dives were deeper during the day than at night (111.6 v 73.0 m).

Leatherback nesting in the Pacific is widespread in the western Pacific, including China, Indonesia, Southeast Asia, and Australia (NMFS and USFWS 1998c). However, there are no known nesting grounds in the Pacific under US jurisdiction. Leatherbacks undertake some of the longest migrations of all sea turtles and can travel great distances between feeding and nesting areas (Dutton 2004). Genetic results, coupled with tag-recapture and satellite telemetry data suggest that the nesting stocks in the western Pacific primarily use the North Pacific for development and foraging, while animals from eastern Pacific stocks generally forage in the Southern Hemisphere, including the waters off Peru and Chile (Dutton, Broderick and Fitzsimmons, 2002). However, there are exceptions to this pattern, since animals of western Pacific stock origin have been found off Chile (Donoso et al., 2000), and likewise, some leatherbacks of eastern Pacific stock origin have been found in the north Pacific (Dutton, Broderick and Fitzsimmons, 2002).

Primary threats to the species are incidental take in coastal and high seas fisheries, and the killing of nesting females and collecting of eggs at the nesting beaches (NMFS and USFWS 1998c). Thirty two percent of the turtles reported captured by the Hawai'i-based longline fisheries during the 1990 to 1994 observer program were leatherbacks (NMFS and USFWS 1998c). Over the period of 1994 to 1999, it was estimated that an annual average of 112 leatherbacks were caught in this fishery (McCracken 2000)

The leatherback turtle is listed as "endangered" under the ESA throughout its global range. It is listed in Appendix I of CITES (CITES 2005) and the Red List 2000 of the IUCN has classified the leatherback as "critically endangered".

Loggerhead Turtle (*Caretta caretta*):

Loggerheads are circumglobal, occurring throughout the temperate and tropical regions, primarily from 28° to 40° North (Polovina et al. 2004). In the Pacific Ocean, loggerhead habitats include ocean and island areas around Polynesia, Micronesia, Melanesia, Indonesia, the Philippines, Australia, China, Japan, Mexico, and the United States (NMFS and USFWS, 1998d). Historically, loggerheads may have inhabited Hawaiian waters. Today juveniles are rarely seen in the Hawaiian Islands, generally north of 22°N. Only four records exist. All four specimens were juveniles and most likely drifted or traveled to Hawai'i from Mexico to the east or Japan to the west (NMFS and USFWS, 1998d). Therefore the likelihood of loggerheads near Honokohau is very low.

Adult loggerheads typically prey on benthic invertebrates (such as gastropods, mollusks, as well as decapod crustaceans) in hard bottom habitats, although fish and plants are occasionally taken (NMFS and USFWS, 1998d). Foraging has also been reported at sea, far from coastal hard bottom habitats (NMFS and USFWS, 1998d). Dive depth distribution data collected from satellite-linked dive recorders attached to two loggerhead sea turtles caught and released in the Hawai'i-based longline fishery, indicated that they spend 40% of their time at the surface and 90% of their time at depths less than 40 m (Polovina et al. 2004). According to Bolten (2003), oceanic loggerheads spend 75 percent of their time in the top 5 m (16.4 ft) of the water column and 80 percent of their dives are within 2 to 5 m (6.6 to 16.4 ft). The maximum depth recorded during a dive was 233 m (764 ft). Mean dive lengths for Loggerhead turtles have been measured at 16.1 min (SD = 6.0) with a range of 5-40 minutes (Lutcavage and Lutz 1991). Oceanic turtles studied in the Azores swam at speeds of 0.2 m/s (0.7 ft/s) (Bolten, 2003). Loggerheads in the Mediterranean Sea typically dove to about 25 m, and had resting (overwintering) dives as long as 10.2 hours, the longest for any vertebrate (Broderick et al. 2007).

Major nesting grounds of the loggerhead are generally located in warm temperate and subtropical regions, with some scattered nesting in the tropics (NMFS and USFWS, 1991b). In the Pacific, loggerhead sea turtles nest in warm temperate and subtropical regions, primarily in Japan and Australia (NMFS and USFWS, 1998d). Loggerheads in Japan are known to migrate across the Pacific to California, carried by the California Current (Luschi et al., 2003). There is no loggerhead nesting in Hawai'i (Balazs 1983) and there are very few records on any of the many islands of the Central Pacific where this species is considered rare or vagrant (NMFS and USFWS, 1998d).

The primary threat to loggerhead populations is incidental capture by commercial trawlers and longline fisheries. Loggerheads comprised 36% of the annual observed take of all species of turtle by the Hawai'i-based longline fishery between 1990 and 1994 (NMFS and USFWS, 1998d). Between 1994 and 1999, 147 loggerheads were observed taken by the Hawai'i-based longline fishery, with a mortality rate of 17.5% (McCracken 2000). The predicted annual take of loggerheads by this fishery is 305 turtles (NMFS and USFWS, 1998d). Results to date in this fishery confirm the reduction in incidental catches of loggerheads that can be achieved from the elimination of shallow sets. Beginning in April 2001, shallow sets were prohibited in the Hawai'i-based longline fishery. Data from the onboard observers in the longline fleet, which now comprise 20% of the fishing effort, showed that no loggerheads were caught from April through December 2001 (Polovina et al. 2003). Coastal development is also a serious threat to loggerhead nesting (NMFS and USFWS, 1991b).

Loggerhead turtles are listed as "threatened" under the ESA, are protected under CITES (CITES 2005) and are listed as "vulnerable" under the IUCN.

Olive ridley turtle (*Lepidochelys olivacea*):

Olive Ridleys occur worldwide in tropical and warm temperate ocean waters. In the Pacific they have been documented from 8° to 31° North (Polovina et al. 2004). It is by far the most abundant and widespread sea turtle in the waters of the eastern Pacific (NMFS and USFWS 1998e). Olive ridleys resident in Pacific waters comprise two stocks: an eastern Pacific stock that nests along the Pacific coast from Mexico to Colombia and a western Pacific stock that nests in coastal areas of southeastern Asia, New Guinea and northern Australia (NMFS and USFWS 1998e).

Olive ridleys, like leatherbacks, lead a primarily pelagic existence, however, they also forage in nearshore benthic habitats (Dutton 2004). Large juveniles and adults reside primarily within 100 km of the coast, and aggregate in large concentrations in coastal waters during the nesting season (Plotkin 1995). It is increasingly uncommon further offshore, and rare in the central Pacific, both at sea and around islands (Plotkin 1995). In Hawai'i this species is rare, but sightings are reportedly increasing (Balazs 1983). It has

been suggested that pelagic waters surrounding the Hawaiian Islands may serve as development habitat for animals from the Pacific coast of Mexico (Balazs 1983).

Olive ridley turtles appear to be omnivorous with crustaceans playing a major role. They feed on benthic organisms including bottom fish, crab, oysters, sea urchins, snails, tunicates, shrimp, and algae and pelagic species including jellyfish medusae, red crabs, and salps (Plotkin 1995; NMFS and USFWS 1998e). They can switch from one food type to another, e.g., bottom dwelling and water-column crustaceans, mollusks, fish, and salps, as it moves between habitats (Kopitsky et al. 2004). Olive ridley turtles have been documented feeding on crabs at a depth of 300m (NMFS and USFWS 1998e). Polovina et al. (2004) collected dive depth distribution data from satellite-linked dive recorders attached to two olive ridleys caught and released in the Hawai'i-based longline fishery. These data demonstrated that olive ridleys (compared with loggerheads) have a relatively deep dive pattern, spending only 20% of their time at the surface and over 40% of their time below 40 m. However, they tended to spend little time (10%) deeper than 100 m. One dive was recorded to 254 m.

Olive ridley turtles appear to have a bimodal diving pattern, with a number of short (presumably shallow) dives and longer dives (Beavers and Cassano 1996). Mean surface times from the same study were from 2.4 minutes at night and 2.9 minutes during the day, with a total range of 1-10 minutes. Olive ridley turtles off Australia had dives lasting up to 200 minutes in length (McMahon et al. 2007). Mean dive depths were between 20 and 46.7 m, but one individual dove to 150 m. These turtles appeared to be foraging on the bottom, and therefore the dive depths reflect the local environment rather than their ultimate diving capability. Migrating Olive ridley turtles had speeds ranging from 0.19 to 3.88 km/h with a mean of 1.28 km/h (Beavers and Cassano 1996).

Preferred nesting areas for Olive ridley turtles occur along continental margins and, rarely, on oceanic islands (NMFS and USFWS 1998e). With the exception of a single nesting in September 1985 on the island of Maui, Hawai'i (Balazs and Hau 1986), there is no nesting by this species anywhere in the United States or the territories under U.S. political jurisdiction (NMFS and USFWS 1998e). Nesting occurs throughout the year in the Eastern Tropical Pacific Ocean, with peak nesting months from September through December (NMFS and USFWS 1998e).

At sea in the eastern tropical Pacific, olive ridleys readily associate with objects floating in the water including anything from logs to plastic debris to dead whales (Pitman 1992; Arenas and Hall 1992), and appear strongly attracted to brightly colored objects (Arenas and Hall 1992). It is possible that young turtles move offshore and occupy areas of surface current convergences to find food and shelter among aggregated floating objects until they are large enough to recruit to the nearshore benthic feeding grounds of the adults (NMFS and USFWS 1998e).

The primary threat to these turtles in Hawaiian waters is incidental take in fisheries. Olive ridleys comprised 18% of the annual take of all species of sea turtles by the Hawai'i-based longline fishery observed from 1990 to 1994 (NMFS and USFWS 1998e). Over the period of 1994 to 1999, it was estimated that an annual average of 146 olive ridleys were caught in the Hawai'i-based longline fishery (McCracken 2000). Results to date in the fishery confirm the reduction in incidental catches of olive ridleys that can be achieved from the elimination of shallow sets. Beginning in April 2001, shallow sets were prohibited in the Hawai'i-based longline fishery. Data from the onboard observers in the longline fleet, which now comprise 20% of the fishing effort, showed that only two olive ridleys were caught from April through December 2001 (Polovina et al. 2003). The entanglement of juveniles and adults in marine debris around the Hawaiian Islands is reported from Kailua-Kona (Hawai'i), Puko'o (Moloka'i), Hana (Maui), and O'ahu (Balazs 1985).

The olive ridley is listed as "threatened" under the ESA in the Pacific, except for the Mexican nesting population, which is classified as "endangered" due to over-harvesting. It is classified as "endangered" under the IUCN and is listed in Appendix I of CITES (CITES 2005).

2.0 CETACEANS

Background/Literature Review

The Hawaiian Islands make up the most isolated archipelago in the world. At least 18 species of odontocetes and 5 mysticetes are regularly or occasionally found in Hawaiian waters (Carretta et al. 2004; Barlow 2006). While our knowledge of the ecology of many cetacean species in Hawai'i has increased in recent years (e.g. Maldini et al. 2005; Barlow 2006), currently, there is very little known about the status, numbers, distribution and life histories of many of these species (e.g., Carretta et al. 2004). For example, the degree of insularity of most, if not all, Hawaiian cetacean stocks is an important question, which remains unresolved.

It has been suggested that higher-densities of odontocete species, close to the islands, may represent reproductively-isolated "resident" populations of animals, rather than aggregations of individuals from a broader oceanic population (Andrews et al. 2006; Baird et al. 2005b). Sparse, and generally short-lived, genetic and photo-identification studies have been conducted in Hawai'i to investigate such questions. Genetic information is available for only a few species, but suggests that some degree of reproductive isolation exists between Hawaiian and other populations of spinner dolphins, false killer whales, short-finned pilot whales and killer whales (Andrews et al. 2006; Chivers et al. 2003; Chivers et al. In Press; Baird et al. 2006a). Furthermore, while there is apparently inter-island movements of false killer whales (Baird et al. 2005a) and melon-headed whales (Huggins et al. 2005) (at least within the leeward Hawaiian Islands), work with spinner dolphins (Andrews et al. 2006), bottlenose dolphins (Baird et al. 2002, 2003; Martien et al. 2005), pygmy killer whales (McSweeney et al. 2005) and likely rough-toothed dolphins (Webster et al. 2005) suggests little or no movement of animals between islands. Thus, differentiation of populations may even be occurring within the Hawaiian Island chain. High site fidelity is likely paired with small population sizes for rough-toothed dolphins (Webster et al. 2005), dwarf sperm whales (Baird et al. 2006b) and pygmy killer whales (McSweeney et al. 2005), along the western coast of the island of Hawai'i.

Table 1. List of Cetacean Species

Common name	Scientific name
Blainville's beaked whale	*Mesoplodon densirostris*
Blue whale	*Balaenoptera musculus*
Bottlenose dolphin	*Tursiops truncatus*
Bryde's whale	*Balaenoptera edeni*
Cuvier's beaked whale	*Ziphius cavirostris*
Dwarf sperm whale	*Kogia sima*
False killer whale	*Pseudorca crassidens*
Fin whale	*Balaenoptera physalus*
Fraser's dolphin	*Lagenodelphis hosei*
Humpback whale	*Megaptera novaeangliae*
Killer whale	*Orcinus orca*
Longman's beaked whale	*Indopacetus pacificus*
Melon-headed whale	*Peponocephala electra*
North Pacific minke whale	*Balaenoptera acutorostrata*
Pantropical spotted dolphin	*Stenella attenuata*
Pygmy killer whale	*Feresa attenuata*
Pygmy sperm whale	*Kogia breviceps*
Risso's dolphin	*Grampus griseus*
Rough-toothed dolphin	*Steno bredanensis*
Sei whale	*Balaenoptera borealis*
Short-finned pilot whale	*Globicephala macrorhynchus*
Sperm whale	*Physeter macrocephalus*
Spinner dolphin	*Stenella longirostris*
Striped dolphin	*Stenella coeruleoalba*

2.1 Mysticetes

Blue Whale (*Balaenoptera musculus*):

Blue whales are found in tropical to polar waters worldwide (Carretta et al. 2004). In the North Pacific, the IWC only recognizes one stock (Donovan 1991). However, recent analyses of acoustic data obtained throughout the North Pacific Ocean (Stafford et al. 2001; Stafford 2003) has revealed two distinct blue whale call types, suggesting two North Pacific stocks: eastern and western. Blue whales belonging to the western Pacific stock appear to feed in summer southwest of Kamchatka, south of the Aleutians, and in the Gulf of Alaska (Stafford 2003; Watkins et al. 2000), and in winter they migrate to lower latitudes in the western Pacific and less frequently in the central Pacific, including Hawai'i (Stafford et al. 2001). There has been one published sighting record of blue whales near Hawai'i and two sightings have been made by observers on Hawai'i-based longline vessels (Carretta et al. 2004). Additional evidence that blue whales occur in this area comes from acoustic recordings made off O'ahu and Midway Atoll (Northrop et al. 1971; Thompson and Friedl 1982), which included at least some within the U.S. EEZ. The recordings made off Hawai'i showed bimodal peaks throughout the year (Stafford et al. 2001), with western Pacific call types heard during winter and eastern Pacific calls heard during summer. For management purposes under the Marine Mammal Protection Act (MMPA), two stocks are considered to occur in U.S. waters of the North Pacific: North Pacific and the western North Pacific, which includes whales found around the Hawaiian Islands during winter.

No blue whale sightings were made during twelve aerial surveys conducted in 1993-98 within about 25 nmi of the main Hawaiian Islands (Mobley et al. 2000), nor during a summer/fall 2002 shipboard surveys of the entire Hawaiian Islands EEZ (Barlow 2006). No estimate of abundance is available for the western Pacific blue whale stock (Carretta et al. 2004).

This species has been protected in the North Pacific by the IWC since 1966. They are listed in Appendix I of the CITES (CITES 2005). Blue whales are formally listed as "endangered" under the ESA, and consequently the Hawaiian stock is automatically considered as a "depleted" and "strategic" stock under the MMPA.

The swimming and diving behavior of blue whales has been relatively well characterized. The average surface speed for a blue whale is 4.5 km/h (2.4 knots) (with a maximum speed of 7.2 km/h (3.9 knots) (Mate et al., 1999). Dive times range from 4 to 15 min (Laurie, 1933; Croll et al., 2001b). Dive depths average 140 m (460 ft). Blue whales typically make 5 to 20 shallow dives at 12 to 20-second intervals followed by a deep dive of 3 to 30 min (Yochem and Leatherwood, 1985; Croll et al., 1999). The dive depth of foraging blue whales averages 67.6 m (222 ft) (Croll et al., 2001b). Blue whales foraging off California were found to have a mean dive duration ranging from 4 to near 10 min (Strong, 1990). Blue whales feed almost exclusively on euphausiids, or krill (Fiedler et al., 1998; Sears, 2002).

There is no direct measurement of auditory threshold for the hearing sensitivity of blue whales (Ketten 2000). In one of the only studies to date, no change in blue whale vocalization pattern or movement relative to an LFA sound source was observed for RLs of up to approximately 155 dB re 1 μPa (Aburto et al. 1997).

Blue whales produce a variety of LF sounds in a 10 to 200 Hz band (Edds, 1982; Thompson and Friedl, 1982; Alling and Payne, 1991; Clark and Fristrup, 1997; Rivers, 1997; Stafford et al., 1998, 1999a, 1999b, 2001). The Eastern Pacific population of blue whales produce at least four unique sounds that have been described previously, the pulse A call and tonal B call, and downsweeps known as D calls (Thompson et al. 1996; McDonald et al. 2001). The A and B calls occur in repetitive patterns that have been classified as song. In the Eastern North Pacific, the amplitude modulated A part typically lasts 17 seconds and has a fundamental frequency of 16 Hz. The frequency modulated B

part lasts about 19 seconds that sweeps down from ~ 18 Hz to ~ 15 Hz. There are often strong harmonics that accompany the fundamental frequency. This blue whale song appears to be produced only by males (McDonald et al. 2001; Oleson et al. 2007) and may function as a reproductive display. Song was recorded solely from traveling animals, while animals that produced individual A or B calls could be engaged in a variety of behavioral states (Oleson et al. 2007). Songs are produced throughout the year and there are distinct structural differences in the songs of different populations (McDonald et al. 2006). The D calls are known to be produced by both sexes, frequently during foraging (Oleson et al. 2007). The blue whale is one of the loudest baleen whales with maximum estimated SLs ranging between 180 and 190 dB re 1 μPa at 1m (Cummings and Thompson, 1971; Aroyan et al., 2000 (McDonald et al. 2001).

Blue whale song has been recorded over the entire migratory path, from the Gulf of Alaska south to Mexico and the Costa Rica dome (Stafford et al. 2001; Stafford 2003; Burtenshaw et al. 2004). Croll et al. (2001a) studied the effects of anthropogenic low-frequency noise on the foraging ecology of blue and fin whales off San Nicolas Island, California. Blue and fin whales produce long, intense patterned sequences of signals in the band of 10 to 100 Hz. These signals have been recorded over ranges of hundreds of miles. This study examined the response of blue and fin whales to human-produced low-frequency sounds at RLs greater than 120 dB produced by SURTASS LFA sonar. The blue and fin whale sightings did not appear to be randomly distributed and did not appear to be related to the sound source. No clear trends appeared in vocalization rates. There was no significant change in vocal activity in the study area or obvious responses of blue or fin whales in the presence of LF sound. It is possible that the brief interruption of normal behavior or short-term physiological responses to LF noise at RLs of approximately 140 dB re 1 μPa have few implications on survival and reproductive success. Long-term effects, however, could have more significant effects, but these effects are harder to identify and quantify (Croll et al., 2001a).

Bryde's Whale (*Balaenoptera edeni*):

Bryde's whales are distributed worldwide in tropical and warm temperate waters and several stocks are recognized. It is one of the least known of the large whales and its population size is virtually unknown (Cummings 1985). Confusion of this species with sei whales has been widespread, leading to uncertainties about the exact distribution of both species in the areas of overlap (Klinowska and Cooke 1991).

Shallenberger (1981) reported a sighting of a Bryde's whale southeast of Nihoa in April 1977 (see DeLong and Brownell 1977; Leatherwood et al. 1982). Leatherwood et al. (1982) described the species as relatively abundant in summer and fall on the Mellish and Miluoki banks northeast of Hawai'i and around Midway Atoll, but the basis for this statement was not explained. Ohsumi and Masaki (1975) reported the tagging of "many" Bryde's whales between the Bonin and Hawaiian Islands in the winters of 1971 and 1972 (Ohsumi 1977). A shipboard survey of U.S. EEZ waters of the Hawaiian Islands in 2002 resulted in 13 Bryde's whale sightings throughout the study area (Barlow 2006). With presently available evidence, there is no biological basis for defining separate stocks of Bryde's whales in the central North Pacific.

For management purposes under the MMPA, two stocks of Bryde's whales are recognized within the Pacific U.S. EEZ of the eastern Pacific: 1) Hawaiian, and 2) the ETP (east of 150°W and including the Gulf of California and waters off California).

An estimate of 13,000 (CV=0.20) Bryde's whales in the ETP was made from vessel surveys between 1986 and 1990 (Wade and Gerrodette 1993). The area to which this estimate applies is mainly east and somewhat south of the Hawaiian Islands, and it is not known whether these animals are part of the same population that occurs around the Hawaiian Islands (Carretta et al. 2004).

No Bryde's whale sightings were made during twelve aerial surveys conducted in 1993, 1995 and 1998 within about 25 nmi of the main Hawaiian Islands (Mobley et al. 2000). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 3,215 (CV=0.59) Bryde's whales (Barlow 2006). This is currently the best available abundance estimate for this stock.

Bryde's whales are listed in Appendix I of CITES (CITES 2005). They are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA.

The swim speed of a Bryde's whale has been recorded at 20 km/h (10.8 knots) (Cummings, 1985), and they dive for as long as 20 min, although dive depths are not known. Bryde's whales feed primarily on euphausiids, copepods, and schooling fish such as sardines, herring, pilchard, and mackerel (Best, 1960; Nemoto and Kawamura, 1977; Cummings, 1985; Tershy, 1992; Tershy et al., 1993).

There is no direct measurement of auditory threshold for the hearing sensitivity of Bryde's whales. Recordings off California have revealed that Bryde's whales make short low-frequency moans. Moans are between 70 and 245 Hz and last between 0.2 and 1.5 sec. Source levels range between 152 and 174 dB re 1 µPa at 1m (Cummings et al. 1986). Bryde's whales also make a pulsed moan, which ranges between 100 and 900 Hz and between 0.5 and 51 sec in duration. The pulse rate varies between adults and calves (Edds et al. 1993). Finally, calves have been recorded making a series of discrete pulses between 700 and 900 Hz. These were recorded from calves when the adult was diving and from a captive juvenile (Edds et al. 1993). Bryde's whales in the Eastern Tropical Pacific produce at least six different call types. Most of these are lower in frequency than the earlier recordings, between 20 and 60 Hz, with one type being frequency downsweep from 207 to 75 Hz. Durations ranged from 1.1 to 4.9 seconds (Oleson et al. 2003).

Fin Whale (*Balaenoptera physalus*):

The fin whale occurs in all major oceans worldwide and seasonally migrates between temperate and polar waters (Gambell 1985). Balcomb (1987) observed 8-12 fin whales in a multi-species feeding assemblage on 20 May 1966 approximately 250 mi. south of Honolulu. Additional sightings were reported north of O'ahu in May 1976 and in the Kaua'i Channel in February 1979 (Shallenberger 1981). More recently, a single fin whale was observed north of Kaua'i in February 1994 (Mobley et al. 1996), and five sightings were made during a 2002 survey of waters within the U.S. EEZ of the Hawaiian Islands (Barlow 2006). A single stranding has been reported on Maui (Shallenberger 1981). Thompson and Friedl (1982; and see Northrop et al. 1968) suggested that fin

whales migrate into Hawaiian waters mainly in fall and winter, based on acoustic recordings off O'ahu and Midway Atoll. More recently, McDonald and Fox (1999) reported an average of 0.027 calling fin whales per 1000^2 km (grouped by 8-hr periods) based on passive acoustic recordings within about 16 km of the north shore of O'ahu.

In the North Pacific, the IWC recognizes two stocks of fin whales, the east China Sea and the rest of the North Pacific (Donovan 1991). Mizroch et al. (1984) cites evidence for additional fin whale subpopulations in the North Pacific. For management purposes under the MMPA, three stocks of fin whales are recognized in the North Pacific: 1) Hawaiian, 2) California/Oregon/Washington, and 3) Alaskan.

A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 174 (CV=0.72) fin whales (Barlow 2003b). This is currently the best available abundance estimate for this stock (Carretta et al. 2004).

Fin Whales have been protected in the North Pacific by the IWC since 1976. They are listed in Appendix I of the CITES (CITES 2005). Fin whales are formally listed as "endangered" under the ESA, and consequently the Hawaiian stock is automatically considered as a "depleted" and "strategic" stock under the MMPA.

Swimming speeds average between 1 to 16 km/h (Watkins, 1981). Fin whales have a mean dive time of 4.2±1.67 min at depths averaging 60 m (197 ft) (Panigada, 1999; Croll et al., 2001a). Maximum dive depths have been recorded deeper than 360 m (1,181 ft) (Charif et al., 2002). Similar to blue whales, fin whales typically make 5-20 shallow dives at 13-20 second intervals, followed by a deep dive of 1.5-15 min (Strong, 1990; Croll et al., 1999). Fin whales forage at dive depths close to 100 m (328 ft) deep. Foraging dive times range from 5 to 8 min and fin whales feed primarily upon planktonic crustaceans (particularly euphausiids), fish and squid (Gambell, 1985a; Aguilar, 2002).

There is no direct measurement of auditory threshold for the hearing sensitivity of fin whales (Ketten, 2000; Thewissen, 2002). Fin whales produce a variety of LF sounds in the 10 to 200 Hz band (Watkins, 1981; Watkins et al., 1987; Edds, 1988; Thompson et al., 1992). Short sequences of rapid FM calls in the 20-70 Hz band are associated with animals in social groups (Watkins, 1981; Edds, 1988; McDonald et al., 1995. The most typical signals are long, patterned sequences of low and infrasonic pulses in the 18-35 Hz range (Patterson and Hamilton, 1964; Watkins et al., 1987; Clark et al., 2002). This sound is referred to as a "20-Hz pulse." The seasonality of the pattern of bouts suggests that these are male reproductive displays or displays associated with food resources (Watkins et al., 1987; Clark et al., 2002; Croll et al., 2002) while the individual counter-calling sounds suggest that the more variable calls are contact calls (McDonald et al. 1995). Estimated SLs are as high as 180 to 190 dB (Patterson and Hamilton, 1964; Watkins et al., 1987; Thompson et al., 1992; McDonald et al., 1995; Charif et al., 2002; Croll et al., 2002).

Croll et al. (2001a) studied the effects of anthropogenic low-frequency noise on the foraging ecology of blue and fin whales off San Nicolas Island, California. This study is described above in the blue whale section.

Humpback Whale (*Megaptera novaeangliae*):

The humpback whale has a cosmopolitan distribution, occurring in all ocean basins, although it is less common in Arctic waters. There has been a prohibition on taking humpback whales since 1966. Population estimates for the entire North Pacific have increased substantially from 1,200 in 1966 to 6,000-8,000 circa 1992 (Carretta et al. 2004).

Although the IWC only recognizes a single stock in the North Pacific (Donovan 1991), there is good evidence for multiple populations of humpback whales (Johnson and Wolman 1984; Baker et al. 1990). At present, three MMPA management units of humpback whales are recognized within the U.S. EEZ of the North Pacific: 1) the eastern North Pacific stock, wintering in coastal Mexico; 2) the central North Pacific stock, wintering in the Hawaiian Islands; and 3) the western North Pacific stock, wintering in Japanese waters (Carretta et al. 2004). In general, fidelity to breeding and feeding areas is high, but interchange occurs at low levels between breeding areas and between feeding areas.

The humpback whales that winter in Hawai'i are part of the central North Pacific (CNP) stock which is comprised of whales that summer in discrete feeding aggregations along the Pacific rim from northern British Columbia and Alaska, west to Unimak Pass (Baker et al. 1994; Calambokidis et al. 1997, 2001). This stock is listed as "endangered" under the ESA and "depleted" under the MMPA. It is therefore classified as a strategic stock. It is listed in Appendix I of CITES (CITES 2005).Calambokidis et al. (1997) estimated 4,005 (CV = 0.095) humpback whales in the CNP stock based on photo-identification data, with a current rate of increase of 7-10% per year (Mobley et al. 2001; Mizroch et al. 2004).

Threats to the CNP stock are difficult to quantify due to a lack of data, but include serious injury and mortality resulting from interactions with fishing gear, ship strikes, habitat degradation and vessel disturbance. In Hawai'i, data from 1972 to 1996 reveal at least six entanglements of humpback whales and one death due to vessel strike (Mazzuca et al. 1998). These data also indicate an increasing trend of entanglement in natural fiber and synthetic lines in Hawai'i since 1992 and a three-fold increase in death and entanglement occurrences related to human activity in 1996. Increasing levels of anthropogenic noise in the world's oceans have also been identified as a habitat concern for baleen whales that communicate using low- and mid-frequency sound (e.g. Richardson et al. 1995).

Mean humpback whale swim speeds during migration are near 4.5 km/h (2.4 knots) (Gabriele et al. 1996). Dive times recorded off southeast Alaska are near 3 to 4 min in duration (Dolphin, 1987). In the Gulf of California, humpback whale dive times averaged 3.5 min (Strong, 1990). The deepest recorded humpback dive was 240 m (790 ft) (Hamilton et al., 1997). Dives on feeding grounds ranged from 2 to 5 min (Dolphin, 1987; Croll, et al., 1999). Dive depths average near 40 m (131 ft). Humpbacks eat a wide variety of prey including schooling fish and krill, which are likely found above 300 m (1,000 ft) (Hamilton et al., 1997).

There is no direct measurement of auditory threshold for the hearing sensitivity of humpback whales (Ketten 2000; Thewissen 2002). Because of this lack of auditory sensitivity information, Houser et al. (2001a) developed a mathematical function to

describe the frequency sensitivity by integrating position along the humpback basilar membrane with know mammalian data. The results predicted the typical U-shaped audiogram with sensitivity to frequencies from 700 Hz to 10 kHz with maximum sensitivity between 2 to 6 kHz. Humpback whales have been observed reacting to LF industrial noises at estimated RLs of 115-124 dB (Malme et al., 1985). They have also been observed to react to playback of conspecific calls at RLs as low as 102 dB (Frankel et al., 1995). Playbacks of 75 Hz signals to humpbacks resulted in a very slight increase in their dive times as well as time spent submerged (Frankel and Clark 1998; Frankel and Clark 2000). The received sound levels ranged from 90 to 130 dB re 1 μPa, and the change in behavior resulting from these levels was less than that resulting from the nearest vessel (Frankel and Clark 1998).

Humpbacks produce a great variety of sounds that fall into three main groups: 1) sounds associated with feeding, 2) sounds made within groups on winter grounds, and 3) songs associated with reproduction. These vocalizations range in frequency from 20 to 10,000 Hz. Feeding groups produce distinct repeated sounds ranging from 20 to 2,000 Hz, with dominant frequencies near 500 Hz (Thompson et al., 1986; (Frankel 2002). These sounds are attractive and appear to rally animals to the feeding activity (D'Vincent et al., 1985; Sharpe and Dill, 1997). Feeding sounds were found to have SLs in excess of 175 dB (Thompson et al., 1986; Richardson et al., 1995).

Social sounds in the winter breeding areas are produced by males and extend from 50 Hz to more than 10,000 Hz with most energy below 3000 Hz (Tyack and Whitehead, 1983; Richardson et al., 1995). These sounds are associated with agonistic behaviors from males competing for dominance and proximity to females. They have shown to elicit reactions from animals up to 9 km (4.9 nm) away (Tyack and Whitehead, 1983).

During the breeding season, males sing long, complex songs with frequencies between 25 and 5,000 Hz. Mean SLs are 165 dB (broadband), with a range of 144 to 174 dB (Payne and Payne, 1971; Frankel et al., 1995; Richardson et al., 1995; (Tyack and Clark 2000). The songs vary geographically among humpback populations and appear to have an effective range of approximately 10 to 20 km (5.4 to 10.8 nm) (Au et al. 2000). Singing males are typically solitary and maintain spacing of 5 to 6 km (2.7 to 3.2 nm) apart (Tyack, 1981; Frankel et al., 1995). Songs have been recorded on the wintering ground, along migration routes, and less often on northern feeding grounds (Richardson et al., 1995; Gabriele and Frankel 2002). A song is a series of sounds in a predictable order. The humpback songs are typically about 15 min long and are believed to be a mating-related display performed only by males.

North Pacific Minke Whale (*Balaenoptera acutorostrata*):

The minke whale has a cosmopolitan distribution in polar, temperate and tropical waters worldwide (Carretta et al. 2004). Several stocks are recognized around the world. The IWC recognizes three stocks of minke whales in the North Pacific: one in the Sea of Japan/East China Sea, one in the rest of the western Pacific west of 180°N, and one in the remainder of the Pacific (Donovan 1991). Although reliable abundance estimates do not exist for several of the stocks, the worldwide population size of minke whales is likely in the hundreds of thousands.

Minke whales have only been recently confirmed to occur seasonally (about November - March) around the Hawaiian Islands (Carretta et al. 2004; Barlow 2006), and their migration routes or destinations are not known. Four reliable sightings of minke whales were made by observers in the Hawai'i-based longline fishery during the months of December-March, 2000-2002 (Carretta et al. 2004). One confirmed sighting of a minke whale was made in November 2002 during a survey of waters within the U.S. EEZ of the Hawaiian Islands (Rankin and Barlow 2005; Barlow 2006). There are no known stranding records of this species from the main islands (Nitta 1991; Maldini et al. 2005). For management purposes under the MMPA, there are three stocks of minke whale recognized within the Pacific U.S. EEZ: 1) Hawaiian, 2) California/Oregon/ Washington, and 3) Alaskan.

A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in one 'off effort' sighting of a minke whale (Barlow 2006), following the acoustic detection of the so-called "boing" sound, which is now be attributed to the North Pacific minke whale (Rankin and Barlow 2005). This sighting was not part of regular survey operations and, therefore, could not be used to calculate an estimate of abundance (Barlow 2006). Furthermore, the majority of this survey took place during summer and early fall, when the Hawaiian stock of minke whale would be expected to be farther north. There currently is no abundance estimate for this stock of minke whales.

Minke whales are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA. Minke whales are listed in Appendix I of CITES (CITES 2005). The increasing levels of anthropogenic noise in the world's oceans have been suggested to be a habitat concern for whales (e.g. Richardson et al. 1995).

Normal swimming speeds of minke whales have been reported as 6.1 km/h (3.3 knots) (Lockyer, 1981). Dive times range from 1.5 to 7 min (Stewart and Leatherwood, 1985), but dive depths are not well known. Minke whales generally feed on small schooling fish, euphausiids, and copepods. They specialize their diet both seasonally and geographically based on prey availability (Stewart and Leatherwood, 1985).

There is no direct measurement of auditory threshold for the hearing sensitivity of minke whales (Ketten, 2000; Thewissen, 2002). Minke whales produce a variety of sounds, primarily moans, clicks, downsweeps, ratchets, thump trains, and grunts in the 80 Hz to 20 kHz range (Winn and Perkins, 1976; Thompson et al., 1979; Edds-Walton, 2000; Mellinger and Clark, 2000; Frankel, 2002). Complex vocalizations recorded from Australian minke whales involved pulses ranging between 50 and 9,400 Hz, followed by pulsed tones at 1,800 Hz and tonal calls shifting between 80 and 140 Hz (Gedamke et al., 2001)

Minke whales have been identified as the source of the "boing" signal. There are distinct differences between these signals in the eastern and central portions of the Pacific. Central Pacific boings has a pulse repetition rate of 115 s-1 and last approximately 2.6 whereas eastern Pacific boings has a pulse repetition rate of 92 s-1 and last approximately 3.6 (Rankin and Barlow 2005). The central Pacific type will be found around Hawai'i.

Sei Whale (*Balaenoptera borealis*):

Sei whales are distributed far out to sea in temperate regions of the world and do not appear to be associated with coastal features (Carretta et al. 2004). They are not found as far into polar waters as the other rorquals (Gambell 1985). In the North Pacific, the IWC recognizes only one stock of sei whales (Donovan 1991), but some evidence exists for multiple populations (Masaki 1977; Mizroch et al. 1984; Horwood 1987). Six sightings of sei whales were recently made during a summer/fall 2002 shipboard survey of waters within the U.S. EEZ of the Hawaiian Islands (Barlow 2006). For management purposes under the MMPA, sei whales within the Pacific U.S. EEZ are divided into three discrete, stocks: 1) Hawai'i 2) California, Oregon and Washington, and 3) Alaska.

Sei whales were estimated to have been reduced to 20% (8,600 out of 42,000) of their pre-whaling abundance in the North Pacific (Tillman 1977). There have been no direct estimates of sei whale abundance in the entire North Pacific based on sighting surveys. Twelve aerial surveys conducted within about 25 nmi of the main Hawaiian Islands in 1993-98 (Mobley et al. 2000) resulted in no sightings of sei whales. The 2002 shipboard survey resulted in a summer/fall abundance estimate of 77 (CV=1.06) sei whales (Barlow 2003b). This is currently the best available abundance estimate for this stock, but the majority of sei whales would be expected to be at higher latitudes in their feeding grounds at this time of year (Carretta et al. 2004).

There has been an IWC prohibition on taking sei whales since 1976, and commercial whaling in the U.S. has been prohibited since 1972. They are listed in Appendix I of CITES (CITES 2005). Sei whales are formally listed as "endangered" under the ESA, and consequently the Hawaiian stock is automatically considered as a "depleted" and "strategic" stock under the MMPA. A possible habitat concern for sei whales is the increasing levels of anthropogenic noise that may affect their communication (Richardson et al. 1995).

Swim speeds have been recorded at 4.6 km/h (2.5 knots). Dive times range from 0.75 min to 15 min, with a mean duration of 1.5 min (Schilling et al., 1992). Sei whales make shallow, foraging dives of 20 to 30 m (65 to 100 ft) followed by a deep dive up to 15 min in duration (Gambell, 1985b). They feed predominantly on copepods in the higher latitudes and schooling fish in the lower latitudes (Jonsgård and Darling, 1977; Rice, 1977; Nemoto and Kawamura, 1977; Kawamura, 1994; Sigurjonsson, 1995).

There is no direct measurement of auditory threshold for the hearing sensitivity of sei whales (Ketten, 2000; Thewissen, 2002). Few sounds have been recorded from sei whales. Knowlton et al. (1991) and Thompson et al. (1979) recorded rapid sequences of FM pulses in the 1.5 to 3.5 kHz range near groups of feeding sei whales during the summer off eastern Canada. Sei whales in the Antarctic produced low-frequency tonal signals and FM sweeps as well as broadband sounds that were markedly different from the mid-frequency signals recorded in the northern hemisphere (McDonald et al. 2005). Tonal calls occurred as single occurrence, or as two, three, or four parts. Each part of a call was short, with a mean duration of 0.45 seconds with a mean frequency of 433 Hz. The FM sweeps had a mean duration of 1.1 seconds and were centered around 432 Hz. The maximum source level for these calls was reported as 156 dB re 1 μPa at 1 m (McDonald et al. 2005).

2.2 Odontocetes

Blainville's Beaked Whale ***(Mesoplodon densirostris):***

Estimating the abundance and density of beaked whales is more difficult than for most other cetacean species, because beaked whales spend so much of their time submerged and field identification is difficult (Barlow et al. 2006). Blainville's beaked whale has a cosmopolitan distribution in tropical and temperate waters, apparently the most extensive known distribution of any Mesoplodon species (Mead 1989). Two strandings were reported in 1961 from Midway Atoll (Galbreath 1963) and another in 1983 from Laysan Island (Nitta 1991). Sixteen sightings were reported from the main islands by Shallenberger (1981), who suggested that Blainville's beaked whales were present off the Waianae Coast of O'ahu for prolonged periods annually. Three sightings were made during a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands (Barlow 2006). While nothing is known about stock structure, some genetic samples have been collected recently from around the main Hawaiian Islands, and photo-identification studies have suggested long-term sight fidelity for the west side of the island of Hawai'i (McSweeney et al. 2007). For management purposes under the MMPA, three Mesoplodon stocks are defined within the Pacific U.S. EEZ: 1) *M. densirostris* in Hawaiian waters, 2) *M. stejnegeri* in Alaskan waters, and 3) all Mesoplodon species off California, Oregon and Washington.

Aerial surveys were flown within 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998 and resulted in an abundance estimate of 68 (CV=0.60) Blainville's beaked whales for the Hawaiian stock (Mobley et al. 2000). This is an underestimate of the stock's abundance because areas around the Northwestern Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main islands were not surveyed (Carretta et al. 2004). Furthermore, this species is known to spend a large proportion of time diving, causing additional downward bias in the abundance estimate (Baird et al. 2005b). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 2,872 (CV=1.25) Blainville's beaked whales (Barlow 2006), including a correction factor for missed diving animals. This is currently the best available abundance estimate for this stock.

Between 1994 and 2002, at least one Blainville's beaked whale was observed hooked and killed in the Hawai'i-based longline fishery, with approximately 4-25% of all fishing effort observed (Forney 2004). In recent years, there has been increasing concern that loud underwater sounds, such as active sonar and seismic operations, may be harmful to beaked whales (Malakoff 2002). The use of active sonar from military vessels has been implicated in mass strandings of beaked whales in the Mediterranean Sea during 1996 (Frantzis 1998), the Bahamas during 2000 (Balcomb and Claridge 2001), and the Canary Islands 2002 (Martel 2002). Similar military active sonar operations may occur around the Hawaiian Islands but are unlikely near Honokohau Bay. No estimates of potential mortality or serious injury are available for U.S. waters (Carretta et al. 2004).

Blainville's beaked whales are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA. The Hawaiian stock of Blainville's beaked

whales is not considered strategic under the MMPA because the estimated rate of fisheries related mortality or serious injury within the Hawaiian Islands EEZ (0.8 animals per year) is less than the PBR (9.6) (Carretta et al. 2004).

General swim speeds for ziphiids have averaged 5 km/h (2.7 knots) (Kastelein and Gerrits, 1991). Dives of Blainville's beaked whales averaged 7.47 min during social interactions at the surface (Baird et al. 2004). Dives over 45 min have been recorded for some species in this genus (Jefferson et al., 1993). Dive depths are variable among species and not well documented.

Mesoplodon whales are deep diving species which consume small cephalopods and bentho-pelagic fish ((Sullivan and Houck 1979); Leatherwood et al., 1988; (Mead 1989); Jefferson et al., 1993; (MacLeod et al. 2003). Blainville's beaked whales diving to depths near 900 m (2625 ft) for 20 min or longer are most likely foraging (Leatherwood et al., 1988; (Baird et al. 2004).

There is no direct measurement of auditory threshold for the hearing sensitivity of *Mesoplodon* species (Ketten, 2000; (Thewissen 2002). There are sparse data available on the sound production of *Mesoplodon* species. A stranded Blainville's beaked whale in Florida produced chirps and whistles below 1 kHz up to 6 kHz (Caldwell and Caldwell, 1971a). More recent studies on Cuvier's beaked whales and Blainville's beaked whales conducted by Johnson et al. (2004) concluded that no vocalizations were detected from any tagged beaked whales when they were within 200 m (656.2 ft) of the surface. The Blainville's beaked whale started clicking at an average depth of 400 m (1312.3 ft), ranging from 200 to 570 m (656.2 to 1870.1 ft), and stopped clicking when they started their ascent at an average depth of 720 m (2362.2 ft), with a range of 500 to 790 m (1640.4 to 2591.9 ft). The intervals between regular clicks were approximately 0.4 second. Trains of clicks often end in a rapid increase in the click rate, which is also called a buzz. Both the Cuvier's beaked whale and the Blainville's beaked whale have a somewhat flat spectrum that was accurately sampled by Johnson et al. between 30 and 48 kHz. There may be a slight decrease in the spectrum above 40 kHz, but the 96 kHz sampling rate was not sufficient to sample the full frequency range of clicks from either of the species (Johnson et al., 2004).

Bottlenose Dolphin (*Tursiops truncatus*):

Bottlenose dolphins are distributed worldwide in tropical and warm-temperate waters (Carretta et al. 2004). In many regions, separate coastal and offshore forms are known (Walker 1981; Ross and Cockcroft 1990; Van Waerebeek et al. 1990). In Hawaiian waters, onshore-offshore forms of bottlenose dolphins may exist, but currently only one stock is recognized in this area. In U.S. Pacific EEZ, the following three stocks are recognized for management purposes under the MMPA: 1) Hawaiian, 2) California, Oregon and Washington offshore, and 3) California coastal.

Bottlenose dolphins are relatively common throughout the Hawaiian Islands, from the island of Hawai'i to the Kure Atoll (Shallenberger 1981). In the NWHI, they are found primarily in relatively shallow inshore waters (Rice 1960). In the main Hawaiian Islands, they are found in both shallow inshore waters and deep channels between islands. However, relative to survey effort, they occur primarily inshore of 500 m (Baird et al. 2003). Off the islands of Kaua'i and Ni'ihau, bottlenose dolphins are found out to at least 900 m depth, but, extensive survey efforts in waters deeper than 1500 m around the main islands resulted in no sightings (Baird et al. 2003). Fifteen strandings have been reported in the main Hawaiian Islands (Nitta 1991; Maldini et al. 2005; M. Breese, pers. comm.).

Photographic identification surveys suggest that there is no movement of animals between the island groups of 1) Hawai'i, 2) Maui, Moloka'i, Lana'i and Kaho'olawe, 3) O'ahu and 4) Kaua'i and Ni'ihau (Baird et al. 2003). There is also a bimodal depth distribution in sightings off Kaua'i and Ni'ihau, suggesting separate shallow and deep-water populations. In their analysis of sightings of bottlenose dolphins in the eastern tropical Pacific (ETP), Scott and Chivers (1990) noted that there was a large hiatus between the westernmost sightings and the Hawaiian Islands. These data suggest that bottlenose dolphins in Hawaiian waters belong to a separate stock from those in the ETP (Martien et al. 2005).

Photographic mark-recapture studies off Maui and Lana'i estimated 134 (95% C.I. 107- 180) bottlenose dolphins inhabiting that area (Baird et al. 2002). More recently, a minimum of 219 distinct bottlenose dolphins were identified around all the main Hawaiian Islands (Baird et al. 2003). The Hawaiian stock was estimated at 743 (CV=0.56) animals based on twelve aerial surveys conducted in 1993, 1995 and 1998 (Mobley et al. 2000). This abundance underestimates the total number of bottlenose dolphins within the U.S. EEZ off Hawai'i, because areas around the NWHI and beyond 25 nmi from the main Hawaiian Islands were not surveyed (Carretta et al. 2004). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 3,215 (CV=0.59) bottlenose dolphins (Barlow 2006). This is currently the best available abundance estimate for this stock.

Interactions with cetaceans have been reported for all Hawaiian pelagic fisheries, and some of these interactions involved bottlenose dolphins (Nitta and Henderson 1993). Between 1994 and 2002 two bottlenose dolphins were observed hooked or entangled in the Hawai'i-based longline fishery outside of U.S. EEZ waters, with approximately 4-25% of all effort observed (Forney 2004). During the 905 observed trips with 11,014 sets, the average interaction rate of bottlenose dolphins was one animal per 905 fishing trips, or one animal per 11,014 sets. Both animals caught were considered seriously injured (Forney 2004), based on an evaluation of the observer's description of the interaction and following established guidelines for assessing serious injury in marine mammals (Angliss and Demaster 1998). Average 5-yr estimates of annual mortality and serious injury for 1998-2002 are 5.8 (CV = 1.00) bottlenose dolphins outside of U.S. EEZs, and none within U.S. EEZs. Several additional unidentified cetaceans, which may have been bottlenose dolphins, were also taken in this fishery (Forney 2004).

Bottlenose dolphins are one of the species commonly reported to take bait and catch from several Hawaiian sport and commercial fisheries (Nitta and Henderson 1993; Schlais 1984; S. Yin, pers. obs.). Observations of bottlenose dolphins taking bait or catch have also been made in the day handline fishery (palu-ahi) for tuna, the handline fishery for mackerel scad, the troll fishery for billfish and tuna, and the inshore set gillnet fishery (Nitta and Henderson 1993). Nitta and Henderson (1993) indicated that bottlenose

dolphins remove bait and catch from handlines used to catch bottomfish off the island of Hawai'i and Ka'ula Rock and on several banks of the NWHI. Fishermen have reported that interactions with dolphins that steal bait and catch are increasing. Interaction rates between dolphins and the NWHI bottomfish fishery have been estimated based on studies conducted in 1990-1993, indicating that an average of 2.67 dolphin interactions, most likely involving bottlenose and rough-toothed dolphins (*Steno bredanensis*), occurred for every 1000 fish brought on board (Kobayashi and Kawamoto 1995). It is not known whether these interactions result in serious injury or mortality of dolphins. Beginning in the early 1970s the National Marine Fisheries Service received reports of fishermen shooting at bottlenose dolphins to deter them from taking fish catches (Nitta and Henderson 1993). Nitta and Henderson (1993) also reported that one bottlenose dolphin calf was removed from a small-mesh set gillnet off Maui in 1991 and expressed surprise that bottlenose dolphins are "rarely reported entangled or raiding set gill nets in Hawaii," considering that they so often remove fish from fishing lines. In Hawai'i, some mortality of bottlenose dolphins has been observed in inshore gillnets (including an entangled dolphin that stranded in 1998: Carretta et al. 2004), but no estimate of annual human-caused mortality and serious injury is available for this stock, because these fisheries are not observed or monitored.

No habitat issues are known to be of concern for bottlenose dolphins. They are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA.

Sustained swim speeds for bottlenose dolphins range between 4 and 20 km/h (2.2 and 10.8 knots). Speeds commonly range from 6.4 to 11.5 km/h (3.4 to 6.2 knots) and may reach speeds as high as 29.9 km/h (16.1 knots) for 7.5 seconds (Croll et al., 1999). Dive times range from 38 seconds to 1.2 min but have been known to last as long as 10 min (Mate et al. 1995); Croll et al. 1999). The dive depth of a bottlenose dolphin in Tampa Bay was measured at 98 m (322 ft) (Mate et al. 1995). The deepest dive recorded for a bottlenose dolphin is 535 m (1,755 ft), reached by a trained individual (Ridgway, 1986).

At present, there is very little information about the prey species or feeding behavior of the bottlenose dolphins off the island of Hawai'i, although studies in other parts of the world have found bottlenose dolphins to be very opportunistic in their feeding behavior (see review in Connor et al. 2000). The diet of the bottlenose dolphin is diverse in nature, ranging from coastal squid and fish to small mesopelagic fish and squid (Croll et al., 1999), with a preference for sciaenids, scombrids, and mugilids (Wells and Scott, 2002). Seasonal and geographical variation may influence the diet of bottlenose dolphins (Evans, 1994). There is also some evidence that dolphins feed in different areas depending on sex and size. Lactating females and calves have been reported foraging in the near-shore zone, while adolescents feed farther offshore. Females without young and male adults may feed still farther offshore (Wells and Scott, 2002). Bottlenose dolphins appear to be active during both the day and night. Their activities are influenced by the seasons, time of day, tidal state, and physiological factors such as reproductive seasonality (Wells and Scott, 2002).

Bottlenose dolphins hear underwater sounds in the range of 150 Hz to 135 kHz (Johnson, 1967; Ljungblad et al., 1982). Their best underwater hearing occurs at 15 kHz, where the threshold level range is 42 to 52 dB RL (Sauerland and Dehnhardt, 1998). Bottlenose dolphins also have good sound location abilities and are most sensitive when sounds arrive from the front (Richardson et al., 1995).

Bottlenose dolphins produce sounds as low as 0.05 kHz and as high as 150 kHz with dominant frequencies at 0.3 to 14.5 kHz, 25 to 30 kHz, and 95 to 130 kHz (Johnson, 1967; Popper, 1980a; McCowan and Reiss, 1995; Schultz et al., 1995; Croll et al., 1999; Oswald et al., 2003). The maximum SL is 228 dB re 1 μPa at 1 m (P-P) (Croll et al., 1999). Bottlenose dolphins produce a variety of whistles, echolocation clicks and burst-pulse sounds. Echolocation clicks with peak frequencies from 40 to 130 kHz are hypothesized to be used in navigation, foraging, and predator detection (Au, 1993; Houser et al., 1999 *in* Helweg et al., 2003; Jones and Sayigh, 2002). According to Au (1993), biosonar clicks are broadband, ranging in frequency from a few kHz to more than 150 kHz, with a 3-dB bandwidth of 30 to 60 kHz (Croll et al., 1999). The echolocation signals usually have a 50 to 100 microsecond duration with peak frequencies ranging from 30 to 100 kHz and fractional bandwidths between 10 and 90 percent of the peak frequency (Houser et al., 1999 *in* Helweg et al., 2003).

Burst-pulses, or squawks, are commonly produced during social interactions. These sounds are broadband vocalizations that consist of rapid sequences of clicks with inter-click intervals less than 5 milliseconds. Burst-pulse sounds are typically used during escalations of aggression.

Each individual bottlenose dolphin has a fixed, unique FM pattern, or contour whistle called a signature whistle. These signal types have been well studied and are presumably used for recognition, but may have other social contexts (Frankel, 2002; Sayigh, 2002). More recent work with synthetically produced signature whistles has demonstrated that the whistle contour itself conveys information to the listener (Janik et al. 2006). This is a necessary condition for the animals to use the signature whistles in a referential, or labeling, context. One application of this may be seen as bottlenose dolphins appear to be use signature whistles as a contact call when animals are separated (Watwood et al. 2005). Signature whistles typically have a narrow-band sound with the frequency commonly between 4 and 20 kHz, duration between 0.1 and 3.6 seconds, and a SL of 125 to 140 dB re 1 μPa at 1m (Caldwell et al. 1990).

Cuvier's Beaked Whale (*Ziphius cavirostris*):

Estimating the abundance and density of beaked whales is more difficult than for most other cetacean species, because beaked whales spend so much of their time submerged and field identification is difficult (Barlow et al. 2006). Cuvier's beaked whales occur in all oceans and major seas (Heyning 1989). In Hawai'i, five strandings have been reported from Midway Atoll, Pearl & Hermes Reef, O'ahu, and the island of Hawai'i (Shallenberger 1981; Galbreath 1963; Richards 1952; Nitta 1991; Maldini et al. 2005). Sightings have been reported off Lana'i and Maui (Shallenberger 1981) and Hawai'i, Ni'ihau, and Kaua'i (Mobley et al. 2000; Baird et al. 2004). Three sightings were made during a 2002 shipboard survey of waters within the U.S. EEZ of the Hawaiian Islands (Barlow 2006). While nothing is known about stock structure, some genetic samples have been collected recently (Carretta et al. 2004), and photo-

identification studies have suggested long-term sight fidelity for the west side of the island of Hawai'i (McSweeney et al. 2007). In U.S. Pacific EEZ, the following three stocks are recognized for management purposes under the MMPA: 1) Hawaiian, 2) Alaskan, and 3) California, Oregon and Washington.

In Hawaiian waters, nothing is known about the stock structure of this species. Wade and Gerrodette (1993) made an abundance estimate of Cuvier's beaked whales in the ETP of 20,000 (CV = 0.265), but it is not known if these are part of the Hawaiian stock. The Hawaiian stock was estimated at 43 (CV=0.51) animals based on twelve aerial surveys conducted in 1993, 1995 and 1998 (Mobley et al. 2000). This abundance underestimates the total number of Cuvier's beaked whales within the U.S. EEZ off Hawai'i, because areas around the NWHI and beyond 25 nmi from the main Hawaiian Islands were not surveyed (Carretta et al. 2004). Furthermore, this species is known to spend a large proportion of time diving, causing additional downward bias in the abundance estimate. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 15,242 (CV=1.43) Cuvier's beaked whales (Barlow 2006), including a correction factor for missed diving animals. This is currently the best available abundance estimate for this stock.

Cuvier's beaked whales are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA.

No Cuvier's beaked whales were observed hooked or entangled in the Hawai'i-based longline fishery in U.S. and international waters between 1994 and 2002, with approximately 4-25% of all effort observed (Forney 2004). However, three unidentified cetaceans, which may have been Cuvier's beaked whales, were taken in this fishery (Forney 2004). The increasing levels of anthropogenic noise in the world's oceans has been suggested to be a habitat concern for whales (Richardson et al. 1995), particularly for deep-diving whales like Cuvier's beaked whales that feed in the oceans' "sound channel" (Carretta et al. 2004). In recent years, there has been increasing concern that loud underwater sounds, such as active sonar and seismic operations, may be harmful to beaked whales (Malakoff 2002). The use of active sonar from military vessels has been implicated in mass strandings of beaked whales in the Mediterranean Sea during 1996 (Frantzis 1998), the Bahamas during 2000 (Carretta et al. 2004), and the Canary Islands 2002 (Martel 2002). Similar military active sonar operations may occur around the Hawaiian Islands but are unlikely near Honokohau Bay.

Swim speeds of Cuvier's beaked whale have been recorded between 5 and 6 km/h (2.7 and 3.3 knots) (Houston, 1991). Dive durations range between 20 and 87 min with an average dive time near 30 min (Heyning, 1989; Jefferson et al., 1993; (Baird et al. 2004). Dive depths for this species are inconclusive. Cuvier's beaked whales consume squid and deep-sea fish (Clarke 1996).

There is no direct measurement of auditory threshold for the hearing sensitivity of Cuvier's beaked whales (Ketten, 2000; (Thewissen 2002). Studies on Cuvier's beaked whales and Blainville's beaked whales conducted by Johnson et al. (2004) concluded that no vocalizations were detected from any tagged beaked whales when they were within 200 m (656.2 ft) of the surface. The Cuvier's beaked whale started clicking at an average depth of 475 m (1,558.4 ft), ranging from 450 to 525 m (1,476 to 1,722 ft), and stopped clicking when they started their ascent at an average depth of 850 m (2,789 ft), with a range of 770 to 1,150 m (2,526 to 3,773 ft). The intervals between regular clicks were approximately 0.4 second. Trains of clicks often end in a rapid increase in the click rate, which is also called a buzz. According to these studies, both the Cuvier's beaked whale and the Blainville's beaked whale have a somewhat flat spectrum that was accurately sampled by Johnson et al. (2004) between 30 and 48 kHz. There may be a slight decrease in the spectrum above 40 kHz, but the 96 kHz sampling rate was not sufficient to sample the full frequency range of clicks from either of the species (Johnson et al., 2004). Beaked whales are capable of producing SLs of 200 to 220 dB (peak-to-peak) (Johnson et al., 2004).

Zimmer et al. (2005a) also studied Cuvier's beaked whales and their echolocation clicks. The highest measured SL was 214 dB (peak-to-peak). It is recognized in this study that it is possible that Cuvier's beaked whales cannot produce any higher source levels, but it is more likely that the full capabilities of the Cuvier's beaked whales are underestimated by this study. Therefore, the maximum SL shown in this study may be the result of the whale's reducing the volume when ensonifying at each other (Zimmer et al., 2005a).

Dwarf Sperm Whale (*Kogia sima*):

Dwarf sperm whales, like pygmy sperm whales, are found in tropical to warm-temperate waters worldwide (Nagorsen 1985). At least four strandings of dwarf sperm whales have been documented in Hawai'i (Tomich 1986; Nitta 1991; Maldini et al. 2005). Two sightings of five pygmy or dwarf sperm whales were made between Hawai'i and Maui during twelve aerial surveys conducted in 1993, 1995 and 1998 within about 25 nmi of the main Hawaiian Islands (Mobley et al. 2000). Five sightings of dwarf sperm whale were made during a 2002 shipboard survey of waters within the U.S. EEZ of the Hawaiian Islands (Barlow 2006). Baird (2005b) reports that dwarf sperm whales are the sixth most commonly sighted odontocete around the main Hawaiian Islands. High site fidelity has been suggested off the west side of the island of Hawai'i, evidenced by a high rate of both within- and between-year photographic re-sightings (Baird et al. 2006b). In U.S. Pacific EEZ, the following two stocks are recognized for management purposes under the MMPA: 1) Hawaiian, and 2) California, Oregon and Washington.

A conservative estimate of approximately 11,200 was made for dwarf sperm whales in the ETP (Wade and Gerrodette 1993), Pacific, but it is not known whether these animals are part of the same population that occurs in the central North Pacific (Carretta et al. 2004). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 17,519 (CV=0.74) dwarf sperm whales (Barlow 2006), including a correction factor for missed diving animals. This is currently the best available abundance estimate for this stock.

No estimate of annual human-caused mortality is available for the Hawaiian stock of dwarf sperm whales because no reports of direct or incidental takes have been reported in Hawaiian waters (Nitta and Henderson 1993). None were observed hooked in the Hawai'i-based longline fishery between 1994 and 2002, with approximately 4-25% of all effort observed (Forney 2004).

Dwarf sperm whales are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA. The increasing levels of anthropogenic noise in the world's oceans has been suggested to be a habitat concern for whales (Richardson et al. 1995), particularly for deep-diving whales like dwarf sperm whales that feed in the oceans' "sound channel" (Carretta et al. 2004).

A stranded *Kogia breviceps* produced ultrasonic clicks, with frequencies between 60 and 200 kHz with a peak in energy at 125 kHz (Marten 2000). Click duration averaged 600 µsec, and repetition rates began typically began at 20 Hz and increased during a click train. Kogia simus has been reported to have clicks between 13 and 33 kHz (Jérémie et al. 2006), however the details of the recording equipment were not provided. Therefore, the completeness of this report remains in doubt.

False Killer Whale (*Pseudorca crassidens*):

False killer whales are found in tropical and warm-temperate waters worldwide (Stacey et al. 1994). In the North Pacific this species is well known from southern Japan, Hawai'i and the ETP. In U.S. Pacific waters, one stock of false killer whales, the Hawaiian stock, is recognized for management purposes under the MMPA. Fishery interactions with false killer whales demonstrate that this species also occurs in U.S. EEZ waters around Palmyra Atoll (Carretta et al. 2004) but it is not known whether these animals are part of the Hawaiian stock or whether they represent a separate stock of false killer whales. False killer whales occur around all the main Hawaiian Islands (Nitta and Henderson 1993) as well as the NWHI (Barlow 2003b). There are six stranding records from Hawaiian waters (Nitta 1991; Maldini et al. 2005). Two sightings of false killer whales were made during a 2002 shipboard survey of waters within the U.S. EEZ of the Hawaiian Islands (Barlow 2006). While there is apparently inter-island movement of false killer whales, at least within the leeward Hawaiian Islands (Baird et al. 2005a), genetic analyses of tissue samples collected near the main Hawaiian Islands indicate that Hawaiian false killer whales are reproductively isolated from false killer whales found in the eastern tropical Pacific Ocean (Chivers et al. In Press).

Population estimates for this species have been made for Japanese waters (16,600 animals, Miyashita 1993) and the ETP (39,800 animals, CV = 0.636, Wade and Gerrodette 1993). However, evidence suggests these animals are from different populations (Carretta et al. 2004). Aerial surveys were flown within 25nmi of the main Hawaiian Islands in 1993, 1995 and 1998 and resulted in an abundance estimate of 121 (CV=0.47) false killer whales for this stock (Mobley et al. 2000). This is an underestimate of abundance because the survey did not encompass their entire range in Hawaiian waters and estimates were uncorrected for the proportion of diving animals missed from the survey aircraft (Carretta et al. 2004). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 236 (CV=1.13) false killer whales (Barlow 2006). This is the best available abundance estimate for false killer whales within the Hawaiian Islands EEZ.

False killer whales have been identified in fishermen's logs and NOAA Fisheries observer records as taking catches from pelagic longlines (Nitta and Henderson 1993; Carretta et al. 2004). They have also been observed feeding on mahimahi (*Coryphaena* *hippurus*) and yellowfin tuna (*Thunnus albacares*) and frequently steal large fish (up to 70 pounds) (Shallenberger 1981) from the trolling lines of both commercial and recreational fishermen (Carretta et al. 2004). Between 1994 and 2002, at least ten false killer whales were observed hooked in the Hawai'i-based longline fishery with approximately 4-25% of all effort observed (Forney 2004). Baird and Gorgone (2005) examined the rate of major dorsal fin disfigurements of false killer whales from near-shore waters around the main Hawaiian Islands and hypothesized that these animals were likely part of the same population that interacts with the Hawai'i-based tuna and swordfish longline fishery in offshore Hawaiian waters.

False killer whales are not listed as "depleted" under the MMPA nor as "threatened" or "endangered" under the ESA. Because the rate of mortality and serious injury to false killer whales within the Hawaiian Islands EEZ in the Hawai'i-based longline fishery (4.4 animals per year) exceeds the Potential Biological Removal (PBR) level (1.0) (Carretta et al. 2004), this stock is considered a strategic stock under the MMPA.

False killer whales have an approximate swim speed of 3 km/h (1.6 knots), although a maximum swim speed has been documented as 28.8 km/h (11.9 knots) (Brown et al. 1966; Rohr et al., 2002). No data is available on diving (Baird 2002a). Their diet consists primarily of fish and squid and on occasion, other small odontocetes (Evans and Raga, 2001; Baird, 2002a).

False killer whales hear underwater sounds in the range of <1 to 115 kHz (Johnson, 1967; Awbrey et al., 1988; Au, 1993). Their best underwater hearing occurs at 17 kHz, where the threshold level ranges between 39 to 49 dB RL (Sauerland and Dehnhardt, 1998).

Au et al. (1997) conducted a survey on the effects of the Acoustic Thermometry of Ocean Climate (ATOC) program on false killer whales and on Risso's dolphins. The ATOC program broadcast a low-frequency 75-Hz phase modulated, 195 dB SL signal through ocean basin-sized water masses to study ocean temperatures on a global scale. The hearing sensitivity was measured for false killer whales. The hearing thresholds for false killer whales were 140.7 dB RL, plus or minus 1.2 dB for the 75-Hz pure tone signal and 139.0 dB RL plus or minus 1.1 dB for the ATOC signal.

False killer whales produce a wide variety of sounds from 4 to 130 kHz, with dominant frequencies between 25 to 30 kHz and 95 to 130 kHz (Busnel and Dziedzic, 1968; Kamminga and van Velden, 1987; Thomas and Turl, 1990; Murray et al., 1998). Most signal types vary between whistles, burst-pulse sounds and click trains (Murray et al. 1998). Whistles generally range between 5.4 and 8.3 kHz (Rendell et al. 1999). False killer whales echolocate highly directional clicks ranging between 20 and 60 kHz and 100 and 130 kHz (Kamminga and van Velden, 1987; Thomas and Turl, 1990). There is no available data regarding seasonal or geographical variation in the sound production of false killer whales. Estimated SL of clicks are near 228 dB re 1 µPa at 1m (P-P) (Thomas and Turl, 1990).

Fraser's Dolphin (*Lagenodelphis hosei*):

Little is known about Fraser's dolphin, which is a tropical oceanic species distributed worldwide (Perrin et al. 1994a; Jefferson and Leatherwood 1994). It has only recently been documented within the U.S. EEZ of the Hawaiian Islands, during a 2002 cetacean survey (Barlow 2006). One stranding from the island of Kaua'i has since been documented in 2004 (M. Breese, pers. comm.). For the MMPA stock assessment reports, there is a single Pacific management stock including only animals found within the U.S. EEZ of the Hawaiian Islands.

An estimate of abundance for this species in the ETP was made of 289,300 Fraser's dolphins (CV = 0.335) (Wade and Gerrodette 1993), but it is not known whether these animals are part of the same population that occurs around the Hawaiian Islands and in the central North Pacific (Carretta et al. 2004). No sightings of this species were made during twelve aerial surveys conducted in 1993, 1995 and 1998 within about 25 nmi of the main Hawaiian Islands (Mobley et al. 2000). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 10,226 (CV=1.16) Fraser's dolphins (Barlow 2006). This is currently the best available abundance estimate for this stock.

Fraser's dolphins are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA.

Swim speeds of Fraser's dolphin have been recorded between 4 and 7 km/h (2.2 and 3.8 knots) with swim speeds up to 28 km/hr (15 knots) when escaping predators (Croll et al., 1999). Several foraging depths have been recorded. Based on prey composition, it is believed that Fraser's dolphins feed at two depth horizons in the eastern tropical Pacific. The shallowest depth in this region is no less than 250 m (820 ft) and the deepest is no less than 500 m (1640 ft). In the Sulu Sea, they appear to feed near the surface to at least 600 m (1968.5 ft) In South Africa and in the Caribbean, they were observed feeding near the surface (Dolar et al. 2003). According to Watkins et al. (1994), Fraser's dolphins herd when they feed, swimming rapidly to an area, diving for 15 seconds or more, surfacing and splashing in a coordinated effort to surround the school of fish. Dive durations are not available. They feed on mesopelagic fish, crustaceans, and cephalopods, particularly Myctophidae, Chauliodontidae, and Oplophoridae (Croll et al., 1999; Dolar, 2002).

There is no direct measurement of auditory threshold for the hearing sensitivity of Fraser's dolphins (Ketten, 2000; Thewissen, 2002).

Fraser's dolphins produce sounds ranging from 4.3 to over 40 kHz (Leatherwood et al., 1993; Watkins et al., 1994). Echolocation clicks are described as short broadband sounds without emphasis at frequencies below 40 kHz, while whistles were frequency-modulated tones concentrated between 4.3 and 24 kHz. Whistles have been suggested as communicative signals during social activity (Watkins et al., 1994).

Killer Whale (*Orcinus orca*):

Killer whales have been observed in all oceans and seas throughout the world (Leatherwood and Dahlheim 1978). Although reported from tropical and offshore waters (Heyning and Dahlheim 1988), killer whales prefer the colder waters of both hemispheres, with greatest abundances found within 800 km of major continents (Mitchell 1975). They are rare in Hawaiian waters (Baird et al. 2006a), and no data are available to estimate abundance for this species in the central Pacific (Carretta et al. 2004). No killer whales were seen during 1993-98 aerial surveys within about 25 nmi of the main Hawaiian Islands, but one sighting was reported during subsequent surveys (Mobley et al. 2000, 2001). Two sightings of killer whales were made during a 2002 shipboard survey of waters within the U.S. EEZ of the Hawaiian Islands (Barlow 2006). One stranding from the island of Hawai'i was reported in 1950 (Richards 1952) and another from the island of Lana'i in 2004 (M. Breese, pers. comm.). Except in the northeastern Pacific where "resident", "transient", and "offshore" stocks have been described for coastal waters of Alaska, British Columbia, and Washington to California (Bigg 1982; Leatherwood et al. 1990; Bigg et al. 1990; Ford et al. 1994), little is known about stock structure of killer whales in the North Pacific.

Baird et al. (2006a) reviewed 21 records of killer whales around the main Hawaiian Islands between 1994 and 2004 (with one sighting off French Frigate Shoals in the Northwestern Hawaiian Islands). Group sizes reported from these Hawaiian sightings ranged from 1 to 10 individuals, with a mean group size of 4.2 (SD 1/4 2.1). Baird et al (2006) also note analyses of skin samples from two animals indicated two mitochondrial haplotypes, one identical to the ''Gulf of Alaska transient 2'' haplotype (a mammal-eating form), and the other a unique mitochondrial haplotype for Hawaiian killer whales. Based on this and external morphology, they speculate that there may be genetic differentiation from populations from the coastal temperate waters of western North America.

In the Pacific U.S. EEZ, the following five stocks of killer whales are recognized for management purposes under the MMPA: 1) the Eastern North Pacific Northern Resident stock - occurring from British Columbia through Alaska, 2) the Eastern North Pacific Southern Resident stock - occurring within the inland waters of Washington State and southern British Columbia, 3) the Eastern North Pacific Transient stock - occurring from Alaska through California, 4) the Eastern North Pacific Offshore stock - occurring from Southeast Alaska through California, and 5) the Hawaiian stock (Carretta et al. 2004).

For the ETP, Wade and Gerrodette (1993) estimated the killer whale population to be 8,500 animals (CV = 0.368) from shipboard sightings surveys. Population sizes for killer whales in the coastal waters of British Columbia and Washington were estimated from photo-identification studies to be 261 animals (Bigg et al. 1990). The 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 349 (CV=0.98) killer whales (Barlow 2006). This is currently the best available abundance estimate for this stock.

Threats to killer whales in this stock are difficult to quantify due to limited data. In 1990, a solitary killer whale was reported to have removed the catch from a longline in Hawai'i (Dollar 1991). None were observed hooked or entangled in the Hawai'i-based longline fishery between 1994 and 2002, with approximately 4-25% of all effort observed (Forney 2004). This species is not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA. Because they feed at higher trophic levels, transient

killer whales may be more susceptible to bioaccumulation of environmental contaminants such as organochlorines (Ylitalo et al. 2001; Herman et al. 2005).

Swimming speeds usually range between 6 to 10 km/h (3.2 to 5.4 knots), but they can achieve speeds up to 37 km/h (20 knots) in short bursts (Lang, 1966; (LeDuc 2002). In southern British Columbia and northwestern Washington State, killer whales spend 70 percent of their time in the upper 20 m (66 ft) of the water column, but can dive to 100 m (330 ft) or more with a maximum-recorded depth of 201 m (660 ft) (Baird et al., 1998). The deepest dive recorded by a killer whale is 265 m (870 ft), reached by a trained individual (Ridgway, 1986). Dive durations recorded range from 1 to 10 min (Norris and Prescott, 1961; Lenfant, 1969; Baird et al., 1998).

Killer whales have perhaps the most diverse food habits of any marine mammal, feeding on a variety of fish species, cephalopods, pinnipeds, sea otters, whales, dolphins, seabirds, and marine turtles (Hoyt, 1981; Gaskin, 1982; Jefferson et al., 1991). In the Bering Sea there is some suggestion that killer whales prey on fish at water depths of 200 to 300 m (660-990 ft) or more (Yano and Dahlheim, 1995a and b). In Hawai'i, evidence of a diversity of prey types (including cephalopods, humpback whales, and possibly other cetaceans) suggests that killer whales in Hawaiian waters may not specialize only on marine mammals as seen in some temperate populations of killer whales in the North Pacific (Baird et al. 2006)

Killer whales hear underwater sounds in the range of <500 Hz to 120 kHz (Bain et al., 1993; Szymanski et al 1999). Their best underwater hearing occurs between 15 and 42 kHz, where the threshold level is near 34 to 36 dB RL (Hall and Johnson, 1972; Szymanski et al 1999).

Killer whales produce sounds as low as 80 Hz and as high as 85 kHz with dominant frequencies at 1-20 kHz (Schevill and Watkins, 1966; Diercks et al., 1971, 1973; Evans, 1973; Steiner et al., 1979; Awbrey et al., 1982; Ford and Fisher, 1983; Ford, 1989; Miller and Bain, 2000). An average of 12 different call types (range 7 to 17), mostly repetitive discrete calls, exist for each pod (Ford, 2002). Pulsed calls and whistles, called dialects, carry information hypothesized as geographic origin, individual identity, pod membership, and activity level. Vocalizations tend to be in the range between 500 Hz and 10 kHz and may be used for group cohesion and identity (Ford, 2002; Frankel, 2002). Whistles and echolocation clicks are also included in killer whale repertoires, but are not a dominant signal type of the vocal repertoire in comparison to pulsed calls (Miller and Bain, 2000). Nevertheless, a comparison of tonal (FM) whistles from the four acoustic clans off British Columbia found that the separated northern and southern residents had clearly different calls. The three southern clans that geographically overlap have identical calls (Riesch et al. 2006). These tonal calls may help provide community level recognition. Erbe (2002) recorded received broadband sound pressure levels of orca burst-pulse calls ranging between 105 and 124 dB re 1 μPa at an estimated distance of 100 m.

Longman's Beaked Whale (*Indopacetus pacificus*):

Estimating the abundance and density of beaked whales is more difficult than for most other cetacean species, because beaked whales spend so much of their time submerged and field identification is difficult (Barlow et al. 2006). Longman's beaked whale is considered one of the rarest and least known cetacean species (Jefferson et al. 1993; Rice 1998; Dalebout et al. 2003). The distribution of Longman's beaked whale, as determined from stranded specimens and sighting records of 'tropical bottlenose whales', includes tropical waters from the eastern Pacific westward through the Indian Ocean to the eastern coast of Africa. No strandings of Longman's beaked whales have been documented in Hawaiian waters, although numerous strandings of unidentified beaked whales have been reported (Nitta 1991; Maldini et al. 2005). One sighting of Longman's beaked whale was made during a 2002 survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands (Barlow 2006). For management purposes under MMPA, there is one Pacific stock of Longman's beaked whales, found within waters of the Hawaiian Islands EEZ.

A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 1,007 (CV=1.26) Longman's beaked whales (Barlow 2006). This is currently the best available abundance estimate for this stock.

In recent years, there has been increasing concern that loud underwater sounds, such as active sonar and seismic operations, may be harmful to deep-diving beaked whales (Malakoff 2002). The use of active sonar from military vessels has been implicated in mass strandings of beaked whales in the Mediterranean Sea during 1996 (Frantzis 1998), the Bahamas during 2000 (Carretta et al. 2004), and the Canary Islands 2002 (Martel 2002). Similar military active sonar operations may occur around the Hawaiian Islands but are unlikely near Honokohau Bay.

Longman's beaked whales are not listed as "threatened" or "endangered" under the ESA nor as "depleted" under the MMPA.

Longman's beaked whales in the western Indian ocean appear to have bimodal dive times; with short dives lasting between 11 to 18 minutes while longer dives last from 20 to 33 minutes (Anderson et al. 2006). Most of the whales seen in the Indian ocean were associated with the slope region, in waters from 250 to 2,500 m (Anderson et al. 2006).

Melon-headed Whale (*Peponocephala electra*):

Relatively little is known about melon-headed whales, which are distributed in tropical to warm-temperate waters worldwide (Perryman et al. 1994). They frequently eat small schooling fish, but also feed on squid (Sekiguchi et al. 1992; Jefferson and Barros 1997). These whales prefer deep, equatorial ocean waters (Watkins et al. 1997) and are thought to feed deep in the water column because one of their primary prey, mesopelagic squid, are found in waters up to 1,500m (4,920ft) deep (Jefferson and Barros 1997).

Median melon-headed whale group size around the main Hawaiian Islands from boat-based surveys was 305 individuals, with a range from 17 to 800 animals (Huggins et al. 2005). Large groups are seen regularly off all the main Hawaiian Islands (Shallenberger 1981; Baird et al. 2003; Huggins et al. 2005) over a range of water depths

(255 to 4,407m), but most frequently in depths greater than 2,000m (Huggins et al. 2005). Shallenberger (1981) described them as especially frequent off the Waianae coast of O'ahu, the north Kohala coast of Hawai'i, and the leeward coast of Lana'i. In Hawai'i, melon-headed whales are known to interact with humpback whales, rough-toothed dolphins, pantropical spotted dolphins (Huggins et al. 2005), short-finned pilot whales (Migura and Meadows 2002) and have been observed avoiding killer whales (Huggins et al. 2005). Inter-island movements from Kaua'i to Hawai'i have been documented based on photo-identified individuals (Huggins et al. 2005).

A comprehensive shipboard survey of the Hawaiian EEZ resulted in only one sighting of melon-headed whales (Barlow 2006). Little is known about this species elsewhere in its range, and most knowledge about its biology comes from mass strandings (Perryman et al. 1994). Eighteen strandings are known from Hawai'i (Nishiwaki and Norris 1966; Shallenberger 1981; Nitta 1991; Maldini et al. 2005; Southall et al. 2006). For management purposes under the MMPA, there is a single Pacific stock of melon-headed whales including only animals found in the U.S. EEZ of the Hawaiian Islands (Carretta et al. 2004).

Wade and Gerrodette (1993) produced an estimate of 45,400 melon-headed whales (CV = 0.467) in the ETP based on 14 sightings made during vessel surveys between1986 and 1990, but it is not known whether any of these animals are part of the same population that occurs around the Hawaiian Islands. Abundance of the Hawaiian stock was estimated as 154 (CV=0.88) animals based on aerial surveys conducted in 1993, 1995 and 1998 around the main Hawaiian Islands (Mobley et al. 2000). This study underestimated the total number of melon-headed whales within the U.S. EEZ off Hawai'i, because areas around the NWHI and beyond 25 nautical miles from the main islands were not surveyed (Carretta et al. 2004). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 2,950 (CV=1.17) melon-headed whales (Barlow 2006). This is currently the best available abundance estimate for this stock.

Melon-headed whales are not known to be taken by any fisheries in Hawaiian waters (Nitta and Henderson 1993). None were observed hooked in the Hawai'i-based longline fishery between 1994 and 2002, with approximately 4-25% of all effort observed (Forney 2004). On July 3-4, 2004, a stranding event occurred in which 150 to 200 melon–headed whales occupied the shallow waters of Hanalei Bay, Kaua'i, Hawai'i for over 28 hours. Investigations concluded that active Naval sonar transmissions were a plausible, if not likely, contributing factor in what may have been a confluence of events (Southall et al. 2006).

Melon-headed whales are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA.

General swim speeds for this melon-headed whales are not available. No data is available on dive depths and dive times of melon-headed whales. Melon-headed whales feed on mesopelagic squid found down to 1,500 m (4,920 ft) deep, so they appear to feed deep in the water column (Jefferson and Barros, 1997).

There is no direct measurement of auditory threshold for the hearing sensitivity of melon-headed whales (Ketten, 2000; (Thewissen 2002).

Melon-headed whales produce sounds between 8 and 40 kHz. Individual click bursts have frequency emphases between 20 and 40 kHz. Dominant frequencies of whistles are 8-12 kHz, with both upsweeps and downsweeps in frequency modulation (Watkins et al., 1997). There are no available data regarding seasonal or geographical variation in the sound production of this species. Maximum SLs are estimated at 155 dB for whistles and 165 dB for click bursts (Watkins et al., 1997).

Pantropical Spotted Dolphin (*Stenella attenuata*):

Pantropical spotted dolphins are primarily found in tropical and subtropical waters worldwide (Perrin and Hohn 1994). This species is found in both nearshore and oceanic waters (Reeves and Leatherwood 1994). Much of what is known about the species in the North Pacific has been learned from specimens obtained in the large directed fishery in Japan and in the eastern tropical Pacific (ETP) tuna purse-seine fishery (Perrin and Hohn 1994). These dolphins are common and abundant throughout the Hawaiian archipelago, particularly in channels between islands, over offshore banks (e.g. Penguin Banks), and off the lee shores of the islands (Shallenberger 1981; Barlow 2006). Östman-Lind et al. (2004) calculated a preliminary rough minimum abundance estimate of approximately 250 pantropical spotted dolphins utilizing the near-shore waters off the western coast of the Island of Hawai'i. They also noted the presence of near-shore mixed-species aggregations of spinner (*S. longirostris*) and pantropical spotted dolphins off this same coast. Twelve strandings of this species have been documented in Hawai'i (Nitta 1991; Maldini et al. 2005). Morphological differences and distribution patterns have been used to establish that the spotted dolphins around Hawai'i belong to a stock that is distinct from those in the ETP (Perrin 1975; Dizon et al. 1994; Perrin et al. 1994b). Their possible affinities with other stocks elsewhere in the Pacific are unknown. Fishery interactions with pantropical spotted dolphins demonstrate that this species also occurs in U.S. EEZ waters around Palmyra Island (Carretta et al. 2004), but these animals may represent a separate stock of pantropical spotted dolphins.

For the MMPA stock assessment reports, there is a single Pacific management stock including only animals found within the U.S. EEZ of the Hawaiian Islands. Spotted dolphins involved in eastern tropical Pacific tuna purse-seine fisheries are managed separately under the MMPA.

An abundance estimate of 2,928 (CV=0.45) pantropical spotted dolphins in Hawai'i was calculated from aerial surveys flown in 1993, 1995 and 1998 (Mobley et al. 2000). This number is an underestimate because areas around the Northwestern Hawaiian Islands and beyond 25 nautical miles from the main islands were not surveyed (Carretta et al. 2004). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 8,978 (CV=0.48) pantropical spotted dolphins (Barlow 2006). This is currently the best available abundance estimate for this stock of pantropical spotted dolphins.

Previous to 1994 there were no reports of direct or incidental takes of this species in Hawaiian waters (Nitta and Henderson 1993). Between 1994 and 2002 one pantropical spotted dolphin was observed entangled and killed in the Hawai'i-based

longline fishery within U.S. EEZ waters, with approximately 4-25% of all effort observed (Forney 2004).

Spotted dolphins are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA.

Pantropical spotted dolphins have been documented to feed during the day (e.g. Östman-Lind et al. 2004), but it has also been suggested that they move inshore to feed on the mesopelagic boundary community during the night (Baird et al. 2001), like spinner dolphin schools.

Pantropical spotted dolphins have been recorded swimming up to 39.7 km/hr (21.4 knots) for 2 seconds, although, this may be an overestimate. Other individuals have been recorded as swimming at speeds of 4 to 19 km/hr (2.2 to 10.3 knots) with bursts up to 22 km/hr 12 knots) (Perrin, 2002d). Pantropical spotted dolphins off Hawai'i have been recorded to dive at a maximum depth of 122 m (400 ft) during the day and 213 m (700 ft) during the night (Baird et al. 2001). The average dive duration for the pantropical spotted dolphins is 1.95 min with depths as deep as 100 m (Scott et al., 1993). Dives of up to 3.4 min have been recorded (Perrin, 2002d). An Atlantic spotted dolphin was documented with a maximum dive duration of 3.5 min (Davis et al. 1996).

Atlantic spotted dolphins produce a variety of sounds, including whistles, whistle-squawks, buzzes, burst-pulses, synch pulses, barks, screams, squawks, tail slaps, and echolocation clicks. Like other odontocetes, they produce broadband, short duration echolocation signals. Most of these signals have a bimodal frequency distribution. They project relatively high-amplitude signals with a maximum SL of about 223 dB (Au and Herzing, 2003). Their broadband clicks have peak frequencies between 60 and 120 kHz. Dolphins produce whistles with frequencies generally in the human audible range, below 20 kHz. These whistles often have harmonics which occur at integer multiples of the fundamental and extend beyond the range of human hearing. Atlantic spotted dolphins have also been recorded making burst pulse squeals and squawks, along with bi-modal echolocation clicks with a low-frequency peak between 40 and 50 kHz and a high-frequency peak between 110 and 130 kHz. Many of the vocalizations from Atlantic spotted dolphins have been associated with foraging behavior (Herzing, 1996). There is no available data regarding seasonal variation in the sound production of *Stenella* dolphins, although geographic variation is evident. Peak-to-peak SLs as high as 210 dB have been measured (Au et al., 1998; Au and Herzing, 2003). Pantropical spotted dolphins whistles have a mean minimum frequency of 8.2 (S.D. = 1.7) kHz and a mean upper frequency of 18.7 (SD = 3.0) kHz. The mean duration of these whistles was 0.9 seconds (SD = 0.4) (Oswald et al. 2003). These pantropical spotted dolphin data are consistent with those of the better-described Atlantic spotted dolphin.

Pygmy Killer Whale (*Feresa attenuata*):

The pygmy killer whale is widely distributed in tropical and subtropical waters worldwide (Ross and Leatherwood 1994). They are poorly known in most parts of their range (Carretta et al. 2004). Most knowledge of this species is from stranded or live-captured specimens. Pryor et al. (1965) stated that pygmy killer whales have been observed several times off the lee shore of O'ahu, and that "they seem to be regular residents of the Hawaiian area." Although all sightings up to that time had been off

O'ahu and the Big Island, Shallenberger (1981) stated that this species might be found elsewhere in Hawai'i, as well. No pygmy killer whales were seen during 1993-98 aerial surveys within about 25 nmi of the main Hawaiian Islands (Mobley et al. 2000). Three sightings of pygmy killer whales were made during a 2002 shipboard survey of U.S. EEZ waters surrounding the Hawaiian Islands (Barlow 2006). Six strandings have been documented from Maui and the island of Hawai'i (Nitta 1991; Maldini et al. 2005). For management purposes under the MMPA, one stock of this species is recognized in the U.S. Pacific waters and it is the Hawaiian stock.

A population estimate has been made for this species in the eastern tropical Pacific (Wade and Gerrodette 1993), but it is not known whether any of these animals are part of the same population that occurs around the Hawaiian Islands. The 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 956 (CV=0.83) pygmy killer whales (Barlow 2006). This is currently the best available abundance estimate for this stock. Results of a 19-year photo-identification study off the island of Hawai'i suggest that the population size in this area is small (likely 100-200 individuals), and the individuals show a very high level of site fidelity (McSweeney et al. 2005).

Pygmy killer whales are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA.

General swim speeds for this species is not available. No dive data are available. Pygmy killer whales feed on cephalopods and small fish (Donahue and Perryman, 2002). They are also suspected of feeding on small marine mammals (Evans and Raga, 2001).

There is no direct measurement of auditory threshold for the hearing sensitivity of pygmy killer whales (Ketten, 2000(Thewissen 2002). Little is known of the sound production of this species. One document describes pygmy killer whales producing LF "growl" sounds (Pryor et al., 1965). Echolocation clicks are short (25µs) with estimated source levels between 197 and 223 dB re 1µPa at 1m (P-P) (Madsen et al. 2004b). The spectrum of these clicks were bimodal, with peaks at 45 and 117 kHz, although the received spectral is aspect-dependent.

Pygmy Sperm Whale (*Kogia breviceps*):

The pygmy sperm whale, like the dwarf sperm whale, is found in tropical to warm-temperate waters worldwide (Caldwell and Caldwell 1989). Between the years 1949 and 2002, at least 22 strandings of this species were reported in the Hawaiian Islands (Tomich 1986; Nitta 1991; Maldini et al. 2005). A stranded calf was held for several days at Sea Life Park (Pryor 1975). Shallenberger (1981) reported three sightings off O'ahu and Maui. Two sightings of pygmy or dwarf sperm whales were made between Hawai'i and Maui during 1993-98 aerial surveys within about 25 nmi of the main Hawaiian Islands (Mobley et al. 2000). Two sightings were made during a 2002 shipboard survey of waters within the U.S. EEZ of the Hawaiian Islands (Barlow 2006). Baird (2005b) reported one sighting off Ni'ihau and another off the island off Hawai'i (Carretta et al. 2004). Nothing is known about stock structure for this species. For management purposes under the MMPA, two stocks of pygmy sperm whales are

recognized in U.S. waters of the Pacific Ocean: 1) Hawaiian and 2) California, Oregon, Washington.

A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 7,138 (CV=1.12) pygmy sperm whales (Barlow 2006), including a correction factor for missed diving animals. This is currently the best available abundance estimate for this stock.

Little is known about pygmy sperm whale interactions with fisheries, but no direct or incidental takes have been documented for all Hawaiian pelagic fisheries (e.g. Nitta and Henderson 1993) and none were observed hooked or entangled in the Hawai'i-based longline fishery between 1994 and 2002, with approximately 4-25% of all effort observed (Forney 2004).

Pygmy sperm whales are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA. The increasing levels of anthropogenic noise in the world's oceans has been suggested to be a habitat concern for whales (Richardson et al. 1995), particularly for deep-diving whales like pygmy sperm whales that feed in the oceans' "sound channel".

Swim speeds of pygmy sperm whales vary and were found to reach up to 11 km/h (5.9 knots) (Scott et al. 2001). In the Gulf of California, *Kogia* species have been recorded with an average dive time of 8.6 min and a maximum dive time of 43 min for dwarf sperm whales in the Gulf of Mexico (Breese and Tershy, 1993; Willis and Baird, 1998). *Kogia* spp. consume a variety of cephalopod species and occasionally feed on fish and crustaceans (McAlpine 2002).

There are sparse data on the hearing sensitivity for pygmy sperm whales. An Auditory Brainstem Response study on a rehabilitating pygmy sperm whale indicated that this species has an underwater hearing range that is most sensitive between 90 and 150 kHz (Carder et al., 1995; (Ridgway and Carder 2001).

Recent recordings from captive pygmy sperm whales indicate that they produce sounds between 60 and 200 kHz with peak frequencies at 120-130 kHz (Santoro et al., 1989; Carder et al., 1995; (Ridgway and Carder 2001). Echolocation pulses were documented with peak frequencies at 125 to 130 kHz (Ridgway and Carder 2001). Thomas et al. (1990) recorded a LF sweep between 1,300 and 1,500 Hz from a captive pygmy sperm whale in Hawai'i. Richardson et al. (1995) reported pygmy sperm whale frequency ranges for clicks to be between 60 and 200 kHz with the dominant frequency at 120 kHz. No geographical or seasonal differences in sounds have been documented. Estimated source levels were not available.

Risso's Dolphin (*Grampus griseus*):

Risso's dolphins are distributed worldwide in temperate and tropical waters (Kruse et al. 1999). They have been considered rare in Hawaiian waters (Shallenberger 1981). Only one sighting was made during aerial surveys in 1993, 1995 and 1998 (Mobley et al. 2000). However, seven sightings were made during a 2002 survey of the U.S. EEZ of the Hawaiian Islands (Barlow 2006). There are five stranding records from the main islands (Nitta 1991; Maldini et al. 2005). For management purposes under the

MMPA, there are two stocks of Risso's dolphins recognized within the Pacific U.S. EEZ: 1) Hawaiian, and 2) California, Oregon and Washington (Carretta et al. 2004).

An abundance estimate of 16,483 Risso's dolphins (CV = 0.28) was produced for waters of California, Oregon and Washington waters, from a weighted 1991-96 average based on three ship surveys (Barlow 1997). Population estimates have also been made off Japan (Miyashita 1993) and in the eastern tropical Pacific (Wade and Gerrodette 1993), but it is not known whether these animals are part of the same population that occurs around the Hawaiian Islands and in the central North Pacific. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 2,372 (CV=0.65) Risso's dolphins (Barlow 2006). This is currently the best available abundance estimate for this stock.

Interactions with cetaceans have been reported for all Hawaiian pelagic fisheries (Nitta and Henderson 1993), and some of these interactions involved Risso's dolphins. Between 1994 and 2002, seven Risso's dolphins were observed hooked or entangled in the Hawai'i-based longline fishery outside of U.S. EEZ waters, with approximately 4-25% of all effort observed (Forney 2004). During the 905 observed trips with 11,014 sets, the average interaction rate of Risso's dolphins was one animal per 129 fishing trips, or one animal per 1,573 sets. All Risso's dolphins caught were considered seriously injured (Forney 2004), based on an evaluation of the observer's description of the interaction and following established guidelines for assessing serious injury in marine mammals (Angliss and Demaster 1998). Risso's dolphins are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA.

Swim speeds from Risso's dolphins were recorded at 2 to 12 km/h (1.1 to 6.5 knots) off Santa Catalina Island (Shane, 1995). Risso's dolphins feed on squid species found more than 400 m (1,300 ft) deep (Gonzalez et al., 1994 *in* Croll et al., 1999). Behavioral research suggests that Risso's dolphins primarily feed at night (Baird 2002b). There are currently no known studies on diving behavior.

Audiograms for Risso's dolphins indicate their hearing RLs equal to or less than approximately 125 dB in frequencies ranging from 1.6 to 110 kHz (Nachtigall et al, 1995 *in* Nedwell et al., 2004). Phillips et al. (2003) report that Risso's dolphins are capable of hearing frequencies up to 80 kHz. Best underwater hearing occurs between 4 and 80 kHz with hearing threshold levels from 63.6 to 74.3 dB RL. Hearing thresholds from this study were tested between 1.6 and 110 kHz and were approximately 125 dB down to approximately 65 dB RL (Nachtigall et al., 1995 *in* Croll et al., 1999 and Nedwell et al., 2004). Other audiograms obtained on Risso's dolphin (Au et al., 1997) confirm previous measurements and demonstrate hearing thresholds of 140 dB RL for a one-second 75 Hz signal (Au et al., 1997; Croll et al., 1999).

The hearing sensitivity was measured for Risso's dolphins and their thresholds were found to be 142.2 dB RL, plus or minus 1.7 dB for the 75-Hz pure tone signal and 140.8 dB RL plus or minus 1.1 dB for the ATOC signal (Au et al., 1997). The ATOC signal was a low-frequency 75-Hz phase modulated signal, with a source level of 195 dB re 1 µPa at 1m.

Risso's dolphins produce sounds as low as 30 Hz and as high as 150 kHz (Corkeron and Van Parijs 2001; Madsen et al. 2004a). Their dominant frequencies are

between at 2 to 5 kHz and at 65 kHz. (Watkins, 1967; Au, 1993; Croll et al., 1999; Phillips et al., 2003). In one experiment conducted by Phillips et al. (2003), clicks were found to have a peak frequency of 65 kHz, with 3-dB bandwidths at 72 kHz and durations ranging from 40 to 100 microsecond. In a second experiment, Phillips et al. (2003) recorded clicks with peak frequencies up to 50 kHz, 3-dB bandwidth at 35 kHz with durations ranging from 35 to 75 microsecond. SLs were up to 208 dB. The behavioral and acoustical results from these experiments provided evidence that Risso's dolphins use echolocation. Estimated SLs of echolocation clicks can reach up to 216 dB (Phillips et al., 2003). Recordings of a wild animal produced similar measurements of clicks. These were short (40 µs), broadband clicks with peak frequencies around 50 kHz and source levels between 202 and 222 dB re. 1 µPa at 1m (P-P) (Madsen et al. 2004a). Other sounds include "bark" vocalizations consisted of highly variable burst pulses and have a frequency range of 2 to 20 kHz. Buzzes consisted of a short burst pulse of sound around 2 seconds in duration with a frequency range of 2.1 to 22 kHz. LF, narrowband grunt vocalizations ranged between 400 and 800 Hz. Chirp vocalizations were slightly higher in frequency than the grunt vocalizations, ranging in frequency from 2 to 4 kHz. There are no available data regarding seasonal or geographical variation in the sound production of Risso's dolphin.

Rough-toothed Dolphin (*Steno bredanensis*):

The rough-toothed dolphin is found in tropical and warm-temperate seas worldwide (Miyazaki and Perrin 1994). They are present around all the main Hawaiian Islands (Shallenberger 1981; Tomich 1986) and have been observed at least as far northwest as French Frigate Shoals (Barlow 2006; Nitta and Henderson 1993). Eight strandings have been reported from Maui, O'ahu, and the island of Hawai'i (Nitta 1991; Maldini et al. 2005). Nothing is known about stock structure for this species in the North Pacific. Photographic identification studies around the main Hawaiian Islands suggest little or no inter-island movement of this species (Webster et al. 2005). For management purposes under the MMPA, there is a single Pacific management stock including only animals found within the U.S. EEZ of the Hawaiian Islands.

Wade and Gerrodette (1993) produced an abundance estimate of 145,900 rough-toothed dolphins (CV = 0.320) from five ship surveys conducted each year between 1986 and 1990 in the ETP, but it is not known whether these animals are part of the same population that occurs around the Hawaiian Islands. An abundance estimate of 123 Hawaiian rough-toothed dolphin (CV=0.63) was made based on aerial surveys flown in 1993, 1995, and 1998 (Mobley et al. 2000). This study underestimated the total number of rough-toothed dolphins within the U.S. EEZ off Hawai'i, because areas around the NWHI and beyond 25 nautical miles from the main islands were not surveyed (Carretta et al. 2004). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 8,709 (CV=0.45) rough-toothed dolphins (Barlow 2006). This is currently the best available abundance estimate for this stock.

Interactions with cetaceans have been reported for all Hawaiian pelagic fisheries, and some of these interactions involved rough-toothed dolphins (Nitta and Henderson 1993). They have been observed apparently preying on adult-sized mahimahi

(*Coryphaena hippurus*) in Hawai'i and are known to take bait and catch from Hawaiian sport and commercial fisheries operating near the main islands and in a portion of the northwestern islands (Shallenberger 1981; Schlais 1984; Nitta and Henderson 1993; Pitman and Stinchcomb 2002). They have been specifically reported to interact with the day hand-line fishery for tuna (palu-ahi) and the troll fishery for billfish and tuna (Schlais 1984; Nitta and Henderson 1993). Interaction rates between dolphins and the NWHI bottomfish fishery have been estimated based on studies conducted in 1990-1993, indicating that an average of 2.67 dolphin interactions, most likely involving bottlenose and rough-toothed dolphins, occurred for every 1000 fish brought on board (Kobayashi and Kawamoto 1995). Fishermen report interactions with dolphins, which steal bait and catch are increasing (Carretta et al. 2004). It is not known whether these interactions result in serious injury or mortality of dolphins. There has been an apparent decline in the frequency of sightings of rough-toothed dolphins off the island of Hawai'i over the last 20 years (Baird et al. 2003) and it has been suggested that this decline may be associated with shooting of animals in the areas where fishery interactions have been documented (Baird et al. 2003). They are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA.

Rough-toothed dolphins are not known to be fast swimmers. They are known to skim the surface at a moderate speed and have a distinctive splash (Jefferson, 2002c). Swim speeds of this species vary from greater than 5.5 to 16 km/h (3.0 to 8.6 knots). Rough-toothed dolphins can dive down between 30 and 70 m (98 and 230 ft)(Croll et al., 1999). The dive duration ranges from 0.5 to 3.5 min (Ritter 2002). The maximum dive recorded was 70 m (230 ft). Although, due to their morphology, it is believed that they are capable of diving much deeper. Dives up to 15 min have been recorded for groups of dolphins (Croll et al., 1999).

There is no direct measurement of auditory threshold for the hearing sensitivity of rough-toothed dolphins (Ketten, 2000; Thewissen, 2002).

Rough-toothed dolphins produce sounds ranging from 0.1 kHz up to 200 kHz (Popper, 1980a; Miyazaki and Perrin, 1994; Richardson et al., 1995). Clicks have peak energy at 25 kHz, while whistles have a maximum energy between 2 to 14 kHz and at 4 to 7 kHz (Norris and Evans, 1967; Norris, 1969; Popper, 1980a). There is no available data regarding seasonal or geographical variation in the sound production of this species.

Short-finned Pilot Whale (*Globicephala macrorhynchus*):

Short-finned pilot whales occur in tropical and warm temperate waters worldwide. In the North Pacific Ocean their distribution extends into cool temperate waters. They are commonly observed around the main Hawaiian Islands and are also present around the NWHI (Shallenberger 1981; Barlow 2006). During a 2002 shipboard survey of waters within the U.S. EEZ of the Hawaiian Islands, 25 sightings of short-finned pilot whales were made (Barlow 2006). Fourteen strandings of short-finned pilot whales have been documented from the main Hawaiian Islands, including five mass strandings (Tomich 1986; Nitta 1991; Maldini et al. 2005). In the North Pacific, stocks for this species are not well defined, except off Japan where two morphologically distinct allopatric stocks occur (Kasuya et al. 1988). Preliminary photo-identification work with

pilot whales in Hawai'i indicated a high degree of site fidelity around the main island of Hawai'i (Shane and McSweeney 1990). Genetic analyses of tissue samples collected near the main Hawaiian Islands indicate that Hawaiian short-finned pilot whales are reproductively isolated from short-finned pilot whales found in the eastern Pacific Ocean (Chivers et al. 2003), however, the offshore range of this Hawaiian population is unknown. Fishery interactions with short-finned pilot whales demonstrate that this species also occurs in U.S. EEZ waters of Palmyra Island, but it is possible that these animals represent a separate stock (Carretta et al. 2004). For management purposes under the MMPA, short-finned pilot whales within the Pacific U.S. EEZ are divided into two discrete stocks: 1) Hawaiian, and 2) California, Oregon and Washington.

Estimates of short-finned pilot whale populations have been made off Japan (Miyashita 1993) and in the eastern tropical Pacific (Wade and Gerrodette 1993), but it is not known whether any of these animals are part of the same population that occurs around the Hawaiian Islands. Aerial surveys were flown within 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998 and resulted in an abundance estimate of 1,708 (CV=0.32) short-finned pilot whales (Mobley et al. 2001). This study underestimated the total number of short-finned pilot whales within the U.S. EEZ off Hawai'i, because areas around the NWHI and beyond 25 nautical miles from the main islands were not surveyed (Carretta et al. 2004). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 8,870 (CV=0.38) short-finned pilot whales (Barlow 2006). This is currently the best available abundance estimate for short-finned pilot whales within the Hawaiian Islands EEZ.

Between 1994 and 2002, five short-finned pilot whales were observed hooked in the Hawai'i-based longline fishery with approximately 4-25% of all effort observed (Forney 2004). During the 905 observed trips with 11,014 sets, the average interaction rate of short-finned pilot whales was one animal per 181 fishing trips, or one animal per 2,203 sets. Two of the animals caught were dead upon gear retrieval, and two additional animals were considered seriously injured (Forney 2004), based on an evaluation of the observer's description of the interaction and following established guidelines for assessing serious injury in marine mammals (Angliss and DeMaster 1998). Average 5-yr estimates of annual mortality and serious injury for 1998-2002 are 4.2 (CV = 0.78) short-finned pilot whales outside of the U.S. EEZs, and 0.8 (CV = 1.00) within the U.S. EEZ of Palmyra Island. No short-finned pilot whales were observed taken within the Hawaiian Islands EEZ during 1998-2002. Short-finned pilot whales with propeller scars have been seen around the Hawaiian Islands, but it is unknown if any of these injuries were serious or resulted in mortalities (Carretta et al. 2004).

Short-finned pilot whales are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA.

Pilot whales generally have swim speeds ranging between 2 to 12 km/h (1.1 to 6.5 knots) (Shane 1995). Long-finned pilot whales have an average speed of 3.3 km/h (1.8 knots) (Nelson and Lien, 1996). Short-finned pilot whales have swim speeds ranging between 7 and 9 km/h (3.8 and 4.6 knots) (Norris and Prescott, 1961).

Both long- and short-finned pilot whales are considered deep divers, feeding primarily on fish and squid (Croll et al., 1999). Long-finned pilot whales range in dive depths from 16 m (52 ft) during the day to 648 m (2126 ft) during the night (Baird et al. 2002). The dive times varied between 2 and 13 min. A short-finned pilot whale was recorded as diving to 610 m (2,000 ft) (Ridgway, 1986).

There is no direct measurement of auditory threshold for the hearing sensitivity of either long- or short-finned pilot whales (Ketten, 2000; (Thewissen 2002).

Pilot whales echolocate with a precision similar to bottlenose dolphins and also vocalize with other school members (Olson and Reilly, 2002). Short-finned pilot whales produce sounds as low as 280 Hz and as high as 100 kHz, with dominant frequencies between 2 to 14 kHz and 30 to 60 kHz (Caldwell and Caldwell, 1969; Fish and Turl, 1976; Scheer et al., 1998). Sounds produced by this species average near 7,870 Hz, higher than that of a long-finned pilot whale (Olson and Reilly, 2002). Echolocation abilities have been demonstrated during click production (Evans, 1973). SLs of clicks have been measured as high as 180 dB (Fish and Turl 1976; Richardson et al., 1995). There are little available data regarding seasonal or geographical variation in the sound production of the short-finned pilot whale, although there is evidence of group specific call repertoires (Olson and Reilly, 2002).

Sperm Whale (*Physeter macrocephalus*):

There is much uncertainty surrounding the identity and status of sperm whale populations. Sperm whales are widely distributed in deep waters across the entire North Pacific and into the southern Bering Sea in summer but the majority are thought to be south of 40°N in winter (Rice 1974, 1989; Gosho et al. 1984; Miyashita et al. 1995). For management, the International Whaling Commission (IWC) had divided the North Pacific into two management regions, but has not reviewed this stock boundary in many years (Donovan 1991). The Hawaiian Islands marked the center of a major nineteenth century whaling ground for sperm whales (Gilmore 1959; Townsend 1935). Since 1936, at least 18 strandings have been reported from O'ahu, Kaua'i and Kure Atoll (Woodward 1972; Nitta 1991; Maldini et al. 2005). Sperm whales have also been sighted around several of the NWHI (Rice 1960; Barlow 2006), off the main island of Hawai'i (Lee 1993; Mobley et al. 2000) in the Kaua'i Channel and in the Alenuihaha Channel between Maui and the island of Hawai'i (Shallenberger 1981). In addition, the sounds of sperm whales have been recorded throughout the year off O'ahu (Thompson and Friedl 1982). A summer/fall 2002 shipboard survey of waters within the U.S. EEZ of the Hawaiian Islands resulted in 43 sperm whale sightings throughout the study area (Barlow 2006).

There is much uncertainty surrounding the stock identity of sperm whales in the North Pacific. A 1997 survey designed specifically to investigate stock structure and abundance of sperm whales in the northeastern temperate Pacific revealed no apparent hiatus in distribution between the U.S. EEZ off California and areas farther west, out to Hawai'i (Carretta et al. 2004). Very preliminary genetic analyses revealed significant differences between sperm whales off the coast of California, Oregon and Washington and those sampled offshore to Hawai'i (Carretta et al. 2004). For management purposes under the MMPA, three stocks of sperm whales are recognized within the Pacific U.S. EEZ: 1) Hawaiian, 2) California, Oregon and Washington, and 3) Alaskan.

A spring 1997 combined visual and acoustic line-transect survey conducted in the eastern temperate North Pacific resulted in estimates of 24,000 (CV=0.46) sperm whales based on visual sightings, and 39,200 (CV=0.60) based on acoustic detections and visual group size estimates (Carretta et al. 2004). In the eastern tropical Pacific, the abundance of sperm whales has been estimated as 22,700 (95% C.I.=14,800-34,600, Wade and Gerrodette 1993). However, it is not known whether any or all of these animals routinely enter the U.S. EEZ of the Hawaiian Islands. Aerial surveys were flown within 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998 and resulted in an average abundance estimate of 66 (CV=0.56) sperm whales (Mobley et al. 2000). This is an underestimate of abundance within the Hawaiian EEZ because areas around the NWHI and beyond 25 nautical miles from the main islands were not surveyed (Carretta et al. 2004). Furthermore, this species is known to spend a large proportion of time diving, causing additional downward bias in the abundance estimate (Carretta et al. 2004). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 6,919 (CV=0.81) sperm whales (Barlow 2006), including a correction factor for missed diving animals. This is currently the best available abundance estimate for this stock.

Interactions with cetaceans are reported for all pelagic fisheries, and large whales have been entangled in longlines off the Hawaiian Islands (Nitta and Henderson 1993; Carretta et al. 2004). Between 1994 and 2002, one sperm whale was observed entangled within the Hawaiian Islands EEZ in the Hawai'i-based longline fishery, with approximately 4-25% of all effort observed (Forney 2004). During the 905 observed trips with 11,014 sets, the average interaction rate of sperm whales was one animal per 905 fishing trips, or one animal per 11,014 sets. The caught animal was apparently able to free itself and was not considered seriously injured (Forney 2004), following established guidelines for assessing serious injury in marine mammals (Angliss and DeMaster 1998). One additional sperm whale was observed taken in an experimental set outside the U.S. EEZ, but the severity of its injuries could not be determined (Forney 2004). Sperm whales have been documented to depredate longlines in the Gulf of Alaska offshore of southeastern Alaska (Straley et al. 2005).

Sperm whales are formally listed as "endangered" under the ESA and, consequently, the Hawaiian stock is automatically considered as a "depleted" and "strategic" stock under the MMPA. The increasing levels of anthropogenic noise in the world's oceans has been suggested to be a habitat concern for whales (Richardson et al. 1995), particularly for deep-diving whales like sperm whales that feed in the oceans' "sound channel".

Swim speeds of sperm whales range from 1.25 to about 4 km/h (0.7 to 2.2 knots) (Jaquet et al. 2000); (Whitehead 2002). Dive durations range between 18.2 to 65.3 min (Watkins et al. 2002). Sperm whales may be the longest and deepest diving mammals, having been recorded diving for over 2 hours to depths of 3,000 m (9,842 ft) (Clarke 1976); (Watkins et al. 1985). Foraging dives typically last about 30 to 40 min and descend to depths from 300 to 1,245 m (984 to 4,085 ft) (Papastavrou et al. 1989); (WAHLBERG 2002). Sperm whales mostly feed on squid, but also include demersal and mesopelagic fish in their diet, although, their feeding habits are region-specific (e.g., Iceland) (Reeves and Whitehead 1997); (Whitehead 2002).

Recent audiograms measured from a sperm whale calf resulted in an auditory range of 2.5 to 60 kHz, best hearing sensitivity between 5 and 20 kHz (Ridgway and Carder, 2001). Measurements of evoked response data from one stranded sperm whale have shown a lower limit of hearing near 100 Hz (Gordon et al., 1996).

Sperm whales produce broadband clicks with energy from less than 100 Hz to 30 kHz (Watkins and Schevill, 1977; Watkins et al., 1985; (Goold and Jones 1995); (Weilgart and Whitehead 1997); (Mohl et al. 2000); (MADSEN et al. 2002); (Thode et al. 2002). Regular click trains and creaks have been recorded from foraging sperm whales and may be produced as a function of echolocation (Whitehead and Weilgart 1991); (Jaquet et al. 2001); (Madsen et al. 2002). A series of short clicks, termed "codas," have been associated with social interactions and are thought to play a role in communication (Watkins and Schevill 1977)Weilgart and Whitehead, 1993; (Pavan et al. 2000). Distinctive coda repertoires have shown evidence of geographical variation among female sperm whales (Weilgart and Whitehead 1997); (Whitehead 2002). SELs of clicks have been measured between 202 and 236 dB (Madsen and Møhl 2000; Mohl et al. 2000; Mohl et al. 2003); (Thode et al. 2002).

Spinner Dolphin (*Stenella longirostris*):

Spinner dolphins are found around the world in tropical and warm-temperate waters (Perrin and Gilpatrick 1994). They are common and abundant throughout the entire Hawaiian archipelago (Shallenberger 1981; Andrews et al. 2006; Karczmarski et al. 2005; Norris and Dohl 1980; Norris et al. 1994), where groups enter the nearshore, bay, or lagoon shallows daily to rest and socialize, returning to deeper offshore waters at night to forage. It is believed that relatively shallow, sandy-bottom areas, serve as rest habitat, likely providing increased protection against predation from large sharks (Norris 1994). Twenty-six strandings have been reported in Hawai'i (Maldini et al. 2005). Recent studies have revealed that, with few exceptions, dolphins at different Hawaiian Islands throughout the chain are significantly genetically differentiated from dolphins at every other island (Andrews et al. 2006). Exceptions were dolphins at Kure Atoll, Midway Atoll, and Pearl & Hermes Reef, which together seemed to form one interbreeding group, distinct from the rest of the archipelago. This suggestion is bolstered by photo-identification data, which documented movement of animals from Midway Atoll to Kure Atoll and from Pearl & Hermes Reef to Midway Atoll (Rickards et al. 2002).

Furthermore, there appears to be a well-pronounced differentiation in the population structure and social dynamics of spinner dolphins across the Hawaiian island chain (Karczmarski et al. 2005). There is some suggestion from photo-identification studies off the Kona Coast of Hawai'i that the waters surrounding this island may have a large, relatively stable "resident" population (Norris et al. 1994; Östman-Lind et al. 2004).

Hawaiian spinner dolphins belong to a stock that is separate from those involved in the tuna purse-seine fishery in the eastern tropical Pacific (Dizon et al. 1994). Most spinner dolphin stocks, including the Hawaiian spinner dolphin, are of the subspecies Gray's spinner dolphin (*Stenella longirostris longirostris*), which occurs pantropically

(Perrin 1990). For management purposes under the MMPA, there is a single Pacific management stock including only animals found within the U.S. EEZ of the Hawaiian Islands. Spinner dolphins involved in eastern tropical Pacific tuna purse-seine fisheries are managed separately under the MMPA (Carretta et al. 2004).

In Hawai'i spinner dolphins feed nocturnally on mesopelagic fishes, shrimp and squid (e.g. *Abralia trigonura*, Clarke and Young 1998) in association with the diel vertical and horizontal (Benoit-Bird et al. 2001) migration of the mesopelagic-boundary community (Norris and Dohl 1980; Würsig et al. 1994; Benoit-Bird and Au 2001). The mesopelagic-boundary community is a distinct land-associated assemblage of mesopelagic micronekton, which exists around the Hawaiian Islands (Reid et al. 1991).

Twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998 and an abundance estimate of 3,184 (CV=0.37) spinner dolphins was calculated from the combined survey data (Mobley et al. 2000). This study underestimated the total number of spinner dolphins within the U.S. EEZ off Hawai'i, because areas around the NWHI and beyond 25 nautical miles from the main islands were not surveyed (Carretta et al. 2004). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 3,351 (CV=0.74) spinner dolphins (Barlow 2006). This is currently the best available abundance estimate for this stock, but it may be negatively biased because relatively little survey effort occurred in nearshore areas where these dolphins are abundant. Rough abundance estimates for animals along the Kona coast of the Island of Hawai'i, based on photo-identification data, have varied from 960 animals in 1979-80 (Norris et al. 1994) to 2,334 in 1989-1992 (Östman 1994) to 855 in 2003 (Östman-Lind et al. 2004). Östman-Lind et al. (2004) also noted the presence of near-shore mixed-species aggregations of spinner and pantropical spotted dolphins off this same coast.

In Hawai'i, some entanglements of spinner dolphins have been observed (Nitta and Henderson 1993; Rickards et al. 2001; Carretta et al. 2004; HMMC, unpublished data), but no estimate of annual human-caused mortality and serious injury is available, because the nearshore gillnet fisheries are not observed or monitored (Carretta et al. 2004). Interactions with cetaceans have been reported for all Hawaiian pelagic fisheries (Nitta and Henderson 1993). Between 1994 and 2002, two spinner dolphins were observed hooked or entangled in the Hawai'i-based longline fishery, with approximately 4-25% of all effort observed (Forney 2004). Neither of the animals caught was considered seriously injured (Forney 2004), based on an evaluation of the observer's description of the interaction and following established guidelines for assessing serious injury in marine mammals (Angliss and Demaster 1998). A habitat issue of increasing concern is the potential effect of swim-with-dolphin programs and other tourism activities on spinner dolphins around the main Hawaiian Islands (Carretta et al. 2004, Östman-Lind et al. 2004).

Spinner dolphins are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA.

Hawaiian spinner dolphins have swim speeds ranging from 2.6 to 6 km/h (1.4 to 3.2 knots) (Norris et al., 1994). The hourly average speeds of a spinner dolphin in the Eastern Tropical Pacific, accompanying a spotted dolphin, ranged from 2.33 to 10.71 kts

(Leatherwood and Ljungblad 1979), considerably higher than the speed reported by Norris et al (1994)

Spinner dolphins produce burst pulse calls, echolocation clicks, whistles and screams (Norris et al., 1994; Bazua-Duran and Au, 2002). The results of a study on spotted and spinner dolphins conducted by Lammers et al. (2003) revealed that the whistles and burst pulses of the two species span a broader frequency range than is traditionally reported for delphinids. The fundamental frequency contours of whistles occur in the human hearing range, but the harmonics typically reach 50 kHz and beyond. Additionally, the burst pulse signals are predominantly ultrasonic, often with little or no energy below 20 kHz (Lammers et al., 2003).

Striped Dolphin (*Stenella coeruleoalba*):

Striped dolphins are found in tropical and warm-temperate pelagic waters worldwide (Perrin et al. 1994c). While sightings have historically been infrequent (Shallenberger 1981; Mobley et al. 2000), they have been documented in the Hawaiian Islands from 20 strandings (Nitta 1991; Maldini et al. 2005). A comprehensive shipboard survey of the Hawaiian EEZ resulted in 15 sightings of striped dolphins (Barlow 2006). Striped dolphins have been intensively exploited in the western North Pacific, where three migratory stocks are provisionally recognized (Kishiro and Kasuya 1993). In the eastern Pacific all striped dolphins are provisionally considered to belong to a single stock (Dizon et al. 1994). Within the Pacific U.S. EEZ, the following two stocks of striped dolphins are recognized for management purposes under the MMPA: 1) California, Oregon and Washington, and 2) Hawai'i. Striped dolphins involved in eastern tropical Pacific tuna purse-seine fisheries are managed separately under the MMPA (Carretta et al. 2004).

Population estimates are available for striped dolphins in Japanese waters (Miyashita 1993) and the eastern tropical Pacific (Wade and Gerrodette 1993), but it is not known whether any of these animals are part of the Hawaiian stock. Aerial surveys of the main Hawaiian Islands conducted in 1993, 1995 and 1998 resulted in an abundance estimate of 114 (CV=1.19) spinner dolphins (Mobley et al. 2000). This is an underestimate of spinner dolphins in the Hawaiian EEZ because areas around the NWHI and beyond 25 nautical miles from the main islands were not surveyed (Carretta et al. 2004). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 13,143 (CV=0.46) striped dolphins (Barlow 2006). This is currently the best available abundance estimate for this stock.

Striped dolphins are not listed as "threatened" or "endangered" under the ESA, nor as "depleted" under the MMPA.

Based on Auditory Brainstem Responses, striped dolphins hear SLs equal to or louder than 120 dB in the range of less than 10 to greater than 100 kHz (Popper, 1980a). The behavioral audiogram developed by Kastelein et al. (2003) shows hearing capabilities from 0.5 to 160 kHz. The best underwater hearing of the species appears to be at from 29 to 123 kHz (Kastelein et al. 2003). They have relatively less hearing sensitivity below 32 kHz and above 120 kHz.

The results of a study on spotted and spinner dolphins conducted by Lammers et al. (2003) revealed that the whistles and burst pulses of the two species span a broader frequency range than is traditionally reported for delphinids. The fundamental frequency contours of whistles occur in the human hearing range, but the harmonics typically reach 50 kHz and beyond. Additionally, the burst pulse signals are predominantly ultrasonic, often with little or no energy below 20 kHz (Lammers et al., 2003).

3.0 PINNIPEDS

Hawaiian monk seal (*Monachus schauinslandi*):

The worldwide population size for monk seals was estimated at nearly 1,400 in 2000 (Reeves et al., 2002). In Hawai'i, monk seals are found almost exclusively on the northwest Hawaiian Islands, where they occasionally move among islands and atolls. Their rookeries are primarily located on the Leeward Islands of French Frigate Shoals, Pearl and Hermes Reef, Kure Atoll, and Laysan and Lisianski Islands (Croll et al., 1999; Reeves et al., 2002). Smaller colonies also live on Nihoa and Necker Islands. After two males were translocated to Johnston Atoll in 1997, a few seals have been seen there each year. Hawaiian monk seals have also been seen in the main islands of Hawai'i and since the 1980s, pups have been born on the islands of Maui, Kaua'i, O'ahu, and Moloka'i. Hawaiian monk seals do not seem to be tolerant of human presence. When the U.S. military inhabited Sand Island and the Midway Islands and Kure Atoll, the monk seals disappeared until after the military left. Monk seals prefer to be solitary animals (Reeves et al., 2002).

Hawaiian monk seals are listed as "endangered" under the ESA and IUCN, and protected under CITES.

Mean descent and ascent speeds from tagged monk seal pups were 0.6 and 0.4 m/s (2.2 and 1.5 km/h), respectively (Gazo et al. 2006). Individual juvenile seals had mean velocities as high as 1.55 and 1.34 m/s (5.6 and 4.8 km/h). Since these velocities were based on change in depth over time, they are likely underestimates, as the seals probably dove and surface at an angle (instead of perfectly vertically). The highest swimming speed allowed in an analysis of satellite tag data was 7.2 km/h (Parrish and Abernathy 2006). Foraging dive durations last up to 4 min in the pups. Adult monk seals regularly dive to at least 500 m (the limit of the depth recorder in that study) and these dives can last 20 minutes (Parrish et al. 2002). Some dives have been recorded to last longer than 30 min; however, it is unclear if these are foraging dives. Hawaiian monk seals forage on benthic or reef fish, cephalopods, and crustaceans (particularly lobster).

Underwater hearing in the Hawaiian monk seal has been measured between 300 Hz to 40 kHz. Their most sensitive hearing is at 12 to 28 kHz, which is a narrower range compared to other phocids. Above 30 kHz, their hearing sensitivity drops markedly (Thomas et al. 1990). No underwater sound production has been reported. The in-air vocalizations of a female after giving birth included "low-pitched moans or guttural growls" (Eliason et al. 1990).The pup emitted an "abrupt bleat". Both of these calls had their fundamental frequency between 100 and 200 Hz, indicating the potential for good low-frequency hearing. Other in air sounds include a soft liquid bubble (100 to 400 Hz), a guttural expiration (<800 Hz), a roar (<800 Hz), and a belch cough (Miller and Job, 1992).

4.0 ANIMAL DENSITY

Several sources were examined to provide estimates of marine mammal density in Hawaiian waters. Aerial surveys were conducted over the time period of 1993-1998 and resulted in density estimates for odontocetes (Mobley et al. 2000). Additional aerial surveys were conducted and these data used to produce density estimates for humpback whales (Mobley 2004). The data were segregated by year, and the 2000 estimate was the highest. The 2003 estimate was lower, which may be due to an anomalous year or an anomalous sampling for that year. Since the population is known to be increasing at a rate of ~9% per year, the highest density value was used. Not all species were observed during aerial surveys. Therefore shipboard survey data was also examined. The HICEAS survey produced abundance and density estimates for the Hawaiian Islands (Barlow 2006). This study reported abundance for the main Hawaiian Islands. These abundance numbers were converted to densities by dividing the number of individuals by the area of the study (212,892 sq km). The study itself calculated density values based on both the Main Hawaiian Islands and the 200 nmi Exclusive Economic Zone (EEZ). Since the study area is nearshore off the Big Island, the data from only the main Hawaiian Islands are presented when available. Some species were not seen in the main Hawaiian Islands during this study and the overall densities are reported for them. These are indicated by the Heavy outlined boxes in the Barlow column in Table 2. Finally, several species are 'grayed out', as they are very unlikely to ever be in the vicinity of Honokohau harbor. The deep-diving species are not excluded, as deep water is in close proximity to Honokohau harbor. They are unlikely to be nearby, but it remains a possibility.

		Mobley Data			Barlow Data	
Common name	**Scientific name**	Density	CV (%)		Density	CV (%)
Blainville's beaked whale	*Mesoplodon densirostris*	0.0009	59.6		0.00117	125
Blue whale	*Balaenoptera musculus*					
Bottlenose dolphin	*Tursiops truncatus*	0.0103	55.7		0.00131	59
Bryde's whale	*Balaenoptera edeni*				0.00019	45
Cuvier's beaked whale	*Ziphius cavirostris*	0.0006	51.2		0.00621	143
Dwarf sperm whale	*Kogia sima*				0.00714	74
False killer whale	*Pseudorca crassidens*				0.00010	113
Fin whale	*Balaenoptera physalus*					
Fraser's dolphin	*Lagenodelphis hosei*				0.00417	116
Humpback whale	*Megaptera novaeangliae*	0.2694	15.2			
Killer whale	*Orcinus orca*				0.00014	98
Longman's beaked whale	*Indopacetus pacificus*				0.00041	126
Melon-headed whale	*Peponocephala electra*	0.0021	88.3		0.00120	117
North Pacific minke whale	*Balaenoptera acutorostrata*					
Pantropical spotted dolphin	*Stenella attenuata*	0.0407	45.1		0.02012	48
Pygmy killer whale	*Feresa attenuata*				0.00449	83
Pygmy sperm whale	*Kogia breviceps*				0.00291	112
Risso's dolphin	*Grampus griseus*				0.00241	65
Rough-toothed dolphin	*Steno bredanensis*	0.0017	62.8		0.00805	45
Sei whale	*Balaenoptera borealis*					
Short-finned pilot whale	*Globicephala macrorhynchus*	0.0237	32.2		0.01498	38
Sperm whale	*Physeter macrocephalus*	0.0010	56.0		0.00059	81
Spinner dolphin	*Stenella longirostris*	0.0443	36.5		0.00699	74
Striped dolphin	*Stenella coeruleoalba*				0.00310	46
Hawaiian Monk Seal	*Monachus schauinslandi*					

5.0 REFERENCES

Aburto A, Rountry DJ, Denzer JL (1997) Behavioral response of blue whales to active signals. Naval Command Control and Ocean Surveillance Center RDT and E Div. San Diego CA, pp 10

Aguilar A (2002) Fin Whale (*Balaenoptera physalus*). In: Perrin W, Würsig B, Thewissen J (eds) Encyclopedia of marine mammals, San Diego

Alling A, Payne R (1991) Song of the Indian Ocean blue whale, *Balaenoptera musculus*. In: Leatherwood S (ed) Special Issue on the Indian Ocean Sanctuary

Anderson RC, Clark R, Madsen PT, Johnson C, Kiszka J, Breysse O (2006) Observations of Longman's Beaked Whale (*Indopacetus pacificus*) in the Western Indian Ocean. Aquatic Mammals 32:223-231

Andrews, K. R., L. Karczmarski, W. W. L. Au, S. H. Rickards, C. A. Vanderlip and R. J. Toonen. 2006. Patterns of genetic diversity of the Hawaiian spinner dolphin (*Stenella longirostris*). Atoll Research Bulletin 543:65-73.

Angliss, R. P. and D. P. DeMaster. 1998. Differentiating Serious and Non-Serious Injury of Marine Mammals Taken Incidental to Commercial Fishing Operations: Report of the Serious Injury Workshop 1-2 April 1997, Silver Spring, Maryland. U. S. Dep. Commerce, NOAA Tech. Memo. NMFS-OPR-13. 48 pp.

Angliss, R. P. and K. L. Lodge. 2004. Alaska marine mammal stock assessments, 2003. U.S. Dep. Commerce NOAA Tech. Memo. NMFS-AFSC-144, 230 pp.

Angliss, R. P. and R. Outlaw. 2005. Draft Alaska marine mammal stock assessments 2005 (http://www.nmfs.noaa.gov/pr/PR2/Stock_Assessment_Program /sars_draft.html), 234 pp.

Angliss, R. P., D. P. DeMaster and A. L. Lopez. 2001. Alaska marine mammal stock assessments, 2001. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-AFSC-124, 231 pp.

Aroyan JL, McDonald MA, Webb SC, Hildebrand JA, D. C, Laitman JT, Reidenberg JS (2000) Acoustic models of sound production. In: Au WWL, Popper A, Fay R (eds) Hearing by whales and dolphins. Springer-Verlag, New York, pp 409-469

Azzaroli, M. L. 1968. Second specimen of *Mesoplodon pacificus*, the rarest living beaked whale. Monitore Zoologico Italiano (N.S.) 2:67-79.

Au WWL (1993) The Sonar of Dolphins. Springer-Verlag, New York

Au WWL, Popper AN, Fay RR (2000) Hearing by Whales and Dolphins. In. Springer-Verlag, New York, pp 485

Au WWL, Herzing DL (2003) Echolocation signals of wild Atlantic spotted dolphin (*Stenella frontalis*). Journal of the Acoustical Society of America 113:598-604

Au WWL, Nachtigall PE, Pawloski JA (1997) Acoustic effects of the ATOC signal (75 Hz, 195 dB) on dolphins and whales. Journal of the Acoustical Society of America 101:2973-2977

Au, W., A. A. Pack, M. O., Lammers, L. M. Herman, M. H. Deakos, K. A. Andrews. 2006. Acoustic properties of humpback whale songs. Journal of the Acoustical Society of America 120:1103-1110.

Awbrey FT (1982) Ross Sea Killer Whale vocalizations: preliminary description and comparison with those of some Northern Hemisphere Killer Whales. Reports of the International Whaling Commission 32:667-670

Awbrey FT, Thomas JA, Kastelein RA (1988) Low-frequency underwater hearing sensitivity in belugas, *Delphinapterus leucas*. Journal of the Acoustical Society of America 84:2273-2275

Baird RW, Dill LM, Hanson B (1998) Diving behaviour of killer whales. In: World Marine Mammal Science Conference, Monaco

Baird RW, Gorgone AM (2005) False Killer Whale Dorsal Fin Disfigurements as a Possible Indicator of Long-Line Fishery Interactions in Hawaiian Waters. Pacific Science 59:593-601

Baird RW, Schorr GS, Webster DL, Mahaffy SD, Douglas AB, Gorgone AM, McSweeny DJ (2006) A survey for odontocete cetaceans off Kaua'i and Ni'ihau, Hawai'i, during October and November 2005: Evidence for population structure and site fidelity. Pacific Islands Fisheries Science Center, pp 17

Baird RW (2002a) False Killer Whale. In: Perrin WF, Würsig B, Thewissen HGM (eds) Encyclopedia of Marine Mammals. Academic Press, San Diego, pp 411-412

Baird RW (2002b) Risso's Dolphin: Grampus griseus. In: Perrin WF, Würsig B, Thewissen HGM (eds) Encyclopedia of Marine Mammals. Academic Press, San Diego, CA, pp 1037-1039

Baird RW, Borsani JF, Hanson MB, Tyack PL (2002) Diving and night-time behavior of long-finned pilot whales in the Ligurian Sea. Marine Ecology Progress Series 237:301-305

Baird RW, Ligon AD, Hooker SK, Gorgone AM (2001) Subsurface and nighttime behaviour of pantropical spotted dolphins in Hawai'i. Canadian Journal of Zoology 79:988-996

Baird RW, McSweeney DJ, Ligon AD, Webster DL (2004) Tagging feasability and diving of Cuvier's beaked whales (Ziphius cavirostris) and Blainville's beaked whales (Mesoplodon densirostris) in Hawaii.

Baird, R. W. 2005. Sightings of dwarf (*Kogia sima*) and pygmy (*K. breviceps*) sperm whales from the main Hawaiian Islands. Pacific Science 59:461-466.

Baird, R. W. and A. M. Gorgone. 2005. False Killer Whale Dorsal Fin Disfigurements as a Possible Indicator of Long-Line Fishery Interactions in Hawaiian Waters. Pacific Science 59:593-601.

Baird, R. W., A. D. Ligon, S. K. Hooker and A. M. Gorgone. 2001. Subsurface and nighttime behaviour of pantropical spotted dolphins in Hawai'i. Canadian Journal of Zoology79:988-996.

Baird, R. W., A. M. Gorgone, and D. L. Webster. 2002. An examination of movements of bottlenose dolphins between islands in the Hawaiian Island Chain. Report prepared under contract # 40JGNF110270 to the Southwest Fisheries Science Center, National Marine Fisheries Service, 8604 La Jolla Shores Drive, La Jolla, CA 92037, USA. 10 pp.

Baird, R. W., D. J. McSweeney, D. L. Webster, A. M. Gorgone and A. D. Ligon. 2003. Studies of odontocete population structure in Hawaiian waters: Results of a survey through the main Hawaiian Islands in May and June 2003. Report prepared under contract #AB133F-02-CN-0106 to the Southwest Fisheries Science Center, National Marine Fisheries Service, 8604 La Jolla Shores Drive, La Jolla, CA 92037, USA. 25 pp.

Baird, R. W., D. J. McSweeney, A. D. Ligon and D. L. Webster. 2004. Tagging feasibility and diving of Cuvier's beaked whales (*Ziphius cavirostris*) and Blainville's beaked whales (*Mesoplodon densirostris*) in Hawai'i. Report prepared under Order No. AB133F-03-SE-0986 to the Hawai'i Wildlife Fund, Volcano, HI, from the Southwest Fisheries Science Center, National Marine Fisheries Service, La Jolla, CA, 92037 USA.

Baird, R. W., A. M. Gorgone, D. L. Webster, D. J. McSweeney, J. W. Durban, A. D. Ligon, D. R. Salden, and M. H. Deakos. 2005a. False killer whales around the main Hawaiian islands: an assessment of inter-island movements and population size using individual photo-identification. Report prepared under Order No. JJ133F04SE0120 from the Pacific Islands Fisheries Science Center, National Marine Fisheries Service.

Baird, R. W., D. L. Webster and D. J. McSweeney. 2005b. Biases and data limitations of odontocete cetacean sighting data from small-boat based surveys around the main Hawaiian Islands. Report prepared under Purchase Order No. N62742-05-P-1880 to Cascadia Research Collective, 218 1/2 W. 4th Avenue, Olympia, WA, 98501, USA. 11 pp.

Baird, R. W., D. J. McSweeney, C. Bane, J. Barlow, D. R. Salden, L. K. Antoine, R. G. LeDuc and D. L. Webster. 2006a. Killer whales in Hawaiian waters: information on population identity and feeding habits. Pacific Science 60:523-530.

Baird, R. W., G. S. Schorr, D. L. Webster, D. J. McSweeney and S. D. Mahaffy. 2006b. Studies of beaked whale diving behavior and odontocete stock structure in Hawai'i in March/April 2006. Report prepared under contract No. AB133F-06-CN-0053 to Cascadia Research from the Southwest Fisheries Science Center, NMFS, La Jolla, CA,

Baker, C. S. and L. M. Herman. 1984. Aggressive behavior between humpback whales (*Megaptera novaeangliae*) wintering in Hawaiian waters. Canadian Journal of Zoology 62:1922-1937.

Baker, C. S., L. M. Herman, A. Perry, W. S. Lawton, J. M. Straley, A. A. Wolman, G. D. Koffman, H. E. Winn, J. D. Hall, J. M. Reinke and J. Östman. 1986. Migratory movement and population structure of humpback whales (*Megaptera novaeangliae*) in the central and eastern North Pacific. Marine Ecology Progress Series 31:105-119.

Baker, C. S., R. W. Slade, J. L. Bannister, R. B. Abernethy, M. T. Weinrich, J. Lien, J. Urban, P. Corkeron, J. Calmabokidis, O. Vasquez and S. R. Palumbi. 1994. Hierarchical Structure of mitochondrial DNA gene flow among humpback whales *Megaptera novaeangliae*, world-wide. Molecular Ecology 3:313-327.

Baker, C. S., S. R. Palumbi, R. H. Lambertsen, M. T. Weinrich, J. Calambokidis, and S. J. O'Brien. 1990. Influence of seasonal migration on geographic distribution of mitochondrial DNA haplotypes in humpback whales. Nature 344(15):238-240.

Balazs, G. H. 1983. Status review document for Pacific sea turtles. NOAA/NMFS/SWFSC Admin. Rept. H-83-17. 6 pp.

Balazs, G. H. 1985. Impact of ocean debris on marine turtles: Entanglement and ingestion. Pages 387-429 in R.S. Shomura and H.O. Yoshida (eds.), Proceedings of the Workshop on the Fate and Impact of Marine Debris, 26-29 November 1984, Honolulu, HI. U.S. Dep. of Comm., NOAA Tech. Memo. NMFS-SWFC-054.

Balazs GH, Ellis DM (2000) Satellite telemetry of migrant male and female green turtles breeding in the Hawaiian Islands. In: Abreu-Grobois A, Briseño-Dueñas R, Márquez-Millán R, Sarti-Martínez L (eds) Proceedings of the 18th international sea turtle symposium: NOAA Tech Memo. NOAA-TM-NMFS-SEFSC-436, pp 281-283

Balazs GH, Katahira LK, Ellis DM (2000) Satellite tracking of hawksbill turtles nesting in the Hawaiian Islands. In: Abreu-Grobois A, Briseño-Dueñas R, Márquez-Millán R, Sarti-Martínez L (eds) Proceedings of the 18th international sea turtle symposium: NOAA Tech Memo. NOAA-TM-NMFS-SEFSC-436, pp 279-281

Balazs, G. H. 1983. Status review document for Pacific sea turtles. NOAA/NMFS/SWFSC Admin. Rept. H-83-17. 6 pp.

Balazs, G. H. 1985. Impact of ocean debris on marine turtles: Entanglement and ingestion. Pages 387-429 in R.S. Shomura and H.O. Yoshida (eds.), Proceedings of the Workshop on the Fate and Impact of Marine Debris, 26-29 November 1984, Honolulu, HI. U.S. Dep. of Comm., NOAA Tech. Memo. NMFS-SWFC-054.

Balazs GH, Ellis DM (2000) Satellite telemetry of migrant male and female green turtles breeding in the Hawaiian Islands. In: Abreu-Grobois A, Briseño-Dueñas R, Márquez-Millán R, Sarti-Martínez L (eds) Proceedings of the 18th international sea turtle symposium: NOAA Tech Memo. NOAA-TM-NMFS-SEFSC-436, pp 281-283

Balazs GH, Katahira LK, Ellis DM (2000) Satellite tracking of hawksbill turtles nesting in the Hawaiian Islands. In: Abreu-Grobois A, Briseño-Dueñas R, Márquez-Millán R, Sarti-Martínez L (eds) Proceedings of the 18th international sea turtle symposium: NOAA Tech Memo. NOAA-TM-NMFS-SEFSC-436, pp 279-281

Balazs G (1994) Homeward Bound: Satellite tracking of Hawaiian green turtles from nesting beaches to foraging pastures. In: Schroeder BA, Witherington B (eds) Proceedings of the thirteenth annual symposium on sea turtle biology and conservation. NOAA Tech Memo NMFS-SEFSC-341, pp 205-208

Balazs GH, Pooley SG (1991) Research plan for marine tutle fibropapilloma. NOAA-SWFSC, pp 110

Balcomb, K. C., III. 1987. The Whales of Hawaii. Marine Mammal Fund, 99 pp.

Balcomb, K. C., III. and D. E. Claridge. 2001. A mass stranding of cetaceans caused by naval sonar in the Bahamas. Bahamas Journal of Science 8(2):2-12.

Barlow, J. 1997. Preliminary estimates of cetacean abundance off California, Oregon and Washington based on a 1996 ship survey and comparisons of passing and closing modes. Admin. Rep. LJ-97-11. Southwest Fisheries Science Center, National Marine Fisheries Service, P.O. Box 271, La Jolla, CA 92038. 25 pp.

Barlow, J. 2003. Preliminary estimates of cetacean abundance off the U.S. West Coast: 1991-2001. Admin. Rept. LJ-03-03. Southwest Fisheries Science Center, National Marine Fisheries Service, 8604 La Jolla Shores Drive, La Jolla, CA, 92037. 26 pp.

Barlow, J. 2006. Cetacean abundance in Hawaiian waters estimated from a summer/fall survey in 2002. Marine Mammal Science 22(2):446-464.

Barlow, J. 2003b. Cetacean abundance in Hawaiian waters during summer/fall 2002. Admin. Rep. LJ-03-13. Southwest Fisheries Science Center, National Marine Fisheries Service, 8604 La Jolla Shores Drive, La Jolla, CA 92037.

Barlow, J., M. C. Ferguson, W. F. Perrin, L. Balance, T. Gerrodette, G. Joyce, C. D. Macleod, K. Mullin, D. L. Palka and G. Waring. 2006. Abundance and densities of beaked and bottlenose whales (family Ziphiidae). Journal of Cetacean Research and Management 7(3): 263-270.

Barrett-Lennard, L. G., T. G. Smith and G. M. Ellis. 1996. A cetacean biopsy system using lightweight pneumatic darts, and its effect on the behavior of killer whales. Marine Mammal Science 12 (1):14-27.

Bartol SM, Musick JA (2003) Sensory Biology of Sea Turtles. In: Lutz PL, Musick JA, Wyneken J (eds) The Biology of Sea Turtles, Volume II, vol II. CRC Press, pp 79-102

Bartol SM, Musick JA, Lenhardt ML (1999) Auditory evoked potentials of the loggerhead sea turtle (*Caretta caretta*). Copeia 3:836-840

Beamish P, Mitchell E (1973) Short Pulse Length Audio Frequency Sounds Recorded in the Presence of a Minke Whale (*Balaenoptera acutorostrata*). In: Deep-Sea Research and Oceanographic Abstracts, vol 20. Pergamon Press, Oxford, pp 375-386

Bearzi, G. 2000. First report of a common dolphin (*Delphinus delphis*) death following penetration of a biopsy dart. Journal of Cetacean Research and Management 2:217-221.

Bejder, L., A. Samuels, H. Whitehead and N. Gales. 2005. Interpreting short-term behavioural responses to disturbance within a longitudinal perspective. Animal Behaviour 72:1149-1158.

Benoit-Bird, K. J., W. W. L. Au, R. E. Brainard and M. O. Lammers. 2001. Diel horizontal migration of the Hawaiian mesopelagic boundary community observed acoustically. Marine Ecology Progress Series 217:1-14.

Benoit-Bird KJ, Au WWL (2003) Prey dynamics affect foraging by a pelagic predator (*Stenella longirostris*) over a range of spatial and temporal scales. Behavioral Ecology and Sociobiology 53:364-373

Berzin, A. A. and A. A. Rovnin. 1966. The distributions and migrations of whales in the northeastern part of the pacific, Chukchi and Bering Seas. Izvestiya Tikhookeanskogo Nauchno-Issledovatel'skogo Institut Rybnogo Khozyaistva I Okeanografii 58:179-207.

Best, P. B., C. M. Schaeff, D. Reeb and P. Palsbøll. 2003. Composition and possible function of social groupings of southern right whales in South African waters. Behaviour 140: 1469-1494.

Best, P. B., D. Reeb, M. B. Rew, P. J. Palsbøll, C. Schaeff and A. Brandao. 2005. Biopsying southern right whales: their reactions and effects on reproduction. Journal of Wildlife Management 69(3):1171–1180.

Best PB (1960) Further Information on Bryde's Whale (*Balaenoptera edeni* Anderson) from Saldanha Bay, South Africa. Norsk Hvalfangst-Tidende 49:201-215

Beavers SC, Cassano ER (1996) Movement and dive behavior of a male sea turtle (*Lepidochelys olivacea*) in the eastern tropical Pacific. J. Herpetol. 30:97-104

Bigg, M. A. 1982. An assessment of killer whale (*Orcinus orca*) stocks off Vancouver Island, British Columbia. Reports of the International Whaling Commission 32:655-666.

Bigg, M. A., P. F. Olesiuk, G. M. Ellis, J. K. B. Ford, and K. C. Balcomb, III. 1990. Social organization and genealogy of resident killer whales (*Orcinus orca*) in the coastal waters of British Columbia and Washington State. Reports of the International Whaling Commission (Special Issue.12):383-405.

Bjorndal KA (1997) Feeding ecology and nutrition in sea turtles. In: Lutz P, Musick JA (eds) The biology of sea turtles. CRC Press, Boca Raton, FL, pp 199-231

Broderick AC, Coyne MS, Fuller WJ, Glen F, Godley BJ (2007) Fidelity and over-wintering of sea turtles. Proceedings of the Royal Society B: Biological Sciences 274:1533-1538

Brown, M. W., S. D. Kraus, and D. E. Gaskin. 1991. Genetic ecology of whales and dolphins. Reaction of northern right whales, (*Eubalaena glacialis*) to skin biopsy sampling for genetic and pollutant analysis. Reports of the International Whaling Commission (special Issue No. 13):82.

Brown, M.W., P. J. Corkeron, P. T. Hale, K. W. Schultz and M. M. Bryden. 1994. Behavioral responses of east Australian humpback whales *Megaptera novaeangliae* to biopsy sampling. Marine Mammal Science 10(4):391-400.

Brown DH, Caldwell DK, Caldwell MC (1966) Observations on the behavior of wild and captive false killer whales, with notes on associated behavior of other genera of captive delphinids. Los Angeles County Museum Contributions in Science 95:1-32

Burtenshaw JC, Oleson EM, Hildebrand JA, McDonald MA, Andrew RK, Howe BM, Mercer JA (2004) Acoustic and satellite remote sensing of blue whale seasonality and habitat in the Northeast Pacific. Deep Sea Research Part II: Topical Studies in Oceanography 51:967-986

Busnel RG, Dziedzic Z (1968) Caracteristiques physiques des signaux acoustiques de pseudorca crassidens owen (cetaces odontocetes). Extrait de Mammalia 32:1-5

Calambokidis, J., G. H. Steiger, J. M. Straley, T. J. Quinn, II, L. M. Herman, S. Cerchio, D. R. Salden, M. Yamaguchi, F. Sato, J. Urbán R., J. Jacobsen, O. von Ziegesar, K. C. Balcomb, C. M. Gabriele, M. E. Dahlheim, N. Higashi, S. Uchida, J. K. B. Ford, Y. Miyamura, P. Ladrón de Guevara P., S. A. Mizroch, L. Schlender and K. Rasmussen. 1997. Abundance and population structure of humpback whales in the North Pacific Basin. Final Contract Report 50ABNF500113 to Southwest Fisheries Science Center, P.O. Box 271, La Jolla, CA 92038. 72pp.

Calambokidis, J., T. Chandler, K. Rasmussen, L. Schlender, and G. H. Steiger. 2000. Humpback and blue whale photo-identification research off California, Oregon and Washington in

1999. Final Contract Report to Southwest Fisheries Science Center, National Marine Fisheries Service, P.O. Box 271, La Jolla, CA 92038.

Calambokidis, J., G. H. Steiger, J. M. Straley, L. M. Herman, S. Cerchio, D. R. Salden, J. Urbán-R., J. K. Jacobsen, O. von Ziegesar, K. C. Balcomb, C. M. Gabriele, M. E. Dahlheim, S. Uchida, G. Ellis, Y. Miyamura, P. Ladrón de Guevara-P., M. Yamaguchi, F. Sata, S. A. Mizroch, L. Schlender, K. Rasmussen, J. Barlow, and T. J. Quinn II. 2001. Movements and population structure of humpback whales in the North Pacific. Marine Mammal Science 17(4):769-794.

Calambokidis, J, T. Chandler, L. Schlender, G. H. Steiger and A. Douglas. 2003. Research on humpback and blue whale off California, Oregon and Washington in 2002. Final contract report to Southwest Fisheries Science Center, National Marine Fisheries Service. 8604 La Jolla Shores Drive, La Jolla, CA 92037. 49pp.

Caldwell, D. K. and M. C. Caldwell. 1989. Pygmy sperm whale *Kogia breviceps* (de Blainville, 1838): Dwarf sperm whale *Kogia simus* Owen, 1866. In: S. H. Ridgway and R. Harrison (eds.), Handbook of Marine Mammals, Vol. 4: The River Dolphins and Larger Toothed Whales, pp. 235-260. Academic Press, 442 pp.

Caldwell MC, Caldwell DK, Tyack PL (1990) Review of the signature-whistle hypothesis for the Atlantic bottlenose dolphin. In: Leatherwood S, Reeves RR (eds) The bottlenose dolphin. Academic Press, San Diego, pp 199-234

Caldwell DK (1971) Cuvier's Beaked Whale, *Ziphius cavirostris*, from Barbados. Bullentin Southern California Academy of Sciences 70:52-53

Caldwell DK, Caldwell MC (1989) Pygmy sperm whale Kogia breviceps (de Blainville, 1838): Dwarf sperm whale Kogia simus Owen, 1866. In: Handbook of marine mammals, Vol. 4: River dolphins and the larger toothed whales. Academic Press, pp 234-60

Caldwell MC, Caldwell DK (1969) Simultaneous but different narrow-band sound emissions by a captive eastern Pacific pilot whale, *Globicephala scammoni*. Mammalia 33:505-508

Carder D, Ridgway SH, Whitaker B, Geraci J (1995) Hearing and echolocation in a pygmy sperm whale *Kogia*. In: 11th biennial conference on the biology of marine mammals, Orlando, FL

Carretta, J. V., J. Barlow, K. A. Forney, M. M. Muto and J. Baker. 2001. U.S. Pacific Marine Mammal Stock Assessments: 2001. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-317, 280 pp.

Carretta, J. V., K. A. Forney, M. M. Muto, J. Barlow, J. Baker, B. Hanson and M. Lowry. 2004. U.S. Pacific marine mammal stock assessments: 2004. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-375, 316 pp.

Cerchio, S. and C. M. Gabriele. 1994. Movements of humpback whales between Kauai and Hawai'i 1989-1991. Report to the NOAA Sanctuaries and Reserves Division, Honolulu, Hawai'i, 20 pp.

Cerchio, S., C. M. Gabriele, T. F. Norris and L. M. Herman. 1998. Movements of humpback whales between Kauai and Hawaii: implications for population structure and abundance estimation in the Hawaiian Islands. Marine Ecology Progress Series 175:13-22.

Chivers, S. J., R. G. LeDuc and R. W. Baird. 2003. Hawaiian island populations of false killer whales and short-finned pilot whales revealed by genetic analyses. In Abstracts of the 15th Biennial Conference on the Biology of Marine Mammals, 14-19 December 2003, Greensboro, NC.

CITES. 2005. Convention on International Trade in Endangered Species of Wild Fauna and Flora (http://www.cites.org/).

Clapham P. J., P. J. Palsbøll, D. K. Mattila and O. Vasquez. 1992. Composition and dynamics of humpback whale competitive groups in the West Indies. Behaviour 122:182-194

Clarke MR (1976) Observations on Sperm Whale Diving. Journal of the Marine Biological Association of the United Kingdom 56:809-810

Clark, M. and R. Young. 1998. Description and analysis of cephalopod beaks from stomachs of six species of odontocete cetaceans stranded on Hawaiian shores. Journal of the Marine Biological Association, U.K. 78:623-641.

Clarke MR (1996) Cephalopods As Prey. III. Cetaceans. Proceedings of the Royal Society of London, Series B, Biological Sciences 351:1053-1065

Clark CW, Borsani JF, Notarbartolo di Sciara G (2002) Vocal activity of fin whales, *Balaenoptera physalus*, in the Ligurian Sea. Marine Mammal Science 18:286-295

Clark CW, Clapham PJ (2004) Acoustic monitoring on a humpback whale (*Megaptera novaeangliae*) feeding ground shows continual singing into late spring. Proceedings of the Royal Society of London Series B-Biological Sciences 271:1051-1057

Clark CW, Fristrup K (1997) Whales '95: A combined visual and acoustic survey of blue and fin whales off southern California. Rep. Int. Whaling Comm. 47:583-600

Connor RC, Wells RS, Mann J, Read AJ (2000) The Bottlenose Dolphin: Social Relationships in a Fission-Fusion Society. In: Mann J, Connor RC, Tyack PL, Whitehead H (eds) Cetacean Societies, Field Studies of Dolphins and Whales. The University of Chicago Press, Chicago, pp 91-126

Constantine, R., and S. Yin. 2003. Swimming with dolphins in New Zealand. Pages 257-263. In T. Frohoff and B. Peterson, eds. Between species: a celebration of the dolphin – human bond. Sierra Club Books, San Francisco.

Corkeron, P. J., S. M. Van Parijs. 2001. Vocalizations of eastern Australian Risso's dolphins, *Grampus griseus*. Canadian Journal of Zoology 79:160-164.

Croll DA, Acevedo-Gutierrez A, Tershy BR, Urban-Ramirez J (2001a) The diving behavior of blue and fin whales: is dive duration shorter than expected based on oxygen stores? Comparative Biochemistry and Physiology - Part A: Molecular & Integrative Physiology 129:797-809

Croll DA, Clark CW, Acevedo A, Tershy B, Floress S, Gedamke J, Urban J (2002) Only Male Fin Whales Sing Loud Songs. Nature 417:809

Croll DA, Clark CW, Calambokidis J, Ellison WT, Tershy BR (2001b) Effect of anthropogenic low-frequency noise on the foraging ecology of *Balaenoptera* whales. Animal Conservation 4:13-27

Croll DA, Tershy BR, Acevedo A, Levin P (1999) Marine vertebrates and low frequency sound. Marine Mammmal and Seabird Ecology Group, Institute of Marine Sciences, University of California, Satna Cruz

Cummings, W. C. 1985. Right whales *Eubalaena glacialis* (Müller, 1776) and *Eubalaena australis* (Desmoulins, 1822). Pp. 275-304 in S.H. Ridgway and R. Harrison (eds.), Handbook of marine mammals, Vol. 3. Academic Press, London.

Cummings WC, Thompson PO, Ha SJ (1986) Sounds from bryde, *Balaenoptera edeni*, and finback, *B. physalus*, whales in the Gulf of California. Fishery Bulletin 84:359-370

Cummings WC, Thompson PO (1971) Underwater sounds from the blue whale, *Balaenoptera musculus*. Journal of the Acoustical Society of America 50:1193-1198

D'vincent CG, Nilson RM, Hanna RE (1985) Vocalization and coordinated feeding behavior of the humpback whale *Megaptera novaeangliae* in southeastern alaska usa. Sci Rep Whales Res Inst Tokyo 0:41-48

Dalebout, M. L., G. J. B. Ross, C. S. Baker, R. C. Anderson, P. B. Best, V. G. Cockcroft, H. L. Hinsz, V. Peddemors and R. L. Pitman. 2003. Appearance, distribution and genetic distinctiveness of Longman's beaked whale, *Indopacetus pacificus*. Marine Mammal Science 19:421-461.

Darling, J. D. 1991. Humpback whales in Japanese waters. Ogasawara and Okinawa. Fluke identification catalog 1987-1990. Final Contract Report, World Wide Fund for Nature, Japan. 22pp.

Darling, J. D. 2002. Characterization of behavior of humpback whales in Hawaiian waters. Final contract report to the Hawaiian Islands Humpback Whale National Marine Sanctuary, Kihei, Maui. 55 pp.

Darling J. D, and M. Bérubé. 2001. Interactions of singing humpback whales with other males. Marine Mammal Science 17:570-584.

Darling, J. D., M. E. Jones, C. F. Nicklin. 2006. Humpback Whale Songs: Do they organize males on the breeding grounds? Behaviour 143:1051-1101.

Davis RW, Worthy GAJ, Würsig B, Lynn SK, Townsend FI (1996) Diving Behavior and At-Sea Movements of an Atlantic Spotted Dolphin in the Gulf of Mexico. Marine Mammal Science 12:569-581

Dawson S., J. Barlow and D. Ljungblad. 1998. Sounds recorded from Baird's beaked whale, *Berardius bairdii*. Marine Mammal Science 14:335-344.

DeLong, R. L. and R. L. Brownell, Jr. 1977. Hawaiian monk seal (*Monachus schauinslandi*) habitat and population survey in the northwestern (Leeward) Hawaiian Islands, April 1977. Northwest Alaska Fisheries Center Progress Report, 43 pp.

Diercks KJ, Trochta RT, Evans WE (1973) Delphinid sonar: measurement and analysis. Journal of the Acoustical Society of America 54:200-204

Diercks KJ, Trochta RT, Greenlaw CF, Evans WE (1971) Recording and analysis of dolphin echolocation signals. Journal of the Acoustical Society of America 49:1729-1732

Dizon, A. E., W. F. Perrin, and P. A. Akin. 1994. Stocks of dolphins (*Stenella* spp. and *Delphinus delphis*) in the eastern tropical Pacific: a phylogeographic classification. NOAA Tech. Rep. NMFS 119, 20 pp.

Dolar MLL, Walker WA, Kooyman GL, Perrin WF (2003) Comparative feeding ecology of spinner dolphins (*Stenella longirostris*) and Fraser's dolphins (*Lagenodelphis hosei*) in the Sulu Sea. Marine Mammal Science 19:1-19

Dollar, R. A. 1991. Summary of swordfish longline observations in Hawaii, July 1990-March 1991. Southwest Fish. Cent. Admin. Rep. H-91-09, 13 pp.

Dolphin WF (1987) Ventilation and dive patterns of humpback whales, *Megaptera novaeangliae*, on their Alaskan feeding grounds. Canadian Journal of Zoology 65:83-90

Donahue M, Perryman W (2002) Pygmy Killer Whale - Feresa attenuata. In: Perrin W, Würsig B, Thewissen J (eds) Encyclopedia of marine mammals, San Diego, pp 1009-1010

Donovan, G. P. 1991. A review of IWC stock boundaries. Reports of the International Whaling Commission, Special Issue 13:39-68.

Dutton, P. H. 2003. Molecular ecology of the eastern Pacific green turtle In: J. A. Seminoff (Compiler). Proceedings of the Twenty-Second Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-503.

Eckert SA (2002) Swim speed and movement patterns of gravid leatherback sea turtles (*Dermochelys coriacea*) at St Croix, US Virgin Islands. Journal of Experimental Biology 205:3689-3697

Edds PL, Odell DK, Tershy BR (1993) Vocalizations of a captive juvenile and free-ranging adult-calf pairs of Bryde's whales, *Balaenoptera edeni*. Marine Mammal Science 9:269-284

Edds-Walton PL (2000) Vocalisations of minke whales (*Baleanoptera acutorostrata*) in the St. Lawrence estuary. Bioacoustics 1:31-50

Edds PL (1982) Vocalizations of the blue whale, *Balaenoptera musculus*, in the St. Lawrence River. Journal of Mammology. 63:345-347

Edds PL (1988) Characteristics of finback *Balaenoptera physalus* vocalizations in the St. Lawrence Estuary. Bioacoustics 1:131-149

Eliason JJ, Johanos TC, Webber MA (1990) Parturition in the Hawaiian monk seal (*Monachus schauinslandi*). Marine Mammal Science 6:146-151

Ellis DM, Balazs GH, Gilmartin WG, Murakawa KK, Katahira LK (2000) Short-range reproductive migrations of hawksbill turtles in the Hawaiian Islands as determined by satellite telemetry. In: Abreu-Grobois A, Briseño-Dueñas R, Márquez-Millán R, Sarti-Martínez L (eds) Proceedings of the 18th international sea turtle symposium: NOAA Tech Memo. NOAA-TM-NMFS-SEFSC-436, pp 252-253

Erbe C (2002) Underwater noise of whale-watching boats and potential effects on Killer whales (*Orcinus orca*), based on an acoustic impact model. Marine Mammal Science 18:394-418

Ernst C, Barbour R, Lovich J (1994) Turtles of the United States and Canada. Smithsonian Institution Press, Washington and London

Evans PGH, Raga JA (2001) Marine Mammals: Biology and Conservation. Kluwer Academic/Plenum Publishers, New York

Evans WE (1973) Echolocation by marine delphinids and one species of fresh-water dolphin. Journal of the Acoustical Society of America 54:191-199

Evans WE (1994) Common Dolphin, white bellied porpoise (*Delphnis delphis*, LInnaeus, 1758). In: Ridgway S, Harrison R (eds) Handbook of Marine Mammals, vol 5. Academic Press, pp 191-224

Fiedler PC, Reilly SB, Hewitt RP, Demer D, Philbrick VA, Smith S, Armstrong W, Croll DA, Tershy BR, Mate BR (1998) Blue whale habitat and prey in the California Channel Islands. Deep Sea Research II 45:1781-1801

Fish JF, Turl CW (1976) Acoustic source levels of four species of small whales. Undersea sciences department, Naval undersea center, San Diego, CA, pp 13

Ford J (2002) Killer Whale (*Orcinus orca*). In: Perrin W, Würsig B, Thewissen J (eds) Encyclopedia of marine mammals, San Diego

Ford JKB (1989) Acoustic behaviour of resident killer whales (*Orcinus orca*) off vancouver island, british columbia. Canadian Journal of Zoology 67:727-745

Ford JKB, Fisher HD (1982) Killer Whale (*Orcinus orca*) dialects as an indicator of stocks in British Columbia. Report to the Whaling Commission 32:671-679

Ford, J. K. B., G. M. Ellis, and K. C. Balcomb. 1994. Killer whales. The natural history and genealogy of *Orcinus orca* in British Columbia and Washington State. UBC Press, Vancouver, Canada.

Forney, K. A. 2004. Estimates of cetacean mortality and injury in two U.S. Pacific longline fisheries, 1994-2002. Admin. Rep. LJ-04-07. Southwest Fisheries Science Center, National Marine Fisheries Service, 8604 La Jolla Shores Drive, La Jolla, CA 92038. 17 pp.

Frankel, A. S. 1987. Sound playback experiments with humpback whales *Megaptera novaeangliae* in Hawaiian waters. A Thesis submitted to the Graduate Division of the University of Hawai'i in Partial Fulfillment Of The Requirements For the Degree of Master Of Science In Zoology.

Frankel, A. S. 1994. Acoustic and Visual Tracking reveals distribution, song variability and social roles of humpback whales in Hawaiian waters. University of Hawaii, Department of Oceanography, Doctoral Dissertation.

Frankel, A. S. and L. M. Herman. 1987. Sound playback experiments with humpback whales *Megaptera novaeangliae* in Hawaiian waters. In Abstracts of the 7th Biennial Conference on the Biology of Marine Mammals.

Frankel, A. S., Clark, C. W., Herman, L. M., and C. M. Gabriele. 1995a. Spatial Distribution, habitat utilization, and social interactions of humpback whales, *Megaptera novaeangliae*, off Hawai'i, determined using acoustic and visual techniques. Canadian Journal of Zoology 73:1134-1146.

Frankel AS, Mobley JR, jr, Herman LM (1995) Estimation of auditory response thresholds in humpback whales using biologically meaningful sounds. In: Kastelein RA, Thomas JA, Nachtigall PE (eds) Sensory Systems of Aquatic Mammals. DeSpil Publishers, Woerden, The Netherlands, pp 55-70

Frankel, A. S. and C. W. Clark. 1998. Results of low-frequency playback of M-sequence noise to humpback whales (*Megaptera novaeangliae*), in Hawai'i. Canadian Journal of Zoology 76(3):521-535.

Frankel, A. S., J. R. Mobley, Jr. and L. M. Herman. 1995b. Determining auditory thresholds in free-ranging cetaceans using biologically meaningful sound. In: R. A. Kastelein, J. A. Thomas, P. Nachtigall (Eds.), Sensory processes of aquatic animals, pp. 55-70. Woerden, Netherlands: De Spil Publishers.

Frankel, A. S., S. E. Yin, C. M. Gabriele and S. H. Rickards. In prep. A description of sounds recorded from melon-headed whales (*Peponocephala electra*) off Hawai'i.

Frankel AS (2002) Sound Production. In: Perrin WF, Wursig B, Thewissen JGM (eds) Encyclopedia of Marine Mammals. Academic Press, San Diego, pp 1126-1138

Frantzis, A. 1998. Does acoustic testing strand whales? Nature 392(5):29.

Fristrup K. M, L. T. Hatch and C. W. Clark. 2003. Variation in humpback whale (*Megaptera novaeangliae*) song length in relation to low-frequency sound broadcasts. Journal of the Acoustical Society of America 113:3411-3424.

Gabriele, C. M. 1992. Behavior and residence characteristics of humpback whales in Hawaiian waters. A Thesis submitted to the Graduate Division of the University of Hawai'i in Partial Fulfillment Of The Requirements For the Degree of Master Of Science In Psychology, 92 pp.

Gabriele CM, Straley JM, Herman LM, Coleman RJ (1996) Fastest Documented Migration of a North Pacific Humpback Whale. Marine Mammal Science 12:457-464

Gabriele, C. M. and A. S. Frankel. 2002. The Occurrence and Significance of Humpback Whale Song in Glacier Bay, Southeastern Alaska. Arctic Research of the United States 16:42-47.

Gabriele, C. M., J. M. Straley, S. A. Mizroch, C. S. Baker, A. S. Craig, L. H. Herman, D. Glockner-Ferrari, M. J. Ferrari, S. Cerchio, O. von Ziegesar, J. Darling, D. McSweeney, T. J. Quinn II and J. K. Jacobsen. 2001a. Estimating the mortality rate of humpback whale calves in the central North Pacific Ocean. Canadian Journal of Zoology. 79:589-600.

Gabriele, C. M., J. M. Straley and J.L. Neilson. 2007. Age at first calving of female humpback whales in southeastern Alaska. Marine Mammal Science 23(1): 226-239.

Gabriele, C. M., S. H. Rickards, S. E. Yin and A. S. Frankel. 2003. Trends in relative distribution, abundance and population composition of humpback whales, *Megaptera novaeangliae*, in Kawaihae Bay, Hawai'i 1988-2003. Report from the Hawai'i Marine Mammal Consortium to the Department of Land and Natural Resources, State of Hawai'i and the Hawaiian Islands Humpback Whale National Marine Sanctuary, Office of National Marine Sanctuaries, NOAA, U.S. Department of Commerce, 40 pp.

Gabriele, C. M., J. M. Straley, L. M. Herman, and R. J. Coleman. 1996. Fastest documented migration of a North Pacific humpback whale. Marine Mammal Science 12(3):457-464.

Gabriele, C. M., S. H. Rickards, A. S. Frankel and J. Östman-Lind. 2001. Summary of Winter 2001 Shore-based Monitoring of Humpback Whales, *Megaptera novaeangliae*, off the

Kohala Coast. Hawai'i Marine Mammal Consortium Final Report to the Hawaiian Islands Humpback Whale National Marine Sanctuary, 726 S. Kihei Rd., Kihei HI 96753, 6 pp.
Galbreath, E. C. 1963. Three beaked whales stranded on the Midway Islands, central Pacific Ocean. Journal of Mammalogy 44:422-423.
Gambell, R. 1985. Sei whale *Balaenoptera borealis* Lesson, 1828. Pp. 155-170 in S.H. Ridgway and R. Harrison (eds.), Handbook of marine mammals, Vol. 5. Academic Press, London.
Gambell R (1985a) Fin Whale (*Balaenoptera physalus)*. In: Handbook of Marine Mammals, vol 3. Academic Press Inc., London, pp 171-192
Gaskin DE (1982) The Ecology of Whales and Dolphins, First edn. Heinemann, London
Gauthier, J., and R. Sears. 1999. Behavioral response of four species of balaenopterid whales to biopsy sampling. Marine Mammal Science 15(1):85-101.
Gazo M, Lydersen C, Aguilar A (2006) Diving behaviour of Mediterranean monk seal pups during lactation and post weaning. Marine Ecology-Progress Series 308:303-309
Gedamke J, Costa DP, Dunstan A (2001) Localization and visual verification of a complex minke whale vocalization. Journal of the Acoustical Society of America 109:3038-3047
Gilmore, R. M. 1959. On the mass strandings of sperm whales. Pacific Naturalist 1(9-10):3-15.
Glockner, D. A. 1983. Determining the sex of humpback whales (*Megaptera novaeangliae*) in their natural environment. In: Payne R (ed) Communication and Behavior of Whales. Westview Press, Colorado, pp 447-466.
Goold JC, Jones SE (1995) Time and frequency domain characteristics of sperm whale clicks. Journal of the Acoustical Society of America 98:1279-1291
Gordon J, Gillespie D, Rendell LE, Leaper R (1996) Draft Report on playback of ATOC like sound to Sperm whales (*Physeter macrocephalus*) off the Azores.
Gosho, M. E., D. W. Rice, and J. M. Breiwick. 1984. The sperm whale *Physeter macrocephalus*. Marine Fisheries Review 46(4):54-64

Hall JD, Johnson CS (1972) Auditory threshold of a killer whale (*Orcinus orca*) Linnaeus. Journal of the Acoustical Society of America 51:515-517
Hamilton PK, Stone GS, Martin SM (1997) Note on a deep humpback whale *Megaptera novaeangliae* dive near Bermuda. Bulletin of Marine Science 61:491-494
Hanan, D. A. 1986. California Department of Fish and Game coastal marine mammal study, annual report for the period July 1, 1983-June 30, 1984. Southwest Fisheries Science Center Admin. Rep. LJ-86-16. 55pp.
Handley, C. O., Jr. 1966. A synopsis of the genus Kogia (pygmy sperm whales). Pp. 62-69 in K.S. Norris (ed.) Whales, dolphins and porpoises. University of California Press, Berkeley.
Hays GC, Broderick AC, Godley BJ, Lovell P, Martin C, McConnell BJ, Richardson S (2002) Biphasal long-distance migration in green turtles. Animal Behaviour 64:895-898
Heimlich, S. L., D. K. Mellinger, S. L. Nieukirk and C. G. Fox. 2005. Types, distribution, and seasonal occurrence of sounds attributed to Bryde's whales (*Balaenoptera edeni*) recorded in the eastern tropical Pacific, 1999--2001. The Journal of the Acoustical Society of America 118:1830-1837.
Helweg DA, Moore PW, Dankiewicz LA, Zafran JM, Brill RL (2003) Discrimination of complex synthetic echoes by an echolocating bottlenose dolphin. Journal of the Acoustical Society of America 113:1138-1144
Herman, D. P., D. G. Burrows, P. R. Wade, J. W. Durban, R. G. LeDuc, C. O. Matkin, L. Barrett-Lennard. and M. M. Krahn. 2005. Ecotype classification and prey preferences of eastern

North Pacific killer whale populations from fatty acid, stable isotope, and organochlorine analyses of blubber biopsies. Marine Ecology Progress Series 302: 275-391.
Herman, L. M. and R. C. Antinoja. 1977. Humpback whales in the Hawaiian breeding waters: population and pod characteristics. Scientific Reports of the Whales Research Institute 29:59-85.
Herman, L. M., C. S. Baker, P. H. Forestell and R. C. Antinoja. 1980. Right whale, *Balaena glacialis*, sightings near Hawaii: a clue to the wintering grounds? Marine Ecology Progress Series 2:271-275.
Herzing DL (1996) Vocalizations and associated underwater behavior of free-ranging Atlantic spotted dolphins, *Stenella frontalis* and bottlenose dolphins, *Tursiops truncatus*. Aquatic Mammals 22:61-79
Heyning, J. E. 1989. Cuvier's beaked whale *Ziphius cavirostris* G. Cuvier, 1823. In: S. H. Ridgway and R. Harrison (eds.), Handbook of Marine Mammals, Vol. 4: The River Dolphins and Larger Toothed Whales, pp. 289-308. Academic Press, 442 pp.
Heyning, J. E. and M. E. Dahlheim. 1988. *Orcinus orca*. Mammalogy. Spec.304:1-9.
Heyning, J. E. and T. D. Lewis. 1990. Fisheries interactions involving baleen whales off southern California. Reports of the International Whaling Commission 40:427-431.
Horwood, J. 1987. The Sei Whale: Population Biology, Ecology and Management. Croom Helm, London, U.K. 375pp.
Houser DS, Helweg DA, Moore PWB (2001) A bandpass filter-bank model of auditory sensitivity in the humpback whale. Aquatic Mammals 27:82-91
Houston J (1991) Status of Cuvier's beaked whale, *Ziphius cavirostris*, in Canada. Can. Field Nat. 105:215-218
Hoyt E (1981) The whale called killer. E.P. Dutton, New York
Huggins, J., R. W. Baird, D. L. Webster, D. J. McSweeney, G. S. Schorr, and A. D. Ligon. 2005. Inter-island movements and re-sightings of melon-headed whales within the Hawaiian archipelago. In Abstracts of the 16th Biennial Conference on the Biology of Marine Mammals, 12-16 December 2005, San Diego, CA.

Janik VM, Sayigh LS, Wells RS (2006) Signature whistle shape conveys identity information to bottlenose dolphins. PNAS 103:8293-8297
Jaquet N, Dawson S, Douglas L (2001) Vocal behavior of male sperm whales: why do they click? Journal of the Acoustical Society of America 109:2254-2259
Jaquet N, Dawson S, Slooten E (2000) Seasonal Distribution and Diving Behaviour of Male Sperm Whales off Kaikoura: Foraging Implications. Canadian Journal of Zoology 78:407-419
Jaquet N, Dawson S, Douglas L (2001) Vocal behavior of male sperm whales: why do they click? Journal of the Acoustical Society of America 109:2254-2259
Jefferson, T. A. and N. B. Barros. 1997. *Peponocephala electra*. Mammalian Species 533:1-6.
Jefferson, T. A., P. J. Stacey and R. W. Baird. 1991. A review of killer whale interactions with other marine mammals: predation to co-existence. Mammal Review 4, 151–180.
Jefferson, T. A., S. Leatherwood and M. A. Webber. 1993. FAO species identification guide: marine mammals of the world. United States Environment Programme; Food and Agriculture Organization of the United Nations (FAO), Rome. 320pp.
Jefferson T, Leatherwood, S., Webber, M. (1993) FAO species identificaion guid: Marine Mammals of the World. FAO UNEP, Rome, Italy
Jefferson TA, Leatherwood S (1994) *Lagenodelphis hosei*. Mammalian Species:1-5
Jefferson TA (2002) Rough-toothed dolphin *Steno breadanesis*. In: Perrin W, Würsig B, Thewissen J (eds) Encyclopedia of marine mammals, San Diego, pp 1055-1059

Jérémie S, A. Gannier, S. Bourreau and J. C. Nicolas. 2006. Acoustic monitoring of cetaceans in territorial waters off La Martinique (FWI), Lesser Antilles: global abundance and first description of *Kogia simus* vocalisations (November December 2004)

Johnson CS (1967) Sound detection thresholds in marine mammals. In: Tavolga WN (ed) Marine Bio-Acoustics, vol 2. Pergamon Press, New York, pp 247-260.

Johnson, J. H. and A. A. Wolman. 1984. The humpback whale, *Megaptera novaeangliae*. Marine Fisheries Review 46(4):30-37.

Johnson M., P. T. Madsen, W. M. X. Zimmer, N. Aguilar de Soto, P. L. Tyack. 2004. Beaked whales echolocate on prey. Proceedings of the Royal Society of London Series B-Biological Sciences 271:S383-S386.

Jones GJ, Sayigh LS (2002) Geographic variation in rates of vocal production of free-ranging bottlenose dolphins. Marine Mammal Science 18:374-393

Jonsgard A, Darling K (1977) On the biology of the eastern north atlantic sei whale, *Balaenoptera borealis* Lesson. Report of the International Whaling Commission Si1:124-129

Julian, F. and M. Beeson. 1998. Estimates of mammal, turtle and bird mortality for two California gillnet fisheries: 1990-1995. Fisheries Bulletin 96:271-284.

Kamminga C, Van Velden JG (1987) Investigations on Cetacean Sonar VIII: Sonar Signals of *Pseudorca crassidens* in comparison with *Tursiops truncatus*. Aquatic Mammals 13:43-50

Karczmarski, L., B. Würsig, G. Gailey, K. W. Larson and C. Vanderlip. 2005. Spinner dolphins in a remote Hawaiian atoll: social grouping and population structure. Behavioral Ecology 16:675–685.

Kastelein RA, Hagedoorn M, Au WWL, de Haan D (2003) Audiogram of a striped dolphin (*Stenella coeruleoalba*). Journal of the Acoustical Society of America 113:1130-1137

Kastelein RA, Gerrits NM (1991) Swimming, diving, and respiration patterns of a Northern bottlenose whale (*Hyperoodon ampullatus*, Forster, 1770). Aquatic Mammals 17:20-30

Kasuya, T., T. Miyashita and F. Kasamatsu. 1988. Segregation of two forms of short-finned pilot whales off the Pacific coast of Japan. Scientific Reports of the Whales Research Institute39:77-90.

Katona, S. K. and J. A. Beard. 1990. Population size, migrations, and feeding aggregations of the humpback whale (*Megaptera novaeangliae*) in the western North Atlantic ocean. Reports of the International Whaling Commission Special Issue 12:295-306.

Katona, S. and H. P. Whitehead. 1981. Identifying humpback whales using their natural markings. Polar Record 20:439-444.

Kawamura A (1994) A review of baleen whale feeding in the Southern Ocean. Rep. Int. Whaling Comm. 44:261-271

Kellar, N. M. 2003. Steroids and Blubber: determining rates of pregnancy and sexual maturity from projectile biopsies. In Abstracts of the 15th Biennial Conference on the Biology of Marine Mammals, 14-19 December 2003, Greensboro, NC.

Kellar, N. M., M. L. Trego, C. I. Marks and A. E. Dizon. 2006. Determining pregnancy from blubber in three species of delphinids. Marine Mammal Science 22(1)1-16.

Ketten DR (2000) Cetacean Ears. In: Au WWL, Popper AN, Fay RR (eds) Hearing by Whales and Dolphins. Springer-Verlag, New York, pp 43-108

Kishiro, T. and T. Kasuya. 1993. Review of Japanese dolphin drive fisheries and their status. Reports of the International Whaling Commission 43:439-452.

Klinowska, M. and J. Cooke. 1991. Dolphins, porpoises and whales of the world - The IUCN Red Data Book. IUCN Gland, Switzerland and Cambridge, U.K.

Kobayashi, D. R. and K. E. Kawamoto. 1995. Evaluation of shark, dolphin, and monk seal interactions with Northwestern Hawaiian Island bottomfishing activity: a comparison of two time periods and an estimate of economic impacts. Fisheries Research 23:11-22.

Knowlton A, Clark CW, Kraus SD (1991) Sounds recorded in the presence of sei whales, *Balaenoptera borealis*. In: Ninth biennial conference on the biology of marine mammals, Chicago, pp 40

Kruse, S. K., D. K. Caldwell and M. C. Caldwell. 1999. Risso's dolphin *Grampus griseus*. Pages 183-212 In: S. H. Ridgway and R. Harrison (eds.), Handbook of Marine Mammals, Volume 6. Academic Press, San Diego.

Laurie AH (1933) Some aspects of respiration in fin and blue whales. Discovery Reports 7:365-406.

Leatherwood, J. S. and M. E. Dahlheim. 1978. Worldwide distribution of pilot whales and killer whales. Naval Ocean Systems Center, Tech. Rep. 443:1-39.

Leatherwood S, Ljungblad DK (1979) Nighttime swimming and diving behavior of a radio tagged spotted dolphin *Stenella attenuata*. Cetology 34:1-6

Leatherwood, S., C. O. Matkin, J. D. Hall and G. M. Ellis. 1990. Killer whales, *Orcinus orca*, photo-identified in Prince William Sound, Alaska, 1976 through 1987. Can Field-Nat. 104:362-371.

Leatherwood, S., R. R. Reeves, W. F. Perrin and W. E. Evans. 1982. Whales, dolphins, and porpoises of the eastern North Pacific and adjacent arctic waters: A guide to their identification. NOAA Technical Report NMFS 444, 245 pp.

Leatherwood S., T.A. Jefferson, J.C. Norris, W.E. Stevens, L.J. Hansen, K.D. Mullin. 1993. Occurrence and sounds of Fraser's dolphins (*Lagenodelphis hosei*) in the Gulf of Mexico. Texas Journal of Science 45:349-354.

Leatherwood S, Reeves RR, Perrin WF, Evans WE (1988) Whales, dolphins and porpoises of the eastern North Pacific and adjacent Arctic waters. Dover Publication, New York, NY

Lee, T. 1993. Summary of cetacean survey data collected between the years of 1974 and 1985. NOAA Technical Memorandum, NMFS 181, 184pp.

LeDuc RG (2002) Overview of Delphinids. In: Perrin WF, Würsig B, Thewissen HGM (eds) Encyclopedia of Marine Mammals. Academic Press, San Diego, pp 310-314

Lenfant C (1969) Physiological properties of blood of marine mammals. In: Andersen HT (ed) the biology of marine mammals. Academic Press, New York, pp 95-116

Leroux, R.A., G.H. Balazs, and P.H. Dutton. 2003 . Genetic stock composition of foraging green turtles off the southern coast of Moloka'i, Hawai'i. In: : J. A. Seminoff (Compiler). Proceedings of the Twenty-Second Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-503.

Ljungblad DK, Scoggins PD, Gilmartin WG (1982) Auditory thresholds of a captive Eastern Pacific bottlenose dolphin, *Tursiops spp.* Journal of the Acoustical Society of America 72:1726-1729

Lockyer C (1981) Growth and energy budgets of large baleen whales from the southern hemisphere. In: Food and Agriculture Organization of the United Nations Fisheries Series, vol 5, pp 379-487

Lockyer C, Hammond PS, McConnell LC (1994) Research on large baleen whales in the Southern Hemisphere: a proposal to re-examine the "Discovery" and other historical data. In: Reports of the International Whaling Commission

Longman, H. A. 1926. New records of Cetacea, with a list of Queensland species. Memoirs of the Queensland Museum 8:266-278.

Luschi P, Hays GC, Papi F (2003) A review of long-distance movements by marine turtles, and the possible role of ocean currents. Oikos 103:293-302

Lutcavage ME, Lutz PL (1991) Voluntary Diving Metabolism and Ventilation in the Loggerhead Sea Turtle. Journal of Experimental Marine Biology and Ecology 147:287-296

MacLeod CD, Sanots MB, Pierce GJ (2003) Review of data on diets of beaked whales: Evidence of niche separation and geographic segregation. Journal of the Marine Biological Association of the United Kingdom 83:651 - 665

Madsen PT, Kerr I, Payne R (2004a) Echolocation clicks of two free-ranging, oceanic delphinids with different food preferences: false killer whales *Pseudorca crassidens* and Risso's dolphins *Grampus griseus*. Journal of Experimental Biology 207:1811-1823

Madsen PT, Kerr I, Payne R (2004b) Source parameter estimates of echolocation clicks from wild pygmy killer whales (*Feresa attenuata*) (L). The Journal of the Acoustical Society of America 116:1909-1912

Madsen PT, Møhl B (2000) Sperm Whales (*Physeter catodon L.*1758) Do Not React to Sounds from Detonators. Journal of the Acoustical Society of America 107:668-671

MADSEN PT, PAYNE R, KRISTIANSEN NU, WAHLBERG M, KERR I, MOHL B (2002) Sperm whale sound production studied with ultrasound time/depth-recording tags. JOURNAL OF EXPERIMENTAL BIOLOGY 205:1899-1906

Madsen PT, Payne R, Kristiansen NU, Wahlberg M, Kerr I, Mohl B (2002) Sperm whale sound production studied with ultrasound time/depth-recording tags. Journal of Experimental Biology 205:1899-1906

Malakoff, D. 2002. Suit ties whale deaths to research cruise. Science 298:722-723.

Maldini, D., L. Mazzuca and S. Atkinson. 2005. Odontocete stranding patterns in the Main Hawaiian Islands (1937-2002): How do they compare with live animal surveys? Pacific Science 59(1):55-67.

Malme CI, Miles PR, Tyack PL, Clark CW, Bird JE (1985) Investigation of the Potential Effects of underwater noise form petroleum industry activities on feeding humpback whale behavior. Bolt, Beranek and Newman, pp var.

Martel, V. M. 2002. Summary of the report on the atypical mass stranding of beaked whales in the Canary Islands in September 2002 during naval exercises. Society for the Study of the Cetaceans in the Canary Archipelago (SECAC). Unpublished report. 11pp.

Marten K (2000) Ultrasonic analysis of pygmy sperm whale (*Kogia breviceps*) and Hubbs' beaked whale (*Mesoplodon carlhubbsi*) clicks. Aquatic Mammals 26:45-48

Martien, K. K., R. W. Baird and K. M. Robertson. 2005. Population structure of bottlenose dolphins (*Tursiops* sp.) around the main Hawaiian Islands. In Abstracts of the 16th Biennial Conference on the Biology of Marine Mammals, 12-16 December 2005, San Diego, CA.

Masaki, Y. 1977. The separation of the stock units of sei whales in the North Pacific. Reports of the International Whaling Commission, Special Issue 1:71-77.

Mate BR, Lagerquist BA, Calambokidis J (1999) Movements of North Pacific blue whales during the feeding season off southern California and their southern fall migration. Marine Mammal Science 15:1246-1257

Mate BR, Rossbach KA, Nieukirk SL, Wells RS, Irvine AB, Scott MD, Read AJ (1995) Satellite-Monitored Movements and Dive Behaviour of a Bottlenose Dolphin (*Tursiops truncatus*) in Tampa Bay, Florida. Marine Mammal Science 11:452-463

Mazzuca, L., S. Atkinson and E. Nitta. 1998. Deaths and entanglements of humpback whales, *Megaptera novaeangliae,* in the main Hawaiian Islands 1972-1996. Pacific Science 52(1): 1-13.

McCowan B, Hanser SF, Doyle LR (1999) Quantitative tools for comparing animal communication systems: information theory applied to bottlenose dolphin whistle repertoires. Animal Behaviour 57:409-419

McCowan B, Reiss D (1995) Quantitative Comparison of Whistle Repertoires from Captive Adult Bottlenose Dolphins (Delphinidae, *Tursiops truncatus*): A Re-evaluation of the Signature Whistle Hypothesis. Ethology 100:194-209

McCowan B, Reiss D (2001) The fallacy of 'signature whistles' in bottlenose dolphins: a comparative perspective of 'signature information' in animal vocalizations. Animal Behaviour 62:1151-1162

McDonald, M. A. and C. G. Fox. 1999. Passive acoustic methods applied to fin whale population density estimation. The Journal of the Acoustical Society of America 105:2643-2651.

McDonald MA, Calambokidis J, Teranishi AM, Hildebrand JA (2001) The acoustic calls of blue whales off California with gender data. Journal of the Acoustical Society of America 109:1728-1735

McDonald MA, Hildebrand JA, Webb SC (1995) Blue and fin whales observed on a seafloor array in the Northeast Pacific. J. Accoust. Soc. Am. 98:712-721

McDonald MA, Hildebrand JA, Wiggins SM, Thiele D, Glasgow D, Moore SE (2005) Sei whale sounds recorded in the Antarctic. The Journal of the Acoustical Society of America 118:3941-3945

McDonald MA, Mesnick SL, Hildebrand JA (2006) Biogeographic characterisation of blue whale song worldwide: using song to identify populations. J. Cetacean Res. Manage. 8:55-65

McDonald M.A., J.A. Hildebrand, S.M. Wiggins, D. Thiele, D. Glasgow, S.E. Moore. 2005. Sei whale sounds recorded in the Antarctic. The Journal of the Acoustical Society of America 118:3941-3945.

McDonald, M. A. and S. E. Moore. 2002. Calls recorded from North Pacific right whales (*Eubalaena japonica*) in the eastern Bering Sea. Journal of Cetacean Research and Management 4:261-266.

McMahon CR, Bradshaw CJA, Hays GC (2007) Satellite tracking reveals unusual diving characteristics for a marine reptile, the olive ridley turtle *Lepidochelys olivacea*. Marine Ecology-Progress Series 329:239-252

McSweeney, D. J., R. W. Baird, D. L. Webster, G. S. Schorr and S. D. Mahaffy. 2005. Requirements for conservation action? Small population size, high site-fidelity, strong associations, and uncertainty: pygmy killer whales off the island of Hawai'i. In Abstracts of the 16th Biennial Conference on the Biology of Marine Mammals, 12-16 December 2005, San Diego, CA.

McSweeney, D. J., R. W. Baird and S. D. Mahaffy. (2007 In Press). Site fidelity, associations and movements of Cuvier's (*Ziphius cavirostris*) and Blainville's (*Mesoplodon densirostris*) beaked whales off the island of Hawai'i. Marine Mammal Science.

Mead, J. G. 1989. Beaked whales of the genus *Mesoplodon.* In: S. H. Ridgway and R. Harrison (eds.), Handbook of Marine Mammals, Vol. 4: The River Dolphins and Larger Toothed Whales, pp. 349-430. Academic Press, 442 pp.

Medrano, L, M. Salinas, I. Salas, P. Ladrón De Guevara, A. Aguayo, J. Jacobsen, C. S. Baker. 1994. Sex identification of humpback whales, *Megaptera novaeangliae*, on the wintering grounds of the Mexican Pacific Ocean. Canadian Journal of Zoology 72:1771-1774

Mellinger DK, Clark CW (2000) Recognizing transient low-frequency whale sounds by spectrogram correlation. The Journal of the Acoustical Society of America 107:3518-3529

Migura, K. A. and D. W. Meadows. 2002. Short-finned pilot whales (*Globicephala macrorhynchus*) interact with melon-headed whales (*Peponocephala electra*) in Hawaii. Aquatic Mammals 28(3):294-297.

Miller P. J. O., N. Biassoni, A. Samuels and P. L. Tyack. 2000. Whale songs lengthen in response to sonar. Nature 405:903.

Miller PJO, Bain DE (2000) Within-pod variation in the sound production of a pod of killer whales, *Orcinus orca*. Animal Behaviour 60:617-628
Mills, H. 1996. Aardvark computer software. Bioacoustics Research Laboratory, Cornell University.
Mitchell, E. D. 1975. Report on the meeting on small cetaceans, Montreal, April 1-11, 1974. Journal of the Fisheries Research Board.
Miyashita, T. 1993. Abundance of dolphin stocks in the western North Pacific taken by the Japanese drive fishery. Reports of the International Whaling Commission 43:417-437.
Miyashita, T., H. Kato and T. Kasuya (Eds.). 1995. Worldwide map of cetacean distribution based on Japanese sighting data. Volume 1. National Research Institute of Far Seas Fisheries, Shizuoka, Japan. 140pp.
Miyazaki, N. and W. F. Perrin. 1994. Rough-toothed dolphin *Steno bredanensis* (Lesson, 1828). In: S. H. Ridgway and R. Harrison (eds.), Handbook of Marine Mammals, Vol.5: The First Book of Dolphins, pp. 1-21. Academic Press, 416 pp.
Mizroch, S. A., L. M. Herman, J. M. Straley, D. A. Glockner-Ferrari, C. Jurasz, J. Darling, S. Cerchio, C. M. Gabriele, D. R. Salden and O. von Ziegesar. 2004. Estimating the adult survival rate of central North Pacific humpback whales (*Megaptera novaeangliae*). Journal of Mammalogy 85:963-972.
Mizroch, S. A., D. W. Rice and J. M. Breiwick. 1984. The fin whale, *Balaenoptera physalus* Marine Fisheries Review 46(4):20-24.
MMC. 2005. Marine Mammal Commission. (http://www.mmc.gov/letters/letters.html#021605)
Mobley, J. R., Jr. and L. M. Herman. 1985. Transience of social affiliations among humpback whales (*Megaptera novaeangliae*) on the Hawaiian wintering grounds. Canadian Journal of Zoology 63:762-772.
Mobley J. R., Jr., M. Smultea, T. Norris, and D. Weller. 1996. Fin whale sighting north of Kaua'i, Hawai'i. Pacific Science 50:230-233.
Mobley, J. R., Jr., S. S. Spitz, K. A. Forney, R. A. Grotefendt, and P. H. Forestall. 2000. Distribution and abundance of odontocete species in Hawaiian waters: preliminary results of 1993-98 aerial surveys Admin. Rep. LJ-00-14C. Southwest Fisheries Science Center, National Marine Fisheries Service, P.O. Box 271, La Jolla, CA 92038. 26 pp.
Mobley, J. R., L. Mazzuca, A. S. Craig, M. W. Newcomer and S. S. Spitz. 2001a. Killer whales (*Orcinus orca*) sighted West of Ni'ihau, Hawai'i. Pacific Science 55:301_303.
Mobley JR, Jr, Spitz S, Grotefendt R (2001) Abundance of humpback whales in Hawaiian waters: Results of 1993-2000 aerial surveys. Hawaiian Islands Humpback Whale National Marine Sanctuary, pp 17
Mobley JR, jr, Spitz SS, Forney KA, Grotefendt R, Forestell PH (2000) Distribution and abundance of odontocete species in Hawaiian waters: preliminary results of 1993-98 aerial surveys. Southwest Fisheries Science Center
Mobley, J. R. and L. M. Herman, L. M. 1985. Transience of social affiliations among humpback whales in Hawaiian breeding waters. Canadian Journal of Zoology, 63, 762-772.
Mobley, Jr., J. R., L. M. Herman and A. S. Frankel. 1988. Responses of wintering humpback whales (*Megaptera novaeangliae*) to playback of recordings of winter and summer vocalizations and of synthetic sound. Behavioral Ecology and Sociobiology, 23, 211-223.
Mobley, J. M., S. Spitz, R. Grotefendt, P. Forestell, A. Frankel and G. Bauer. 2001b. Abundance of humpback whales in Hawaiian waters: Results of 1993-2000 aerial surveys. Report to the Hawaiian Islands Humpback Whale National Marine Sanctuary, 16 pp.
Mobley JR, jr, (2004) Results of marine mammal surveys on U.S. Navy underwater ranges in Hawaii and Bahamas. Office of Naval Research, Arlington, pp 27
Mohl B, Wahlberg M, Madsen P, Heerfordt A, Lund A (2003) The Monopulsed Nature of Sperm Whale Clicks. Journal of the Acoustical Society of America 114:1143-1154

Mohl B, Wahlberg M, Madsen PT, Miller LA, Surlykke A (2000) Sperm whale clicks: Directionality and source level revisited. Journal of the Acoustical Society of America 107:638-648
Moore, J. C. 1968. Relationships among the living genera of beaked whales. Field Zoology 53:209-298.
Mrosovsky N (1972) Spectrographs of the sounds of leatherback turtles. Herpetologica 28:256-258
Murray SO, Mercado E, Roitblat HL (1998) Characterizing the graded structure of false killer whale (*Pseudorca crassidens*) vocalizations. Journal of the Acoustical Society of America 104:1679-1688

Nagorsen, D. 1985. *Kogia simus*. Mammalian Species 239:1-6.
Nachtigall JL, W.W.L.Au, A.J. Read (1995) Harbour porpoises, laboratory studies to reduce bycatch. In. De Spil Publishers, Woerden, The Netherlands, pp 16
National Marine Fisheries Service. 1991. Recovery plan for the Humpback Whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 105 pp.
NMFS (1998) Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle (*Caretta caretta*). National Marine Fisheries Service, Silver Spring, MD
NMFS and USFWS 1991b. Recovery plan for US populations of loggerhead turtles. National Marine Fisheries Service, Washington, DC.
NMFS (1992) Recovery Plan for the Steller Sea Lion (*Eumetopias jubatus*). National Marine Fisheries Service, Silver Springs, Maryland
Nedwell JR, Edwards B, Turnpenny A, Gordon J (2004) Fish and Marine Mammal Audiograms: A summary of available informaiton. In:
Nelson D, Lien J (1996) The status of the Long-finned Pilot Whale, *Globicephala melas*, in Canada. Canadian Field Naturalist 110:511-524
Nemoto T, Kawamura A (1977) Characteristics of food habits and distribution of baleen whales with special reference to the abundance of North Pacific sei and bryde's whales. Report International Whaling Commission Special Issue 1:80-87
Nishiwaki M, Norris KS (1966) A new genus, *Peponocephala*, for the odontocete cetacean species *Electra electra*. Scientific Reports of the Whales Research Institute 20:95-100
Nishiwaki, M. 1966. Distribution and migration of the larger cetaceans in the North Pacific as shown by Japanese whaling results. Pp. 172-191 In: K. S. Norris (ed.), Whales, Dolphins and Porpoises. University of California Press, Berkeley, CA. Academic Press, New York.
Nitta, E. 1991. The marine mammal stranding network for Hawaii: an overview. In: J.E. Reynolds III, D.K. Odell (eds.), Marine Mammal Strandings in the United States, pp.56-62. NOAA Tech. Rep. NMFS 98, 157 pp.
Nitta, E. and J. R. Henderson. 1993. A review of interactions between Hawaii's fisheries and protected species. Marine Fisheries Review 55(2):83-92.
Norris, K. S. 1994. Predators, parasites, and multi-species aggregations. In: The Hawaiian Spinner Dolphin. Edited by K. S. Norris, B. Würsig, R. S. Wells and M. Würsig. University of California Press, Berkeley, CA. pp. 287-300.
Norris, K. S. and T. P. Dohl. 1980. Behavior of the Hawaiian spinner dolphin, *Stenella longirostris*. Fishery Bulletin 77:821-849.
Norris, K. S., B. Würsig, R. S. Wells and M. Würsig. 1994. The Hawaiian Spinner Dolphin. University of California Press, 408 pp.
Norris KS (1969) The echolocation of marine mammals. In: Andersen HT (ed) the biology of marine mammals. Academic Press, New York, pp 54 pp

Norris KS, Evans WE (1967) Directionality of echolocation clicks in the rough-tooth porpoise, *Steno bredanensis* (Lesson). In: Marine Bioacoustics, vol 2. Pergamon Press, Oxford and New York, pp 305-316

Norris KS, Prescott JH (1961) Observations on Pacific cetaceans of Californian and Mexican waters. University of California Publications in Zoology 63:291-402

Northrop, J., W. C. Cummings and M. F. Morrison. 1971. Underwater 20-Hz signals recorded near Midway Island. Journal of the Acoustical Society of America 49:1909-1910.

Northrop, J., W. C. Cummings, and P. O. Thompson. 1968. 20-Hz signals observed in the central Pacific. Journal of the Acoustical Society of America 43:383-384.

Nowacek DP (2005) Acoustic ecology of foraging bottlenose dolphins (*Tursiops truncatus*), habitat-specific use of three sound types. Marine Mammal Science 21:587-602

O'Hara J, Wilcox JR (1990) Avoidance responses of loggerhead turtles, *Caretta caretta*, to low frequency sound. Copeia 1990:564-567

Ohsumi, S. 1977. Stocks and trends of abundance of the sperm whale in the North Pacific. Reports of the International Whaling Commission 27:167-175.

Ohsumi, S. and Y. Masaki. 1975. Japanese whale marking in the North Pacific, 1963-72. Bull. Far Seas Fisheries Research Laboratory 12:171-219

Oleson EM, Barlow J, Gordon J, Rankin S, Hildebrand JA (2003) Low frequency calls of Bryde's whales. Marine Mammal Science 19:407-419

Oleson EM, Calambokidis J, Burgess WC, McDonald MA, LeDuc CA, Hildebrand JA (2007) Behavioral context of call production by eastern North Pacific blue whales. Marine Ecology-Progress Series 330:269-284

Olson P, Reilly SB (2002) Pilot whales *Globicephala melas* and *G. macrorhynchus*. In: Perrin W, Würsig B, Thewissen J (eds) Encyclopedia of marine mammals, San Diego

Östman, J. S. O. 1994. Social organization and social behavior of Hawaiian spinner dolphins (*Stenella longirostris*). Ph.D. dissertation, University of California, Santa Cruz, 114 pp.

Östman-Lind, J., A. D. Driscoll-Lind and S. H. Rickards. 2004. Delphinid abundance, distribution and habitat use off the western coast of the island of Hawai'i. Administrative report LJ-04-02C prepared under Contract No. AB133F-02-CN-0123 from the National Oceanic and Atmospheric Administration, 28 pp.

Oswald J. N., J. Barlow and T. F. Norris. 2003. Acoustic identification of nine delphinid species in the eastern tropical Pacific Ocean. Marine Mammal Science 19:20-37.

Pack, A. A., J. R. Potter and L. M. Herman. 2004. Determining source levels, sound fields, and body sizes of singing humpback whales (*Megaptera novaeangliae*) in the Hawaiian winter grounds. Final technical report to the Office of Naval Research. Arlington. Grant N00014-02-1-1058.

Palacios, D. M. and B. R. Mate. 1996. Attack by false killer whales (*Pseudorca crassidens*) on sperm whales (*Physeter macrocephalus*) in the Galápagos islands. Marine Mammal Science 12(4): 582-587.

Panigada S, Zanardelli M, Canese S, Jahoda M (1999) How Deep Can Baleen Whales Dive? Marine Ecology Progress Series 187:309-311

Panigada S, Zanardelli M, Canese S, Jahoda M (1999) How Deep Can Baleen Whales Dive? Marine Ecology Progress Series 187:309-311

Papastavrou V, Smith SC, Whitehead H (1989) Diving behaviour of the sperm whale, *Physeter macrocephalus*, off the Galapagos Islands. Canadian Journal of Zoology 67:839-846

Parrish FA, Abernathy K (2006) Movements of monk seals relative to ecological depth zones in the lower Northwestern Hawaiian Islands. Atoll Research Bulletin 543

Parrish FA, Abernathy K, Marshall GJ, Buhleier BM (2002) Hawaiian monk seals (*Monachus schauinslandi*) foraging in deep-water coral beds. Marine Mammal Science 18:244-258

Patterson B, Hamilton GR (1964) Repetitive 20 cycle per second biological hydroacoustic signals at Bermuda. In: Tavolga WN (ed) Marine Bio-Acoustics. Pergamon Press, Oxford, pp 125-145

Pavan G, Hayward TJ, Borsani JF, Priano M, Manghi M, Fossati C, Gordon J (2000) Time patterns of sperm whale codas recorded in the Mediterranean Sea 1985-1996. Journal of the Acoustical Society of America 107:3487-3495

Payne, K. and R. Payne. 1985. Large Scale Changes over 19 years in songs of humpback whales in Bermuda. Zeitschrift für Tierpsychologie 68:89-114.

Payne, K., P. Tyack and R. Payne. 1983. Progressive Changes in the Songs Of Humpback Whales (*Megaptera novaeangliae*): A Detailed Analysis of Two Seasons in Hawaii. In: Payne R (ed) Communication and Behavior of Whales. Westview Press, Boulder, pp 9-57.

Payne, R. S. and S. McVay. 1971. Songs of humpback whales. Science 173:585-597.

Payne R, Payne K (1971) Underwater sounds of Southern Right Whales. New York Zoological Society: Zoologica:159-163

Perrin WF (2002) Pantropical spotted dolphin, Stenella attenuata. In: Perrin W, Würsig B, Thewissen J (eds) Encyclopedia of marine mammals, San Diego

Perrin, W. F. 1975. Variation of spotted and spinner porpoise (genus *Stenella*) in the eastern tropical Pacific and Hawaii. Bulletin Scripps Institute of Oceanography 21, 206 pp.

Perrin, W. F. 1990. Subspecies of *Stenella longirostris* (Mammalia: Cetacea: Delphinidae). Proc. Biol. Soc. Wash. 103:453-463.

Perrin, W. F. and A. A. Hohn. 1994. Pantropical spotted dolphin *Stenella attenuata*. In: S. H. Ridgway and R. Harrison (eds.), Handbook of Marine Mammals, Vol.5: The First Book of Dolphins, pp 71-98. Academic Press 416 pp.

Perrin, W. F. and J. Gilpatrick. 1994. Spinner Dolphin *Stenella longirostris* (Gray, 1828). In: Handbook of Marine Mammals, Volume 5. Edited by S. H. Ridgeway and R. Harrison. Academic Press, London, U.K. pp. 99-128.

Perrin, W. F., S. Leatherwood and A. Collet. 1994a. Fraser's dolphin *Lagenodelphis hosei* (Fraser 1956). Pages 225-240 In: S. H. Ridgway and R. Harrison (eds) Handbook of Marine Mammals, Vol. 5: The first book of dolphins. Academic Press, London. 416 pp.

Perrin, W. F., G. D. Schnell, D. J. Hough, J. W. Gilpatrick, Jr., and J. V. Kashiwada. 1994b. Re-examination of geographical variation in cranial morphology of the pantropical spotted dolphin, *Stenella attenuata*, in the eastern Pacific. Fisheries Bulletin 92:324-346.

Perrin, W. F., C. E. Wilson and F. I. Archer, II. 1994c. Striped dolphin *Stenella coeruleoalba* (Meyen, 1833). In: S. H. Ridgway and R. Harrison (eds.), Handbook of Marine Mammals, Vol.5: The First Book of Dolphins, pp 129-159. Academic Press, 416 pp.

Perrin WF (2002) Pantropical spotted dolphin, Stenella attenuata. In: Perrin W, Würsig B, Thewissen J (eds) Encyclopedia of marine mammals, San Diego

Perry, A., J. R. Mobley, Jr., C. S. Baker and L. M. Herman. 1988. Humpback whales of the central and eastern North Pacific. University of Hawai'i Sea Grant Miscellaneous Report UNIHI-SEAGRANT-MR-88-02, 236 pp.

Perryman, W. L., D. W. K. Au, S. Leatherwood and T. A. Jefferson. 1994. Melon-headed whale *Peponocephala electra* Gray, 1846. In: S. H. Ridgway and R. Harrison (eds.), Handbook of Marine Mammals, Vol.5: The First Book of Dolphins, pp. 363-386. Academic Press, 416 pp.

Pettis, H. M., R. M. Rolland, P. K. Hamilton, S. Brault, A. R. Knowlton and S. D. Kraus. 2004. Visual health assessment of North Atlantic right whales (*Eubalaena glacialis*) using photographs. Canadian Journal of Zoology 82: 8-19.

Philips JD, Nachtigall PE, Au WWL, Pawloski JL, Roitblat HL (2003) Echolocation in the Risso's dolphin, *Grampus griseus*. Journal of the Acoustical Society of America 113

Pitman RL, Stinchcomb C (2002) Rough-toothed dolphins (*Steno bredanensis*) as predators of mahimahi (*Coryphaena hippurus*). Pacific Science 56:447-450

Pitman, R. L., D. M. Palacios, P. L Brennan, K. C. III. Balcomb, and T. Miyashita. 1999. Sightings and possible identity of a bottlenose whale in the tropical Indo-Pacific: *Indopacetus pacificus*? Marine Mammal Science 15:531-549.

Polovina, J. J., E, Howell, D. M. Parker, and G. H. Balazs. 2003. Dive-depth distribution of loggerhead (*Caretta caretta*) and olive ridley (*Lepidochelys olivacea*) sea turtles in the central North Pacific: Might deep longline sets catch fewer turtles? Fisheries Bulletin 101(1):189-193.

Popper AN (1980) Sound Emission and Detection by Delphinids. In: Herman LM (ed) Cetacean Behavior. John Wiley and Sons, New York, pp 1-52

Pryor, K. 1975. Lads Before the Wind: Adventures in Porpoise Training. Harper and Row, New York, 278 pp.

Pryor, T., K. Pryor and K. S. Norris. 1965. Observations on a pygmy killer whale (*Feresa attenuata* Gray) from Hawaii. Journal of Mammalogy. 46:450-461.

Rankin, S. and J. Barlow. 2005. Source of the North Pacific "boing" sound attributed to minke whales. The Journal of the Acoustical Society of America 118(5):3346-3351.

Rasmussen, K., J. Calambokidis and G. H. Steiger. 2000. Report of Research during Oceanic Society Expeditions in 2000 in cooperation with Elderhostel volunteers. 31 pp.

Reeves, R. R. and S. Leatherwood. 1994. Dolphins, porpoises, and whales. 1994-1998 Action Plan for the Conservation of Cetaceans. International Union for Conservation of Nature and Natural Resources (IUCN), Gland, Switzerland, 91pp.

Reeves RR, Whitehead H (1997) Status of the sperm whale, Physeter macrocephalus, in Canada. Canadian Field-Naturalist 111:293-307

Reeves, R. R., P. J. Clapham, R. L. Brownell, Jr., and G. K. Silber. 1998. Recovery plan for the blue whale (*Balaenoptera musculus*). Office of Protected Resources, NMFS, NOAA, Silver Spring, Maryland. 30 pp.

Reid, S. B., J. Hirota, R. E. Young and L. E. Hallacher. 1991. Mesopelagic-boundary community in Hawaii: Micronekton at the interface between neritic and oceanic ecosystems. Marine Biology 109(3):427-440.

Reilly S, Hedley S, Borberg J, Hewitt R, Thiele D, Watkins J, Naganobu M (2004) Biomass and energy transfer to baleen whales in the South Atlantic sector of the Southern Ocean. Deep Sea Research Part II: Topical Studies in Oceanography 51:1397-1409

Rendell LE, Matthews J, Gill A, Gordon J, Macdonald DW (1999) Quantitative analysis of the tonal calls of five odontocete species. Journal of Zoology 249:403-410

Rice, D. W. 1974. Whales and whale research in the eastern North Pacific. Pp. 170-195, In W. E. Schevill (ed.), The whale problem: A status report. Harvard Press, Cambridge, MA.

Rice DW (1977) Synopsis of biological data of the sei whale and bryde's whales in the eastern northern pacific. Report of the International Whaling Commission Si1:92-97

Rice, D. W. 1978. The humpback whale in the North Pacific: distribution, exploitation, and numbers. Pp. 29-44 In: K. S. Norris and R. R. Reeves (eds.). Report on a Workshop on Problems Related to Humpback Whales (*Megaptera novaeangliae*) in Hawaii. Contr. Rept. to U. S. Marine Mammal Commission. NTIS PB- 280-794. 90pp.

Rice, D. W. 1989. Sperm whale *Physeter macrocephalus* Linneaus, 1758. In: S. H. Ridgway and R. Harrison (eds.), Handbook of Marine Mammals, Vol. 4: The River Dolphins and Larger Toothed Whales, pp. 177-233. Academic Press, 442 pp.

Rice, D. W. 1998. Marine Mammals of the world: systematics and distribution. Special Publication 4. The Society for Marine Mammalogy, Lawrence, KS, USA.

Rice, D. W. 1960. Distribution of the bottlenose dolphin in the leeward Hawaiian Islands. Journal of Mammalogy 41:407-408.

Richards, L. P. 1952. Cuvier's beaked whale from Hawaii. Journal of. Mammalogy. 33:255.

Richardson, W. J., C. R. Greene, Jr., C. I. Malme, and D. H. Thompson. 1995. Marine Mammals and Noise. Academic Press, San Diego. 576 pp.

Richardson, W. J., and B. Würsig. 1995. Significance of Responses and Noise Impacts. In: Marine Mammals and Noise. W.J. Richardson, C.R. Green, C.I. Malme, D.H. Thomson (eds.). Academic Press, San Diego, CA.

Rickards, S. H., G. L. Ross and J. Gilardi. 2001. Spinner Dolphins (*Stenella longirostris*) of Midway Atoll, Northwest Hawaiian Archipelago: February - November, 2000. Unpublished report to U.S. Fish and Wildlife Service and National Marine Fisheries Service, 50 pp.

Rickards, S. H., C. Vanderlip and G. Oliver. 2002. Spinner Dolphins (*Stenella longirostris*) of Midway Atoll, Northwest Hawaiian Archipelago: February - November, 2001. Unpublished report to U.S. Fish and Wildlife Service and National Marine Fisheries Service, 41 pp.

Ridgway SH (1986) Diving By Cetaceans. In: Brubakk AO, Kanwisher JW, Sundness G (eds) Diving in animals and man. The Royal Norwegian Society of Science and Letters, Trondheim, Norway, pp 33-62

Ridgway SH, Wever EG, McCormick JG, Palin J, Anderson JG (1969) Hearing in the giant sea turtles. Journal of the Acoustical Society of America 59

Ridgway SH, Carder DA (2001) Assessing hearing and sound production in cetaceans not available for behavioral audiograms: Experiences with sperm, pygmy sperm, and gray whales. Aquatic Mammals 27:267-276

Riesch R, Ford JKB, Thomsen F (2006) Stability and group specificity of stereotyped whistles in resident killer whales, Orcinus orca, off British Columbia. Animal Behaviour 71:79-91

Ritter F (2002) Behavioural observations of rough-toothed dolphins (*Steno bredanensis*) off La Gomera, Canary Islands (1995-2000), with special reference to their interactions with humans. Aquatic Mammals 28:46-59

Rivers JA (1997) Blue whale, *Balaenoptera musculus*, vocalizations from the waters off central California. Marine Mammal Science 13:186-195

Robbins, J. and D. K. Mattila. 2004. Estimating humpback whale (*Megaptera novaeangliae*) entanglement rates on the basis of scar evidence. Final report to the US National Marine Fisheries Service (unpublished). Available from the Center for Coastal Studies, Box 1036, Provincetown, MA 02657. 22 pp.

Rohr JJ, Fish FE, Gilpatrick JW (2002) Maximum swim speeds of captive and free-ranging delphinids: Critical analysis of extraordinary performance. Marine Mammal Science 18:1-19

Ross, G. J. B. and S. Leatherwood. 1994. Pygmy killer whale *Feresa attenuata* Gray, 1874. In: S. H. Ridgway and R. Harrison (eds.), Handbook of Marine Mammals, Vol.5: The First Book of Dolphins, pp.387-404.

Ross, G. J. B. and V. G. Cockcroft. 1990. Comments on Australian bottlenose dolphins and the taxonomic status of *Tursiops aduncus* (Ehrenberg, 1832). In: The Bottlenose Dolphin (eds. S. Leatherwood and R. Reeves). pp. 101-128. Academic Press, 653pp.

Ross, H. M. and B. Wilson. 1996. Violent interactions between bottlenose dolphins and harbour porpoises. Proceedings of the Royal Society, London B, 263:283–286.

Samuel Y, Morreale SJ, Clark CW, Greene CH, Richmond ME (2005) Underwater, low-frequency noise in a coastal sea turtle habitat. The Journal of the Acoustical Society of America 117:1465-1472

Santoro A, Marten KI, Crawford TW (1989) Pygmy sperm whale sound *Kogia breviceps*. In: 8th Biennial Conference on the Biology of Marine Mammals, Pacific Grove, CA, pp 59

Sauerland M, Dehnhardt G (1998) Uderwater audiogram of a tucuxi (*Sotalia fluviatilis guianensis*). Journal of the Acoustical Society of America 103:1199-1204

Schlais, J. F. 1984. Thieving dolphins: A growing problem in Hawaii's fisheries. Sea Front. 30(5):293-298.

Scheer M, Hoffman B, Behr PI (1998) Discrete pod-specific call repertoires among short-finned pilot whales (*Globicephala macrorhynchus*) off the SW coast of Tenerife, Canary Islands. In: World Marine Mammal Science Conference, Monaco

Schevill WE, Watkins WA (1966) Sound structure and directionality in *Orcinus* (killer whale). Zoologica 51:71-76

Schilling MR, Seipt I, Weinrich MT, Kuhlberg AE, Clapham PJ (1992) Behavior of individually-identified sei whales *Balaenoptera borealis* during an episodic influx into the southern gulf of maine in 1986. U S Natl Mar Fish Serv Fish Bull 90:749-755

Schultz KW, Cato DH, Corkeron PJ, Bryden MM (1995) Low frequency narrow-band sounds produced by bottlenose dolphins. Marine Mammal Science 11:503-509

Scott, M. D. and S. J. Chivers. 1990. Distribution and herd structure of bottlenose dolphins in the eastern tropical Pacific Ocean. In: The Bottlenose Dolphin (eds. S. Leatherwood and R. Reeves). pp. 387-402. Academic Press, 653 pp.

Scott M, Chivers SJ, Olson R, Lindsay R (1993) Radio tracking of spotted dolphin associated with tuna in the eastern tropical Pacific. In: 10th biennial conference on the biology of marine mammals, Galveston, TX

Scott MD, Hohn AA, Westgate AJ, Nicolas JR, Whitaker BR, Campbell WB (2001) A Note on the Release and Tracking of a Rehabilitated Pygmy Sperm Whale. Journal of Cetacean Research and Management 3:87-94

Sears R (2002) Blue Whale. In: Perrin WF, Würsig B, Thewissen JGM (eds) Encyclopedia of Marine Mammals. Academic Press, New York, pp 112-116

Sekiguchi K, Best PB, Kaczmaruk BZ (1992) New information on the feeding habits and baleen morphology of the pygmy right whale *Caperea marginata*. Mar Mammal Sci 8:288-293

Shallenberger, E. W. 1981. The status of Hawaiian cetaceans. Final report to U.S. Marine Mammal Commission. MMC-77/23, 79 pp.

Shane, S. H. 1995. Behavior patterns of pilot whales and Risso's dolphins off Santa Catalina Islands, California. Aquatic Mammals 21, 195–197.

Shane, S. H. and D. McSweeney. 1990. Using photo-identification to study pilot whales social organization. Reports of the International Whaling Commission, Special Issue. 12:259-263.

Shane SH (1995) LETTERS: Human-Pilot Whale Encounter: An Update. Marine Mammal Science 11:115

Sharpe FA, Dill LM (1997) The behavior of pacific herring schools in response to artificial humpback whale bubbles. Canadian Journal of Zoology 75:725-730

Shelden, K. E. W., A. A. Baldridge, D. E. Withrow. 1995. Observations of Risso's dolphins, *Grampus griseus* with gray whales, *Eschrichtius robustus*. Marine Mammal Science 11:231-240.

Sigurjonsson J (1995) On the life history and autoecology of North Atlantic rorquals. In: Blix A, Walloe L, Ultang O (eds) Developments in marine biology, 4. Whales, seals, fish and man, 39, 1989 edn. International symposium on the biology of marine mammals in the Northeast Atlantic, Tromso, Norway, pp 277-279

Silber, G. K. 1986. The relationship of social vocalizations to surface behavior and aggression in the Hawaiian humpback whale *Megaptera novaeangliae*. Canadian Journal of Zoology 64:2075-2080.

Southall, B. L., R. Braun, F. M. D. Gulland, A. D. Heard, R. W. Baird, S. M., Wilkin and T. K. Rowles. 2006. Hawaiian melon-headed whale (*Peponocephala electra*) mass stranding event of July 3-4, 2004. NOAA Technical Memorandum NMFS-OPR-31, 73 pp.

Spitz, S. S., L. M. Herman, A. A. Pack and M. H. Deakos. 2002. The relation of body size of male humpback whales to their social roles on the Hawaiian winter grounds. Canadian Journal of Zoology 80:1938-1947.

Stacey, P. J., S. Leatherwood, and R. W. Baird. 1994. *Pseudorca crassidens*. Mammalian Species 456:1-6.

Stafford. K. M. 2003. Two types of blue whale calls recorded in the Gulf of Alaska. Marine Mammal Science 19:682-693.

Stafford KM, Fox CG, Clark DS (1998) Long-range acoustic detection and localization of blue whale calls in the northeast Pacific Ocean. Journal of the Acoustical Society of America 104:3616-3625

Stafford KM, Nieukirk SL, Fox CG (1999a) An acoustic link between blue whales in the eastern tropical Pacific and the Northeast Pacific. Marine Mammal Science 15:1258-1268.

Stafford KM, Nieukirk SL, Fox CG (1999b) Low-frequency whale sounds recorded on hydrophones moored in the eastern tropical Pacific. Journal of the Acoustical Society of America 106:3687-3698.

Stafford, K. M., S. L. Nieukirk and C. G. Fox. 2001. Geographic and seasonal variation of blue whale calls in the North Pacific. J. Cetacean Res. Manage. 3(1):65-76.

Steiner WW (1979) Vocalizations and feeding behavior of the Killer Whale (*Orcinus orca*). Journal of Mammology 60:824-827

Stewart BS, Leatherwood S (1985) Minke whale *Balaenoptera acutorostrata*. In: Ridgway SH, Harrison R (eds) Handbook of marine mammals, Vol. 3: Sirenians and the baleen whales. Academic Press, pp 91-136

Straley, J. M. and C. M. Gabriele. 1997. Humpback Whales of Southeastern Alaska. Humpback whale fluke identification catalog, National Park Service, P.O. Box 140, Gustavus, Alaska, 106 pp.

Strong C (1990) Ventilation patterns and behavior of Balaenopterid whales in the Gulf of California, Mexico. California State University, Moss Landing, pp 49

Sullivan RM, Houck WJ (1979) Sightings and Strandings of Cetaceans from Northern California. Journal of Mammalogy 60:828-833

Szymanski MD, Bain DE, Kiehl K, Pennington S, Wong S, Henry KR (1999) Killer whale (*Orcinus orca*) hearing: Auditory brainstem response and behavioral audiograms. Journal of the Acoustical Society of America 106:1134-1141

Tershy BR, Acevedo-G. A, Breese D, Strong CS (1993) Diet and feeding behavior of fin and Bryde's whales in the central Gulf of California, Mexico. Revista de Investigacion Cientifica 1:31-38

Tershy BR (1992) Body Size Diet, Habitat use, and social behavior of *Balaenoptera* whales in the Gulf of California. Journal of Mammalogy 73:477-486

Thewissen HGM (2002) Hearing. In: Perrin WF, Wursig B, Thewissen. JGM (eds) Encyclopedia of Marine Mammals. Academic Press, San Diego, pp 570-574

Thode A, Mellinger DK, Stienessen S, Martinez A, Mullin K (2002) Depth-dependent acoustic features of diving sperm whales (*Physeter macrocephalus*) in the Gulf of Mexico. The Journal of the Acoustical Society of America 112:308-321

Thode A, Straley JM, Folkert K, O'Connel V, Tieman C (2005) Foraging behavior of fish-eating sperm whales in the Gulf of Alaska in the presence and absence of fishing vessels. Journal of the Acoustical Society of America 118:1909

Thomas JA, Turl CW (1990) Echolocation characteristics and range detection threshold of a false killer whale (*Pseudorca crassidens*). In: Thomas JA, Kastelein RA (eds) Sensory abilities of cetaceans: Laboratory and field evidence. Plenum, New York, pp 321-334

Thomas J, Moore P, Withrow R, Stoermer M (1990) Underwater audiogram of a Hawaiian monk seal (*Monachus schauinslandi*). Journal of the Acoustical Society of America 87:417-420

Thompson PO, Cummings WC, Ha SJ (1986) Sounds, source levels, and associated behavior of humpback whales, Southeast Alaska. Journal of the Acoustical Society of America 80:735-740

Thompson PO, Findley LT, Vidal O (1992) 20-Hz pulses and other vocalizations of fin whales, *Balaenoptera physalus*, in the Gulf of California, Mexico. Journal of the Acoustical Society of America 92:3051-3057

Thompson PO, Findley LT, Vidal O, Cummings WC (1996) Underwater sounds of blue whales, *Balaenoptera musculus*, in the Gulf of California, Mexico. Marine Mammal Science 12:288-293

Thompson, P. O. and W. A. Friedl. 1982. A long term study of low frequency sound from several species of whales off Oahu, Hawaii. Cetology 45:1-19.

Thompson TJ, Winn HE, Perkins PJ (1979) Mysticete Sounds. In: Winn HE, Olla BL (eds) Behavior of Marine Animals: Current Perspectives in Research, vol Vol. 3: Cetaceans, pp 403-431 (chp. 12)

Tiemann C., S. Martin and J. R. Mobley Jr. 2006. Aerial and acoustic marine mammal detection and localization on Navy ranges. IEEE Journal of Oceanic Engineering 31:107-119.

Tillman, M. F. 1977. Estimates of population size for the North Pacific sei whale. Reports of the International Whaling Commission, Special Issue 1:98-106.

Tillman, M. F. 1978. Modified Delury estimates of the North Pacific Bryde's whale stock. Reports of the International Whaling Commission 28:315-317.

Tomich, P. Q. 1986. Mammals in Hawaii: A Synopsis and Notational Bibliography. Bishop Museum Press, Hawai'i, 375 pp. 252.

Townsend, C. H. 1935. The distribution of certain whales as shown by logbook records of American whaleships. Zoologica 19:1-50.

Tyack, P. 1981. Interactions between singing Hawaiian humpback whales and conspecifics nearby. Behavioral Ecology and Sociobiology 8:105-116.

Tyack, P. 1982. Humpback whales respond to sounds of their neighbors. The Rockefeller University, Doctoral dissertation. 198 pp.

Tyack, P. and H. Whitehead. 1983. Male competition in large groups of wintering humpback whales. Behaviour 83:132-154.

Tyack P, Clark C (2000) Communication and Acoustic Behavior of Dolphins and Whales. In: Au W, Popper AN, Fay RR (eds) Hearing in Whales and Dolphins. Springer-Verlag, New York, pp 156-224

Van Waerebeek, K., J. C. Reyes, A. J. Read and J. S. McKinnon. 1990. Preliminary observations of bottlenose dolphins from the Pacific coast of South America. In: The Bottlenose Dolphin (eds. S. Leatherwood and R. Reeves). pp. 143-154. Academic Press, 653 pp.

Wade PR, Gerrodette T (1993) Estimates of cetacean abundance and distribution in the eastern tropical Pacific. Reports of the International Whaling Commission 43:477-493

Wahlberg M (2002) The acoustic behaviour of diving sperm whales observed with a hydrophone array. Journal of Experimental Marine Biology and Ecology 281:53-62

Waite, J. M., M. E. Dahlheim, R. C. Hobbs, S. A. Mizroch, O. von Ziegesar-Matkin, J. M. Straley, L. M. Herman and J. Jacobsen. 1999. Evidence of a feeding aggregation of humpback whales (*Megaptera novaeangliae*) around Kodiak Island, Alaska. Marine Mammal Science 15:210-220.

Walker, W. A. 1981. Geographic variation in morphology and biology of bottlenose dolphins (*Tursiops*) in the eastern North Pacific. SWFSC Admin. Rep. LJ-81-03C.

Watkins WA (1967) The Harmonic Interval Fact or Artifact in Spectral Analysis of Pulse Trains. In: Tavolga WN (ed) Marine Bio-Acoustics, vol 2. Pergamon Press, pp 15-43

Watkins WA (1981) Reaction of three species of whales (*Balaenoptera physalus*), (*Megaptera novaeangliae*), and (*Balaenoptera edeni*) to implanted radio tags. Deep-Sea Research 28A:589-599

Watkins WA, Daher MA, DiMarzio N, Samuels A, Wartzok D, Fristrup KM, Howey PW, Maiefski RR (2002) Sperm Whales Dives Tracked by Radio Tag Telemetry. Marine Mammal Science 18:55-68

Watkins WA, Daher MA, Fristrup K, Sciara GNd (1994) Fishing and Acoustic Behavior of Fraser's Dolphin (*Lagenodelphis hosei*) near Dominica, Southeast Caribbean. Caribbean Journal of Science 30:76-82

Watkins WA, Daher MA, Samuels A, Gannon DP (1997) Observations of *Peponocephala electra*, the melon-headed whale, in the southeastern Caribbean. Caribbean Journal of Science 33:34-40

Watkins, W. A., J. E. George, M. A. Daher, K. Mullin, D. L. Martin, S. H. Haga, and N. A. DiMarzio. 2000. Whale call data for the North Pacific November 1995 through July 1999: Occurrence of calling whales and source locations from SOSUS and other acoustic systems. Technical Report WHOI_00_02 available from Woods Hole Oceanographic Institution. 160 pp.

Watkins WA, Moore KE, Tyack P (1985) Sperm Whale Acoustic Behaviors in the Southeast Caribbean. Cetology 49:1-15

Watkins WA, Schevill WE (1977) Sperm Whale Codas. Journal of the Acoustical Society of America 62:1485-1490

Watkins WA, Tyack P, Moore KE (1987) The 20-Hz signals of finback whales (*Balaenoptera physalus*). Journal of the Acoustical Society of America 82:1901-1912

Watwood SL, Owen ECG, Tyack PL, Wells RS (2005) Signature whistle use by temporarily restrained and free-swimming bottlenose dolphins, *Tursiops truncatus*. Animal Behaviour 69:1373-1386

Webster, D. L., R. W. Baird, D. J. McSweeney, A. D. Ligon and G. S. Schorr. 2005. High site-fidelity of a deep-water dolphin: rough-toothed dolphins in the Hawaiian archipelago. In Abstracts of the 16th Biennial Conference on the Biology of Marine Mammals, 12-16 December 2005, San Diego, CA.

Webster WD, Cook KA (2001) Intraseasonal nesting activity of loggerhead sea turltes (Caretta caretta) in Southeastern North Carolina. Am. Midl. Nat. 145

Weilgart L, Whitehead H (1997) Group-Specific Dialects and Geographical Variation in Coda Repertoire in South Pacific Sperm Whales. Behavioral Ecology and Sociobiology 40:277-285

Weilgart L, Whitehead H (1993) Coda Communication by Sperm Whales (*Physeter macrocephalus*) Off the Galapagos Islands. Canadian Journal of Zoology 71:744-752

Weinrich, M. T., R. H. Lambertsen, C. S. Baker, M. R. Schilling, and C. R. Belt. 1991. Behavioural responses of humpback whales (*Megaptera novaeangliae*) in the Southern Gulf of Maine to biopsy sampling. Reports of the International Whaling Commission (special issue 13):91-97.

Weller, D. W., V. G. Cockcroft, B. Würsig, S. K. Lynn and D. Fertl. 1997. Behavioral responses of bottlenose dolphins to remote biopsy sampling and observations of surgical biopsy wound healing. Aquatic Mammals 23:49-58.

Weller, D. W., B. Würsig, H. Whitehead, J. C. Norris, S. K. Lynn, R. W. Davis, N. Clauss and P. Brown. 1996. Observations of an interaction between sperm whales and short-finned pilot whales in the Gulf of Mexico. Marine Mammal Science 12:588–594.

Wells RS, Scott MD (2002) Bottlenose dolphins (*Tursiops truncatus* and *T. aduncus*). In: Perrin W, Würsig B, Thewissen J (eds) Encyclopedia of marine mammals, San Diego, pp 122-128

Whitehead H (2002) Sperm Whale. In: Perrin WF, Wursig B, Thewissen JGM (eds) Encyclopedia of Marine Mammals. Academic Press, San Diego, pp 1165-1172

Whitehead H, Weilgart L (1991) Patterns of Visually Observable Behaviour and Vocalizations in Groups of Female Sperm Whales. Behaviour:275-296

Willis, P. M., B. J. Crespi, L. M. Dill, R. W. Baird and M. B. Hanson. 2004. Natural hybridization between Dall's porpoises (*Phocoenoides dalli*) and harbour porpoises (*Phocoena phocoena*). Canadian Journal of Zoology 82: 828-834.

Winn HE, Perkins PJ (1976) Distribution and sounds of the minke whale, with a review of Mysticete sounds. Cetology:1-12

Winn, H. E. and L. K. Winn. 1978. The song of the humpback whale (*Megaptera novaeangliae*) in the West Indies. Marine Biology 47:97-114.

Witteveen, B. H., J. M. Straley, O. von Ziegesar, D. Steel and C. S. Baker. 2004. Abundance and mtDNA differentiation of humpback whales (*Megaptera novaeangliae*) in the Shumagin Islands, Alaska. Canadian Journal of Zoology 82:1352-1359.

Woodward, P. W. 1972. The natural history of Kure Atoll, northwestern Hawaiian Islands. Atoll Research Bulletin 164:302.

Würsig, B., R. S. Wells and K. S. Norris. 1994. Food and feeding. In: The Hawaiian Spinner Dolphin. Edited by K. S. Norris, B. Würsig, R. S. Wells and M. Würsig. University of California Press, Berkeley, CA. pp. 216-231.

Würsig, B. and T. A. Jefferson. 1990. Methods of photo-identification for small cetaceans. In: Individual Recognition of Cetaceans: Use of Photo-identification and other Techniques to Estimate Population Parameters. Edited by P. S. Hammond, S. A. Mizroch, and G. P. Donovan. Report of the International Whaling Commission (Special Issue 12), Cambridge, U.K. pp. 43-52.

Wyneken J (1997) Sea turtle locomotion: Mechanisms, behavior, and energetics. In: Lutz PL, Musick JA (eds) The biology of sea turtles. CRC Press, Boca Raton, FL, pp 165-198

Yano K, Dahlheim ME (1995a) Behavior of killer whales *Orcinus orca* during longline fishery interactions in the southeastern Bering Sea and adjacent waters. Fisheries Science Tokyo 61:584-589

Yano K, Dahlheim ME (1995b) Killer whale, *Orcinus orca*, depredation on longline catches of bottomfish in the southeastern Bering Sea and adjacent waters. U S National Marine Fisheries Service Fishery Bulletin 93:355-372

Yin, S. E. 1999. Movement patterns, behaviors and whistle sounds of dolphin groups off Kaikoura, New Zealand. Texas A & M University, Masters thesis. 107 pp.

Yin, S., A. S. Frankel, C. M. Gabriele and S. H. Rickards. 2005. Using compass and reticle binoculars to measure animal position: An evaluation and comparison to theodolite data Poster presentation at the Sixteenth Biennial Conference of the Society for Marine Mammalogy, San Diego, December 2005.

Ylitalo, G. M., C. O. Matkin, J. Buzitis, M. M. Krahn, L. L. Jones, T. Rowles and J. E. Stein. 2001. Influence of life-history parameters on organochlorine concentrations in

freeranging killer whales (*Orcinus orca*) from Prince William Sound, AK. Science Total Environment 281(1-3):183-203.

Yochem PK, Leatherwood S (1985) Blue whale *Balaenoptera msculus* (Linnaeus, 1758). In: Ridgway Sam H, Harrison RJ (eds) Handbook of Marine Mammals. Vol 3: the sirenaina and baleen whales. Academic Press, London

Zimmer, W. M. X., M. P. Johnson, P. T. Madsen and P.L. Tyack. 2005. Echolocation clicks of free-ranging Cuvier's beaked whales (*Ziphius cavirostris*). The Journal of the Acoustical Society of America 117:3919-3927.

Attachment 3

Honokohau Bay Ambient Noise Measurements and Estimations for the Kona Kai Ola Project

Prepared For:
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MAI-642-U-07-051
24 June 2007

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Research – Operations – Engineering – Design - Analysis

Marine Acoustics Inc. Technical Report

Honokohau Bay Ambient Noise Measurements and Estimations for the Kona Kai Ola Project

Prepared By:

Dr. Adam Frankel
Stanley J. Labak

24 June 2007

Introduction

This report is an attempt to predict the changes in the ambient noise level that would results from the completion of the Kona Kai Ola project. This project would result in an increase from the existing 272 slip harbor at Honokohau to a combined 1,072 slips. Existing ambient noise data have already been collected from a recorder in Honokohau Bay for the Kaloko-Honokohau (KAHO) National Historical Park (Frankel and Driscoll-Lind, in prep). These empirical data were used in conjunction with acoustic propagation models in order to predict the effect of the increase in vessel traffic on the acoustic environment of Honokohau Bay.

The primary issue of concern with a potential increase in boat traffic is its potential impact on the marine mammal and sea turtle species that inhabit or visit the Honokohau Bay area. The following is a brief description of the utilization of the bay by several species and discussion of the issues of concern. The southern area of the park, near the Honokohau Harbor entrance, is a documented resting area for schools of Hawaiian spinner dolphins (*Stenella longirostris*). Humpback whales (*Megaptera novaeangliae*) and Hawaiian monk seals (*Monachus schauinslandi*) are also visitors to the Bay. Vessel noise has the potential to mask marine mammal sounds (communication) and may cause temporary changes in hearing sensitivity (Erbe 2002). It can also displace marine mammals from their habitat. Gray whales (*Eschrichtius robustus*) temporarily abandoned a calving lagoon in Baja California during an increase in vessel traffic (Gard 1974; Bryant 1984). There is some evidence that humpback whale (*Megaptera novaeangliae*) mothers and calves moved offshore of Maui in response to recreational vessel activities (Salden 1988; Glockner-Ferrari and Ferrari 1990) although this may have been a short-term response. Honokohau Bay provides habitat for many species of fish, and while there has been much less research focusing on the effects of anthropogenic noise on fish, some response have been documented. Studies have reported that high sound levels can damage the inner ear sensory cells, produce hearing loss (threshold shifts), elicit stress response and alter the behavior of fishes (Popper et al. 2004). Lower

noise levels can also lead to temporary reduction in hearing sensitivity in fish (Scholik and Yan 2002; Amoser and Ladich 2003). Honokohau Bay is also a primary feeding area for resident green sea turtles (*Chelonia mydas*), with 70% recapture rate of 186 tagged from this area (NOAA Fisheries Marine Turtle Research Program). Hawksbill sea turtles (*Eretmochelys imbricata*), although much less common, are also regularly sighted within the park. Subadult green turtles hearing was measured between 100 and 600 Hz, with their best sensitivity occurring at 300 Hz With a threshold of ~92 dB (Bartol and Ketten 2006). This is approximately equal to the hearing of dolphins at that frequency. However, dolphins are high-frequency specialist and are about 40 to 50 dB more sensitive at their best frequency than turtles.

In order to attempt to quantify the potential impact of the proposed traffic increase due to the Kona Kai Ola project, this report will: a) describe the equipment and analyses used to quantify the existing noise structure in the Honokohau Bay area, b) describe the current ambient noise conditions, c) estimate the traffic change (based of the current traffic study and the proposed increase in the number of vessels present), d) quantify the potential future ambient noise condition, and finally e) estimate its potential impact of the environment.

Methodology

Data Collection

1. Cornell University 'pop-up' recorders

The system used to gather the *in situ* ambient noise data for the KAHO study was developed at Cornell University and is called a 'pop-up' buoy. As the name implies, this system is deployed in the ocean, where it collects data, until it is commanded acoustically to release from its anchor and 'pop-up" to the surface, where it is recovered and analyzed. A 'pop-up' is an autonomous acoustic data logger enclosed within a seventeen-inch diameter glass sphere housing. The hydrophone used by the 'pop-up' buoy is an externally mounted High-Tech Inc HTI-SSQ 94. The hydrophone for each 'pop-up' buoy is calibrated separately and its sensitivity curve and calibration results are stored for latter use. Acoustic signals are low-pass filtered at 16 kHz and then digitized at a 33.3 kHz sampling rate. Recorded data are stored internally on 80 GB hard drives. The signal processing and storage hardware are all custom-built components of the pop-up recorder. A total end-to-end calibration of each 'pop-up' buoy is generally not conducted, but a series of tests are performed on each buoy and compared to that of a know and completely calibrated buoy. The measured differences between any 'pop-up' and the calibrated 'pop-up' are then used to effectively calibrate the *in-situ* recordings. This calibration procedure was used on the data reported on in this report.

Acoustic data were collected for nine months from Sept 17 2004 to May 29 2005 with a series of three Cornell University 'pop-up' recorders. The pop-ups were deployed, near the bottom (to prevent storm damage), in approximately 450 meters of water at 19° 41.02'N, 156° 3.19' W (see Figure 1). This location is approximately 1 km offshore of the park boundary, but the location was chosen to ensure that large winter waves would not disturb the pop-up recorder. Each pop-up was deployed for approximately three months. The first recorder sampled five contiguous minutes out of each half-hour. The subsequent two recorders sampled four contiguous minutes out of each half-hour. The change in sampling procedure was necessary to ensure that the planned four recorders would capture data from an entire calendar year. Unfortunately, the fourth recorder failed due to salt-water intrusion into the hydrophone cable, so this data is not available.

2. Traffic Study

A study of the marina boat traffic was conducted by the firm, Moffatt and Nichol and is included as Appendix P of the Kona Kai Ola EIS. That report is the basis of the data presented in this section.

The Moffatt and Nichol's study, conducted observations of boat traffic on five separate days in an attempt to categorize the existing traffic patterns of the existing Honokohau small boat harbor. The five days selected included: a) the Saturday and Sunday of a holiday weekend, b) a Saturday when a fishing tournament was scheduled, and c) a Saturday and Thursday (i.e., "typical") when no special events were scheduled. Table 1 identifies some of the statistics reported, that are pertinent to an acoustic analysis.

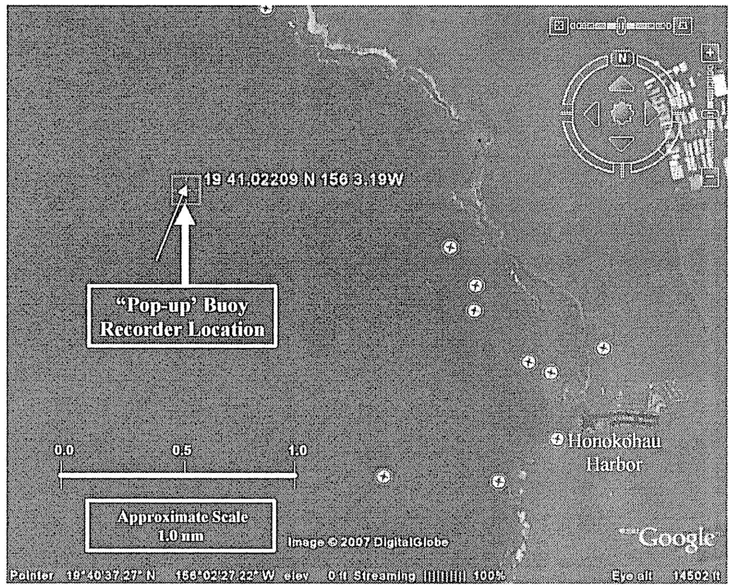


Figure 1: Location of Recording Buoy (Square Box) relative to Honokohau Harbor

The significance of this data from an acoustic point of view is that for any selected day, the average total number of boats either entering or leaving the port per hour is roughly the same, approximately 25 boats per hour (BPH). A review of the data tables in the Moffatt and Nichol's Study indicates that approximately 50% of the boats sighted are sailboats, while the remainder are power boats. That study also predicts that that ratio will remain approximately the same for the proposed 800 slip harbor. For the purpose of this analysis, the sailboats, regardless of whether they are under power or not, are generally much quieter than the powerboats, especially when the powerboats are at their higher speeds (e.g., sailboats have underwater acoustic source levels are greater than 20 dB less than those of power boats). Therefore, the contribution that sailboats make to the ambient noise levels are negligible and not considered further in this analysis.

Table 1 Pertinent Statistics from the Moffatt and Nichol Study

Category	Weekday	Range of Total Hourly Boat in Channel Counts*	Hours Observed	Average Total Boats per Hour* Averaged Over the Hours Observed
Holiday	Saturday	15-38	7 AM – 5 PM	26.8
Holiday	Sunday	15-37	7 AM – 4 PM	25.9
Fishing Tournement	Saturday	11-110	6 AM – 5 PM	22.2
"Typical" Day	Thursday	11-56	6 AM – 5 PM	27.5
"Typical" Day	Saturday	17-95	6 AM – 5 PM	23.3

Note: * Includes both inbound and outbound vessels.

Operations at the Honokohau Harbor indicate that powerboats typically move slowly to reduce wake in the harbor and channel until the final channel buoy is passed on an outbound passage. After which, they rapidly increase speed and travel out to deep water. And the reverse is true for inbound boats. For the purposes of this analysis, the location of that buoy is estimated to be on the north side of the channel, at the 20 fathom curve, and it is designated as the final channel buoy. Since the vast majority of the boat noise is made during the high speed portion of their transits, this location is the basis of the acoustic modeling that follows later in this report. Also, it should be noted that inside of the 20 fathom curve, underwater sound produced by the boats typically interacts often with the bottom and the ocean surface. Therefore, the lower levels of sound produced in the shallow water attenuate in the water faster than outside the 20 fathom curve and is further reduced as a contributor to the overall noise level in the bay. This does not preclude these boats from raising the noise level in their immediate vicinity, but acoustic

transmission loss (TL) and a lower source level (SL) ensure that this noise is localized near each individual boat.

The 3,000 ft (914 m) isobath is located approximately 1.5 nautical miles (nm) (2.8 km) offshore. For powerboats traveling at 10 knots or more this transit should take less than 9 minutes. Beyond this range their contribution to the near-shore ambient noise rapidly decreases with range due to acoustic TL, and is not considerate further. Therefore, of the approximately 12.5 powerboats per hour (i.e., 50% of the 25 total BPH transiting the channel), there are about two boats within two nautical miles of the recording buoy at any given time during the day. The exact course each boat takes from the final channel buoy to deep water varies, but it is assumed that, on average most head generally out to sea for a mile or two before drastically changing course. In order to simplify this analysis, a single course is assumed for all power boat travel. This course proceeds directly due west from the final channel buoy to the deep water. As a rough approximation, the contribution to ambient noise hear at the recording buoy due to boats moving north of this "average" course effectively compensates for (i.e., averages the noise received from) those boats traveling south of this course. Therefore, for simplicity, all boats are assumed to travel east or west near this track.

Analysis Procedure

1. Received Signal Processing

The raw recorded data from the Cornell 'pop-up' were transformed into time-stamped AIFF files by the staff of the Cornell Laboratory of Ornithology Bioacoustics Research Program. These raw data files were processed with a suite of custom-analysis programs written in Matlab (Mathworks 2000). The first program used a standard Matlab spectral analysis code to generate a spectrum for each five (or four) minute sample and stored the resulting pressure vector in a summary matrix for the entire month. Spectrum parameters were 4096 point fast Fourier transform (FFT), with a Hamming window and 50% overlap.

Each matrix was then sorted within each frequency bin, producing an ascending sound pressure level within each frequency bin. Summary statistics were then generated for each frequency bin, specifically the 5th, 25th, 50th, 75th and 95th percentile sound pressure level for each frequency (e.g., for the 95th percentile values, 95% of all of the received values at this frequency, were at this level or below it). These values were plotted for each month, and an example is shown in Figure 2.

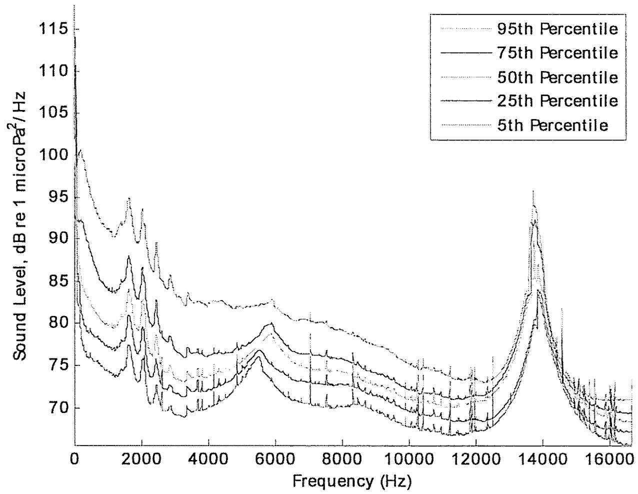


Figure 2: A sample summary presentation of spectral information for a month. The large spike in sound pressure near 14 kHz is due to self-noise of the recorder and does not reflect the levels in the environment. Data up to ~ 12 kHz is considered reliable and representative.

The received level of selected frequencies for each sample was exported to a text file, along with date and time information. These data were used for statistical tests of the

trends in ambient noise level. The entire nine-month dataset was used to test differences in day v. night and weekend v. weekday periods.

2. Acoustic Modeling

The model used to estimate in-water acoustic propagation was the Navy Standard Comprehensive Acoustic System Simulation (CASS) / Gaussian Ray Bundle (GRAB) model (Keenan, 2000). This model is a range dependent program that computes the TL associated with the potential propagation paths between a source and a receiver. This Gaussian Beam model have been demonstrated to successfully model the complex underwater sound propagation for frequencies as low as 50 Hz and as high as 600 kHz.

TL is the loss in intensity of sound as it travels from the position of the acoustic energy source to the position of a virtual receiver. Underwater acoustic propagation is greatly affected by the sound speed structure of the water which in turn is controlled by temperature, salinity and depth in the water column. For this modeling, a typical February sound velocity profile (SVP) of the water column for 19.3° N, 157.0° W from the Generalized Digital Environmental Model (GDEM) database (GDEM, 2007) was used. Analysis of this profile against profiles from the other three seasons for this location showed that the TL was similar. Thus this one profile was used to approximate year-round TL in the Honokohau Bay area.

The results of the CASS/GRAB model runs for this site are shown in Figures 3 and 4. Figure 3 shows the acoustic rays propagating from a source, which is located at the final channel buoy for the harbor entrance, towards the location of the 'pop-up' buoy. The buoy is approximately 1.6 nm (3.0 km) from the source at a depth of 1,480 ft (450 m).

Figure 4 shows the TL for three depths, 1,300, 1480, and 1,600 ft (396, 450, 488 m). Note that as one goes deeper, it is necessary for the curve to start at a farther range from the source. This is due to the fact that for this model run, only in-water TL is displayed. For the range of interest (i.e., from the source to the 'pop-up' buoy – 1.6 nm) a red arrow identifies the correct TL, approximately 68 dB.

It must be emphasized that this modeling analysis is for 300 Hz only, even though the frequency range produced by a small, fast boat covers frequencies from 100 Hz to 20 kHz. It was chosen because the resultant TL would be reasonably accurate for frequencies between 100-600 Hz, where much of the ambient noise energy occurs. This is because typically by 1.4 kHz or so, the boat's SL has decreased by 20-30 db, with this trend continuing until SL is reduced by 40-50 dB at 20 kHz.

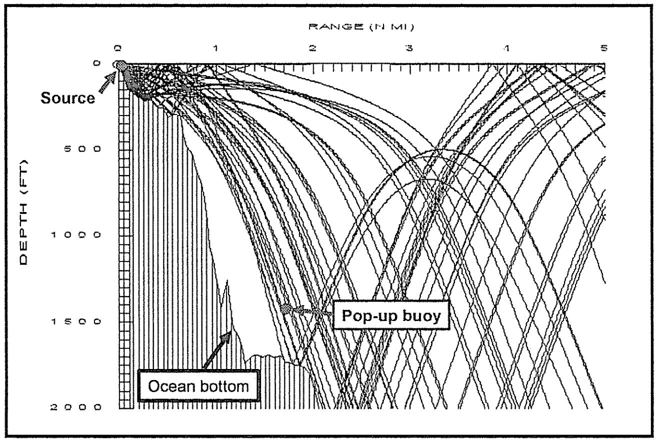


Figure 3: Acoustic Ray Plot from Final Channel Buoy to 'Pop-up' Buoy

A similar model run was conducted for the case where a boat has transited due west from the final channel buoy and is due south of the 'pop-up' buoy. The resulting TL for a range of 0.8 nm (1.5 km) was 55 dB. Therefore, the estimated average boat SL was between 55 – 68 dB above those values recorded by the 'pop-up' buoy.

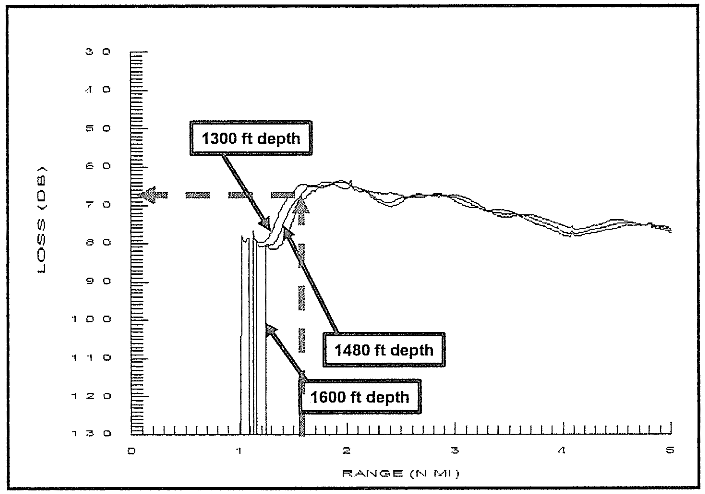


Figure 4: Transmission Loss Plot from Final Channel Buoy to 'Pop-up' Buoy

Results

Monthly Trends

The data in Figure 5 is a plot of all measured 100 Hz sound level over the nine moths of the recordings. It also shows a clear increase in that measured ambient noise at the beginning and the end of the year. This is as expected and it is concurrent with winter storms and high waves. It is also the time when humpback whales migrate into the area. Humpback whale song has significant energy in the 100 Hz band (Fristrup et al. 2003). Both of these factors could drive the increase in low-frequency sound in the winter months. Thus the data set appears to be reasonable sensitive to expected seasonal ambient noise changes due to naturally occurring phenomenon.

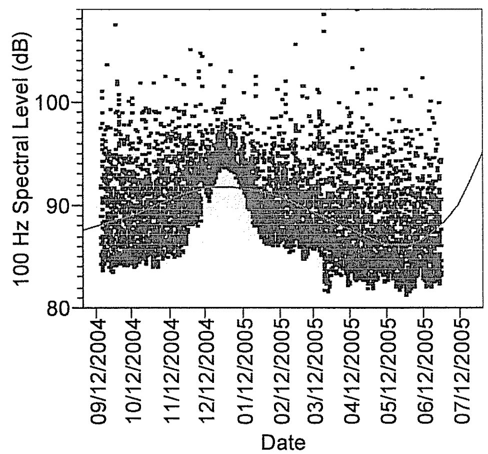


Figure 5: 100 Hz Sound Level Over the Nine Month Observational Period. Showing increased sound levels attributed to higher winter waves.

Weekday v. Weekend Trends

Examination of the monthly spectrograms showed no evidence of a weekend v. weekday pattern (see Figure 6). The selected analysis frequencies were compared with a t-test. No difference was seen in any of the analysis frequencies.

Diurnal Trends (Day v. Night)

Examination of the data showed a clear diurnal pattern (see Figure 7 and 8). This was confirmed with t-tests for each of the analysis frequencies (see Table 2). Each frequency was statistically significantly different, with daytime levels being higher at all frequencies. The noise pattern shown in Figure 8 is consistent with known vessel operational patterns.

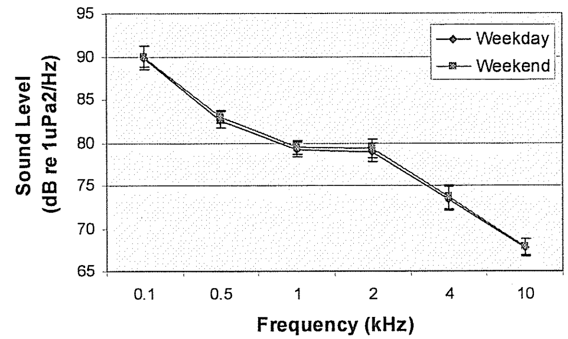


Figure 6: Comparison of median Weekend and Weekday Sound received levels. No significant difference was seen between weekend and weekday sound levels.

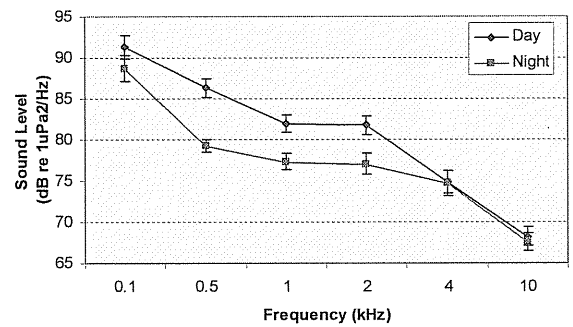
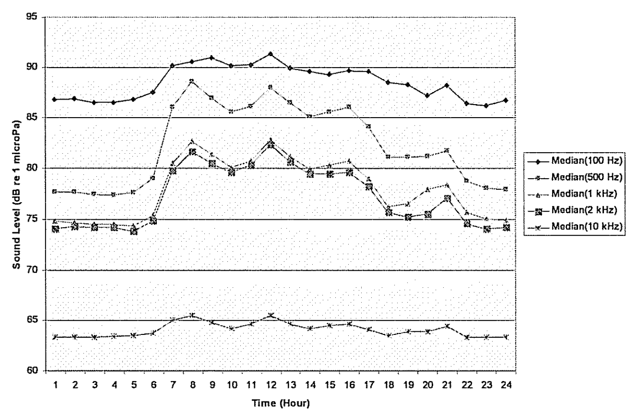


Figure 7: Median daytime Noise levels were statistically significantly greater during the day than at night (statistical details in Table 2).

Table 2: Details of T-Tests for Each Frequency. Statistically significant differences were found at all frequencies, with daytime values being higher than nighttime values.

Frequency	t score	Degrees of Freedom (DF)	probability
100 Hz	-10.491	570	<.0001
500 Hz	-42.524	570	<.0001
1 kHz	-27.73	570	<.0001
2 kHz	-22.615	570	<.0001
4 kHz	-8.473	570	<.0001
10 kHz	-3.487	570	0.0005



Data from Frankel and Driscoll-Lind (in prep), Courtesy of Kaloko-Honokohau NHP

Figure 8: Hourly Sound Levels.

The day/night comparison is the only one where statistically significant differences were noted. The potential cause of the day/night difference was then examined. The differences in day/night wind patterns were examined, because wind can contribute to ambient noise directly or through wave mechanisms. The mean windspeed during the day was 8.1 knots while during the night it was 5.8 knots. However, the Wenz Curves predict that this increase in day wind speed over night windspeed would only

increase ambient noise over the 100 Hz – 20 kHz frequency range (Wenz 1962) (i.e, over the entire measured frequency range) 1-2 dB, much less than that observed in Figure 7. Also, the observed data show increases only up to 2 kHz, with no differences above 4 kHz between night and day. Since Honokohau harbor is primarily a tourist/recreational harbor, this difference in ambient noise levels is taken to be primarily the contribution of vessel activity, i.e. the nighttime values are taken as approximately natural ambient and the daytime values reflect the contribution from vessel activity.

It should be noted that the average "night" noise levels as identified in Figure 7, are still about 10-15 dB higher than the expected average ambient noise level for "light" to "moderate" wind and wave conditions for frequencies from 10 Hz to 4 kHz, per the Wenz generalized ambient noise spectra (Richardson, 1995). This increased level in the general ambient noise level for the area over those predicted in the Wenz curves is probably primarily due to the fact that those curves are for deep, open-ocean and this is a coastal area. The expected contributions to ambient noise from breaking and crashing waves, along with biological sources (e.g., snapping shrimp, parrot fish breaking coral, etc.) account for this 10-15 dB difference. The reported nighttime ambient noise levels are generally consistent with those reported for Kaneohe Bay (Au, 1990), in which a 70 dB re 1 $\mu Pa^2/Hz$ ambient noise level at 20 kHz was typical.

Estimated Boat Source Levels

Estimates of the boat source levels (SL) can be obtained by using the TL values determined previously (i.e., 55-68 dB) to correcting the average "day" received sound levels in Figure 7 by the equation:

$$RL = SL - TL$$

Where:
RL = Received Level
SL = Source Level
TL = Transmission Loss

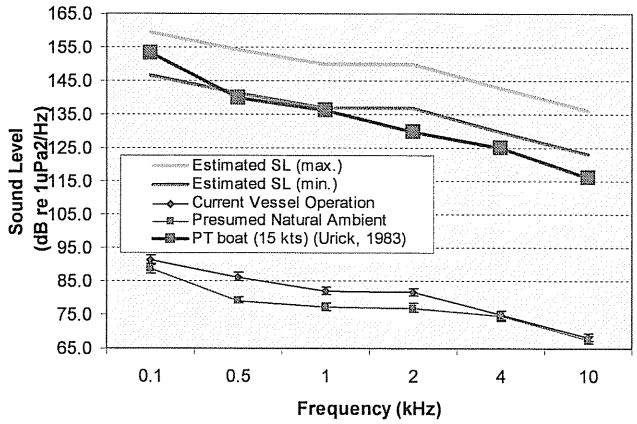


Figure 9: Estimated Source Levels of Boats in Honokohau Channel.

Figure 9 shows the results of this adjustment for TL. The range of estimated SL, over the frequency spectrum varies from the minimum SL shown in green, to the estimated maximum SL, shown in light blue. For comparison, the SL spectrum for a Navy patrol boat (PT boat) traveling at 15 knots is shown in purple (Urick, 1983). Additionally, these source levels are consistent with those reported for civilian small powerboats in Richardson (1995).

Now that the range of SLs has been estimated, they can be applied to the modeled boat distributions for the new harbor, to estimate the change in ambient noise at the 'pop-up' buoy after the harbor expansion is complete. The original geometry used to model TL assumed that the majority of boats travel due west from the last channel buoy towards the open ocean. This geometry assumed that there were typically two powerboats present on this track at any given time of the day (i.e., during daylight hours) contributing to the

ambient noise received at the 'pop-up' buoy. And, this assumption was validated by the small boat traffic study.

If the new harbor is completed, this number of powerboats is expected to approximately quadruple. Currently there are 272 slips in Honokohau Harbor, of which 120 are commercial slips. The proposed project would add 800 slips to a produce a total of 1072 slips. Therefore, eight powerboats would then contribute to the increased ambient noise received at the 'pop-up' buoy for the enlarged harbor. Assuming the geometry remains roughly the same (i.e., the boats take the same track to deep water) each boat's noise will experience a different TL while propagating noise to the 'pop-up' buoy because of their different ranges from that buoy. The range of TLs experienced by the boat-generated-noise has previously been identified as 55-68 dB. Assuming all of the boats have the same nominal SL, an increase of 9.7 dB maximum (i.e., at the 200-600 Hz region) in ambient noise, would be expected to accompany the new harbor, with an average of 8 boats on the channel track at any given day-light period.

If the additional slips had a rate of activity that was one-half of the current slips, then we would predict an effective doubling of vessels activity, or four boats contributing to the ambient noise at any given time during daylight hours. This would result in a maximum ambient noise increase of about 2.9 dB at the 'pop-up' buoy for the lower frequencies. These predictions are presented in Figure 10.

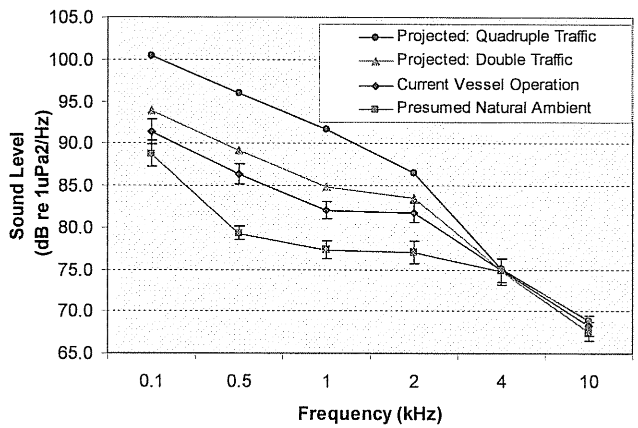


Figure 10; Predicted ambient noise levels at "Pop-up' Buoy Site.

The predicted ambient noise levels at the 'pop-up' buoy only present a portion of the potential increases to ambient noise in the Honokohau Bay, that of those portions of the bay roughly a half mile or more from the assumed powerboat channel modeled. The area that is not represented by Figure 10 is the area within about 0.0–1.0 nm (0.0–1.8 km) of the modeled boat channel. Here the sound field around each individual boat (i.e., the closest boat) dominates, while the other boats' noise field contributes slightly. Assuming a nominal 155 dB boat source (at about 100 Hz) and following the PT boat spectrum in Figure 9, the typical boat has a single frequency (1 Hz band) noise field of 135 dB at 10.9 yards (10.0 m), 115 dB at 109.0 yards (100.0 m), and 100 dB at 615.3 yards (562.3 m) from the boat. And the broad band levels (i.e., summing the acoustic energy across the 100 Hz – 12kHz spectrum) would yield a field of approximately 156 dB at 10.9 yards (10.0 m), 136 dB at 109.0 yards (100.0 m), and 121 dB at 615.3 yards (562.3 m) from the boat. Essentially, small areas of boat-generated noise are constantly moving and ensonifying the area around the modeled boat channel. By quadrupling the number of boats using the modeled track at any time, the number of more intensely ensonified areas has also been quadrupled. On average, the ambient noise level (per Hz) along this track

would nominally be about 115-120 dB during the day, with louder levels as boats pass by.

Conclusions

Historically, the thresholds for Level A and B takes, under the Marine Mammal Protection Act (MMPA), for broadband signals has been 180 and 160 dB re 1 μPa, respectively. In recent years, these levels have been amended to include energy versions of these thresholds, 180 and 160 dB re 1 μPa^2-s. For the typical small boats analyzed in this report, underwater sound could only possible cause Level B takes (due to the maximum broad-band sound level produced), and this only when an animal is within 10.9 ft (3.0 m) of the boat. The only reasonably foreseeable source of Level A takes would be collisions of marine mammals with a boat or an object suspended/deployed from a boat, and this possibility seems negligible. Therefore, although Level B takes could occur, and would be approximately four times more likely to occur if the new harbor is built, it seems unlikely that the very maneuverable dolphins would not easily avoid transiting boats. Whales, although less agile than dolphin, would typically be more rare in the vicinity of the transiting boats, therefore the likelihood of Level B whale takes also seems very low.

Although received levels between 120 – 160 dB re 1 μPa, or re 1 μPa^2-s, do not technically cross the threshold of a take, received levels in this range have been observed to cause changes in marine mammal behavior (Richardson, 1995). This consideration is especially important for the species discussed in the Introduction of this report. Recent long-term studies have shown that an increase in the number of dolphin-watching vessels resulted in reduced abundance of bottlenose dolphins in Australia (Bejder et al. 2006b). This decline in abundance has been interpreted as the abandonment of the area by those individuals that respond more to the presence of dolphin-watching vessels (Bejder et al. 2006a).

Spinner dolphins have remained in Honokohau Bay following the creation and expansion of the current harbor. However, the size of spinner dolphin schools has decreased since the 1989-1992 period (Ostman-Lind 2004) and increases in the numbers of medium to high level aerial behaviors have been observed following approach by motorized vessel (L-V and Duran 2006). These data indicate, but do not conclusively prove, that the existing level of human activity is affecting the behavior of spinner dolphins. -Therefore, increases in ambient noise, numbers of vessels and numbers of dolphin-vessel interactions that will result from the completion of the Kona Kai Ola project has the potential to produce cumulative or long-term effects that may not be adequately represented by acoustic measurements alone.

The increase in ambient noise level predicted by the increase in vessels traffic could be offset through a variety of mechanisms. Factors contributing to the generation of underwater noise by small boats include: hull size, design and cleanliness, motor type, age, mounting, and general maintenance, propeller design, size and condition and vessel speed. Improvement in any of these factors for a specific boat could reduce its projected noise and its contribution to the overall sound field. As an example, if boat speed was restricted to less than 10 knots, vice an estimated 15-20 knot transit speed beyond the final channel buoy, a reduction in each boat's SL of over 10 dB could be realized.

Literature Cited

Biological References

Amoser S, Ladich F (2003) Diversity in noise-induced temporary hearing loss in otophysine fishes. The Journal of the Acoustical Society of America 113:2170-2179

Bartol SM, Ketten DR (2006) Turtle and Tuna Hearing. In: Swimmer Y, Brill R (eds) Sea Turtle and Pelagic Fish Sensory Biology: Developing Techniques to Reduce Sea Turtle Bycatch in Longline Fisheries, vol NOAA Tech. Memo., NOAA-TM-NMFS-PIFSC-07 U.S. Dep. Commer., pp 98-103

Bejder L, Samuels A, Whitehead H, Gales N (2006a) Interpreting short-term behavioural responses to disturbance within a longitudinal perspective. Animal Behavior 72:1149-1158

Bejder L, Samuels AMY, Whitehead HAL, Gales N, Mann J, Connor R, Heithaus M, Watson-Capps J, Flaherty C, Krutzen M (2006b) Decline in Relative Abundance of Bottlenose Dolphins Exposed to Long-Term Disturbance. Conservation Biology 20:1791-1798

Bryant P, Laffety, C., Lafferty, S. (1984) Reoccupation of Laguna Guerrero Negro , Baja California, Mexico by Gray Whales. In: Jones M, Swartz, S., and Leatherwood, S. (ed) The Gray Whale. Academic Press, Inc., Orlando, FL, pp 375-386

Erbe C (2002) Underwater noise of whale-watching boats and potential effects on Killer whales (*Orcinus orca*), based on an acoustic impact model. Marine Mammal Science 18:394-418

Fristrup KM, Hatch LT, Clark CW (2003) Variation in humpback whale (*Megaptera novaeangliae*) song length in relation to low-frequency sound broadcasts. Journal of the Acoustical Society of America 113:3411-3424

Gard R (1974) Aerial census of gray whales in Baja California lagoons, 1970 and 1973, with notes on behavior, mortality and conservation. Calif. Fish and Game 60:132-143

Glockner-Ferrari DA, Ferrari MJ (1990) Reproduction in the humpback whale *Megaptera novaeangliae* in Hawaiian waters 1975-1988: the life history, reproductive rates and behavior of known individuals identified through surface and underwater photography. In: Hammond PS, Mizroch SA, Donovan GP (eds) Individual Recognition of Cetaceans: use of Photo-Identification and other Techniques to estimate population parameters, vol 12. International Whaling Commission, Cambridge, pp 161-170

Mathworks (2000) MatLab.

NOAA Fisheries Marine Turtle Research Program,

Östman-Lind J, Driscoll-Lind AD, Rickards SH (2004) Dephinid abundance, distribution and habitat use off the western coast of the Island of Hawai'i Southwest Fisheries Science Center

Popper AN, Fewtrell J, Smith RD, McCauley RD (2004) Anthropogenic sound effects on the behavior and physiology of fishes. Marine Technology Society Journal 37:35-40

Salden DR (1988) Humpback whale encounter rates offshore of Maui, Hawaii. Journal of Wildlife Management 52:301-304

Scholik AR, Yan HY (2002) Effects of boat engine noise on the auditory sensitivity of the fathead minnow, *Pimephales promelas*. Environmental Biology of Fishes 63:203-209

Luna-Valiente NV, Bazúa-Durán C (2006) Behavioral response of spinner dolphins (*Stenella longirostris*) to human activities in the archipelago of Hawai`i. ECS 2006, Gydnia, Poland

Wenz GM (1962) acoustic Ambient Noise in the Ocean: Spectra and Sound. The Journal of The Acoustical Society of America 34

Acoustic References

GDEM, 2007. Generalized Digital Environmental Model, Web Version 3.0, Database Version 3.0, https://128.160.23.42/gdemv/gdemv.html, May 2007.

Glockner-Ferrari DA, Ferrari MJ (1990) Reproduction in the humpback whale Megaptera novaeangliae in Hawaiian waters 1975-1988: the life history, reproductive rates and behavior of known individuals identified through surface and underwater photography. In: Hammond PS, Mizroch SA, Donovan GP (eds) Individual Recognition of Cetaceans: use of Photo-Identification and other Techniques to estimate population parameters, vol 12. International Whaling Commission, Cambridge, pp 161-170

Keenan, Ruth and D. Brown, E. McCarthy, H. Weinberg, L. Gainey and G. Brooke. 2000. "Software Design Description for the Comprehensive Acoustic System Simulation (CASS Version 3.0) with the Gaussian Ray Bundle Model (GRAB Version 2.0) NUWC-NPT Technical Document 11,231, 1 June 2000.

Kona Kai Ola Draft Environmental Impact Statement (EIS), prepared by OCEANIT, December 2006.

Richardson, W.J., C.R. Greene Jr., C.I. Malme, and D.H. Thomson. 1995. Marine Mammals and Noise. Academic Press, San Diego, CA.

Urick, R.J. 1983. Principles of Underwater Sound 3rd ed. McGraw-Hill, New York.

Attachment 4

Acoustic Analysis of Potential Impacts from the Kona Kai Ola Construction Project

Prepared For:
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MAI-642-U-07-054
24 June 2007

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Research – Operations – Engineering – Design - Analysis

Acoustic Analysis of Potential Impacts from the Kona Kai Ola Construction Project

Prepared For:
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24 June 2007

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Report No. MAI-642-U-07- 054

Executive Summary

This report consists of a noise analysis of the construction of the Kona Kai Ola project on the Island of Hawaii. The objectives were: to predict Received Levels (RLs) during the construction, and to analyze the impact on in-water marine mammals from these same operations. Five spatial positions were selected to document the predicted noise levels in and near the ocean. They included three terrestrial positions on/near the beach and two in-water locations. The scenario assumed for this analysis includes: a) the explosive removal of bedrock, b) the dredging of the loose rock after blasting, and c) drilling of holes for piling installation.

As a reference point to the received levels predicted in this report, the Marine Mammal Protection Act (MMPA) (i.e., one of the primary United States' law applicable to protecting marine mammals) as modified slightly by the National Defense Authorization Act (NDAA) of 2004, was identified as establishing the definitions of Level A and Level B harassment. For the purposes of this document, the specific criteria and calculation techniques utilized in the "Final Environmental Impact Statement (FEIS) for Shock Testing *Seawolf* Submarine" and "Final Environmental Impact Statement Shock Testing *U.S.S. Churchill"* (DoN 1998 and 2001) to estimate Level A and Level B harassment were replicated here and used for explosive analysis. Broadband levels used in pile driving and seismic survey were extrapolated to non-impulsive threshold. And in-air broadband missile criteria were used for airborne noise thresholds.

The calculations and model conducted included: 1) source level (SL) estimation based on standard explosive similitude equations and Net Explosive Weight (NEW) for the explosive rock blasting, 2) acoustic propagation models (specifically, the Navy Standard Comprehensive Acoustic System Simulation (CASS) / Gaussian Ray Bundle (GRAB) model) for in-air and in-water transmission loss (TL) estimation, and 3) utilization of the best available data from the Navy standard underwater acoustic databases and atmospheric data from the National Climatic Data Center (NCDC) of the National Oceanic and Atmospheric Administration (NOAA). The results from the atmospheric, underwater, and seismic propagation model include acoustic ray and TL plots for each source/receiver site combination. The specific TL for each receiver site was then identified and convolved with the SLs for each of the sources. The resulting received levels at each site for each source were then documented.

In conducting this analysis, the best available scientific, environmental, geologic, and meteorological data were obtained and used to calculate the TLs and subsequently to predict the RLs at the five receiver sites. Additionally, throughout this analysis, conservative assumptions were made. Therefore, the results presented here do not represent the full range of TL, which could occur, but an estimate of the typical nominal minimum TL (and therefore nominal maximum RLs) that can be expected for most days throughout the year. The results are not a "worst case" result, because there could be cases with stronger near-ground cooling or wind conditions which could increase the RLs, but days with these conditions would be infrequent and only represent an estimated 10-15 dB higher RL. Similarly, environmental conditions could greatly increase the TL and reduce RLs, and effectively make the noise from the modeled sources indistinguishable from ambient noise.

The estimated nominal, but conservative RLs for the individual non-explosive construction method sources show that the criteria for Level A harassment of marine mammals were never exceeded by these RLs for neither in-water nor in-air conditions. However, these thresholds could be exceeded by the explosive blasting used to create the new harbor. For both the in-air or in-water acoustic propagation, this only occurred when an animal was within about 200 meters (656 ft) of the explosion. This condition could only occur when the explosive source was at locations farthest north in the new harbor and closest to the existing harbor. This condition mandates that a safety range out to at least 200 meters (656 ft) radius from the source be shown to be clear of all marine mammals and sea turtles prior to each blast to preclude potential Level A takes.

Further, the data indicated that the in-air RLs for the explosive sources would exceed the assumed 100 dBA re 20 μPa threshold for Level B harassment of pinnipeds for ranges out to about 731 meters (2,400 ft) This threshold is nominally for pinnipeds, but it should be extended to marine mammals and sea turtles too. Therefore, an in-air safety buffer of at least 731 m from any explosive source is proposed, that should be maintained and found clear of marine mammals (hauled out or on the oceans surface) and sea turtles (basking or beach) prior to any blasts. It should be noted that although a receiver site was not modeled specifically in the existing harbor, that area is often within the range of this safety buffer and that extra care should be taken to ensure that no marine mammals or sea turtles are in the existing harbor prior to any blast where Level A sound pressures are predicted to occur.. Analysis of the most restrictive Level B in-water, explosive threshold shows that it is only exceeded when a animal is closer than 300 m (984 ft) from the explosive source. Thus, an in-water safety buffer of 300 m is established to reduce the possibility of Level B takes to a negligible level.

Although the possibility exist for Level B impacts to marine mammals, analysis of the marine mammal distribution and movement as predicted by the AIM model, indicates that this is very unlikely situation. Therefore, it is expected that there will be much less than 0.5 Level B takes, with or without mitigation. But the mitigation safety buffer must still be enforced to preclude the unlikely possibility of marine mammals or sea turtles being near the explosive sources when they are used.

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Kona Kai Ola Project Acoustic Analysis

1.0 BACKGROUND

This report consists of a noise analysis of the Kona Kai Ola construction Project during the construction of the proposed 800 slip harbor expansion. Kona Kai Ola is designed to be built in Kealakehe, North Kona District, on the Island of Hawaii. An enlarged portion of the proposed preliminary concept plan of the Kona Kai Ola facility, which shows the harbor, (i.e., the proposed action of the Kona Kai Ola Environmental Impact Statement (EIS)) is provided in the map below, Figure 1. This figure is a part of the concept plan which is Figure D in the EIS. The objectives of this analysis were: a) to predict peak in-air noise levels on the adjacent coastline and above Honokohau Bay during the planned construction activities at the sites, b) to predict peak in-water noise levels in Honokohau Bay during the planned construction activities at the sites, and c) to analyze the impact of these in-air and in-water noise level on the marine mammals and sea turtles potential present during the construction.

In order to quantitatively complete the objectives listed above, the following seven steps must be completed: 1) representative source and receiver locations that adequately characterize the acoustic environment must be identified, 2) the source parameters (i.e., source levels, locations, etc.) must be identified, 3) the natural environmental parameters (i.e., air and water temperatures, geological structure, etc.) which control acoustic propagation representative of the entire year (since the process will potential take place over multiple years) must be identified, 4) the propagation, both air and water borne, must be properly executed to determine the resultant noise fields, 5) the details of the potentially present marine animals and sea turtles must be identified and their normal distribution and behavior quantified, 6) animal disposition and noise field occurrences must be integrated to determine or estimate the potential exposure to acoustic energy that the animals receive, and finally 7) estimated animal exposure must be compared to the standard National Marine Fisheries Service (NMFS) criteria to determine the level of impacts to the various species.

Five spatial positions were selected to document the predicted noise levels, three positions were terrestrial and two were just above the water (one near the harbor entrance and the other near the final channel buoy). Hereafter these five sites will be referred to as the receiver sites and they are shown in Figure 1 as red circles. For this figure only, "receiver site" is abbreviated as "RCV." Additionally, the seven modeled source locations are identified in this figure as green circles and abbreviated as "SRC."

The five receiver sites were selected so that a) the model results would predict in-air receive levels (RLs) on the closest beach point from any of the modeled source sites and b) the in-air and in-water RLs for two representative measurement sites were examined. Receiver site #1 is a beach site approximately 510 ft from source sites #1 and #7.

Receiver site #2 is the offshore location, which is in the middle of the harbor channel where it crosses the 5 fathom (30 ft [9.1 m]) isobath, which is about 840 ft (256.0 m) from source sire #1. Receiver site #3 is the beach site which is closest to source site #2, which is about 1,770 ft (539.5 m) away. Receiver site #4 is the beach site which is closest to source site #3, which is about 1,980 ft (603.5 m) away. Receiver site #5 is the final channel buoy, which is north of the channel near the 30 fathom curve (180 ft [54.9 m] isobath) and approximately 1,780 ft (544.1 m) from source site #1. Thus Receiver sites #1, 3 and 4 can be used to predict the in-air RLs at three beach locations, all of which are inside the proposed project site. Receiver sites #2 and 5 are at representative sites, which should be relatively easy to identify from shore.

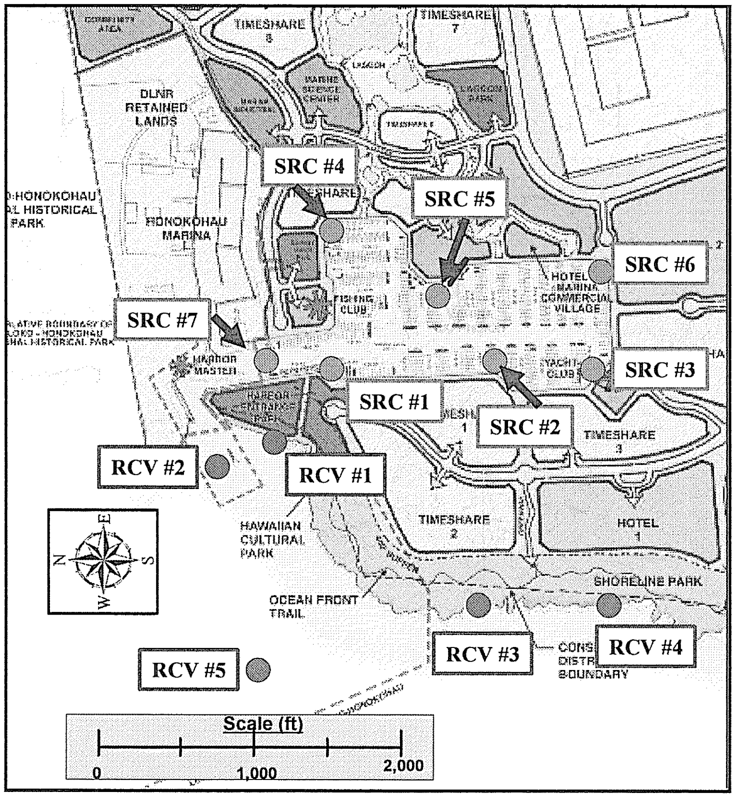

Figure 1 Map of Proposed Kona Kai Ola Site

There are four major potential noise-making processes in the scenario assumed for this analysis. They are: a) the explosives cutting/breaking of lava currently in what will become the 800 slip harbor as proposed for the proposed action in the Kona Kai Ola Environmental Impact Statement (EIS), b) the mechanical removal of the broken rock from the harbor by dredging, c) the drilling of holes prior to the installation of marine piles in the harbor and d) removal of the final solid-rock dam or berm which separates the new harbor from the old Honokohau small boat harbor's channel. All of the harbor explosive, dredging and pile construction, with the exception of that need to remove the final dam, will be completed before the removal of that dam. This analysis was directed toward arriving at the maximum RL that would be measured at each of the five receiver sites for each of these noise making evolutions. Essentially, each of these processes occurs separately and the analysis will not assume that any occur simultaneously. For example, when actual explosive operations are occurring, the area will be cleared for personnel safety, so dredging of the previous blast's debris will be stopped temporarily. Additional details on the characteristics of these noise sources can be found in Section 1.3 of this report.

In order to conduct this analysis, source levels for the in-air and in-ground/water high explosive detonations, drilling, and dredging must be established. These source levels have been documented by many measurements in the field for the drilling and dredging activities and are readily available. However, the source levels for the explosive work will have to be derived from standard equations, due to the unique configurations of their employment. By convention, source levels are designated at a range of one meter (m) (3.28 ft) from the noise source, which is assumed to be a point source (e.g., 1 m from the drilling site, 1 m from the center of the explosion, etc.).

After source levels for each process are established, the potential paths for sound transmission must be estimated from the point of origin to the five sites where the RLs are to be determined. For example, for the explosives, the in-air transmission paths consist of a set of ground paths from the approximately ten foot depth source to the grounds surface, then propagation via the air, to each receiver site. Simultaneously, the in-ground transmission paths consist of a set of ground paths from the approximately ten foot depth source to the ground/water interface, then water-borne propagation into the ocean. Each path has a loss of sound intensity associated with it and this loss is dependent upon many physical properties of the medium be it the air, soil, rock, sediments, or water. The establishment of a reasonable range for the physical properties of the propagation medium must be completed and input into standard, verified computer models in order to estimate the loss in sound level associated with each propagation path. For most areas of the world, a range of values is available to estimate the value of physical parameters by season of the year. For this analysis, published parameters for meteorological, geological, and vegetation cover were used as inputs into acoustic propagation models. Details of the required environmental parameters and the acoustic propagation models that use them are given in Sections 2.0 and 3.0 below.

Technical descriptions of the marine mammals and sea turtles potential present at the site are presented in Section 4.0. Here also is the description of the Acoustic Integration Model (AIM©) which was used to integrate the sound fields and the animal movements. Finally, the NMFS criteria as discussed in Section 1.2 is compared to the results from AIM© and reported in Section 5.0 of this report.

1.1 Units

A short discussion on units is in order to prevent confusion between "in-air" units and "in-water" units and "weighted" and "un-weighted" decibels. Decibels (dB) have by custom been used in the acoustic discipline in order to handle large differences in absolute values of pressures and energies. With the use of a decibel scale, transmission loss (TL) computations become "add and subtract" operations rather than "multiple and divide" operations, thereby simplifying calculations. Additionally, linear values which can cover many orders of magnitude are represented in scales which may cover one or two orders of magnitude. A "dB" is ten times the logarithm to the base ten of the ratio of the measured intensity or energy to a reference intensity or energy. In air the customary intensity reference is 20 micropascals (20 μPa) and in water the customary intensity reference is 1 μPa. To convert from in-air dB to in-water dB, simply add 26 dB. Thus a reading of 100 dB re 20 μPa is 126 dB re 1 μPa. Where "re" means "referenced to:". The same relationship holds for energy flux density (EFD) decibels. If in-air EFD levels are given, add 26 dB to get in-water EFD levels. Further, in order to match intensity levels with the sensitivity of the human ear, weighting is given to the dB readings as a function of frequency. The most common is "A-weighting" and it is indicated as "dBA.". If a letter after the dB is not given, then it is assumed it is an un-weighted sound pressure level; this is not always the case in literature, but it is in this report. Many noise measuring meters are designed to indicate noise levels in dBA (e.g., the "weighting" is built into the meter and should be indicated on the instrument). It is important to note what weighting is being used before comparing noise levels. Additionally it should be noted that the standard "A-weighting" is frequency dependent. In this analysis it was determined that the highest 1/3-octave band typically occurs for the sources at about 200 Hz. At this frequency the "A-weighting" is about 11 dB. This single value will be used conservatively throughout this report to change from "A-weighted" to unweighted values. For frequencies below 200 Hz, the weighting value increases (e.g., about 25 dB for 100 Hz) and for frequencies about 200 Hz the in-band energy level decreases. Therefore this assumption is conservative.

1.2 Established Injury and Harassment Criteria

The primary United States' law applicable to protecting marine mammals is the Marine Mammal Protection Act (MMPA).

The MMPA, subject to limited exceptions, prohibits any person or vessel subject to the jurisdiction of the United States from "taking" marine mammals in the United States or on the high seas without authorization. "Taking" includes harm or harassment. Section

101(a)(5) of the MMPA directs the Secretary of Commerce to allow, upon request, the incidental (but not intentional) taking of marine mammals by U.S. citizens who engage in a specified activity (exclusive of commercial fishing) within a specified geographical region if certain findings are made and regulations are issued. Permission may be granted by the Secretary for the incidental take of marine mammals if the taking will: 1) have a negligible impact on the species or stock(s); and 2) not have an immitigable adverse impact on the availability of the species or stock(s) for subsistence uses. Regulations must be issued setting forth the permissible methods of taking and the requirements for monitoring and reporting such taking.

The term "take" as defined in Section 3 (16 United States Code [USC] 1362) of the MMPA and its implementing regulations means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." The term "harassment" means any act of pursuit, torment, or annoyance that has the potential to:

- Injure a marine mammal or marine mammal stock in the wild (MMPA Level A harassment); or
- Disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (MMPA Level B harassment).

The MMPA was modified slightly by the National Defense Authorization Act (NDAA) of 2004, but for the purposes of the explosive sources in this document, the specific criteria and calculation techniques utilized in the *U.S.S. Seawolf* and *U.S.S. Churchill* FEISs' (DoN 1998 and 2001) are replicated here.

<u>In-Water Impulsive Source Criteria</u>

The *U.S.S. Seawolf* and *U.S.S. Churchill* FEISs' (DoN 1998 and 2001) methodology for determining the potential for effects on marine mammals resulting from the use of explosives in water has been formally accepted in published Final Rules by NOAA Fisheries/National Marine Fisheries Service (NMFS). Currently, these criteria are based on the best science that is available from all in-water and terrestrial experiments and extrapolations. From these, the following dual criteria for harassment (MMPA Level B incidental takes) are established:

- The onset of Temporary Threshold Shift (TTS) is estimated to occur when the highest 1/3-octave band RL at an animal exceeds 182 dB re $(1\mu Pa)^2 \cdot s$ (EFD), or
- The onset of Temporary Threshold Shift (TTS) may occur when an animal is exposed to a 12 pounds per square inch (psi) or greater peak pressure.

For plane waves, EFD is the time integral of the squared pressure divided by the acoustic impedance of sea water. It is assumed the acoustic impedance is the same throughout the sound field. EFD has units of Joules per meter squared or pound force per square inch. In-water EFD levels are by convention expressed in "dB re $(1\mu Pa)^2 \bullet s$" (Urick, 1983), while in-air EFD levels use the reference "dB re $(20\mu Pa)^2 \bullet s$."

The dual Level B incidental harassment criteria will be identified as the "TTS-Energy" and "TTS-12 psi" criteria, respectively, hereafter. The "TTS-Energy" criterion applies to the received signals in the highest 1/3-octave band produced by a source. For mysticetes (i.e., baleen whales, see glossary), 1/3-octave bands above 10 Hz are considered, while for odontocetes (i.e., toothed whales/dolphins, see glossary) 1/3-octave bands above 100 Hz are used. The "TTS-12 psi" peak pressure criterion effectively uses the pressure from all frequencies. The maximum range (or radius) from the source where these TTS criteria are met defines the zone of influence (ZOI) for incidental harassment (Level B) for a single explosion.

TTS was accepted as the Level B (i.e., "harassment" criteria) for the *U.S.S. Seawolf* and *U.S.S. Churchill* FEISs because the actual explosion planned for those tests were a one time occurrence and effectively, the potential "startle" reaction from a single explosion was not considered a "behavior" harassment. TTS was identified and accepted as a better metric of Level B harassment in those documents. The applicability of a similar assumption and utilization of TTS for the Level B criteria for this document can be questioned since a typical day of harbor excavation may consists of probably no more than 2 explosive events over a 12 hour period (i.e., per day assuming daytime construction only). However, the case can made that infrequent use of explosive precludes the same animal from being present (i.e., in the vicinity) for more than one blast; therefore, the use of TTS as the Level B criterion is reasonable.

The *U.S.S. Seawolf* and *U.S.S. Churchill* criteria also define dual-injury criteria (MMPA Level A injury) for marine mammals as follows:

- 50 percent Tympanic Membrane (TM) rupture.
- Onset of slight lung injury.

These dual Level A injury criteria will be identified as the "Injury-Energy" and "Injury-Positive Impulse" criteria, respectively, in this document.

The 50 percent TM criterion was based on experiments with terrestrial mammals, which had been exposed to detonations (in water). This recognizes that a "TM rupture *per se* is not necessarily a serious or life-threatening injury, but is a useful index of possible injury that is well correlated with measures of permanent hearing loss." The EFD associated with 50 percent TM rupture was established as "1.17 in-lb/in^2 (20.44 milli-joules/cm^2"). Note that in SI units this is equivalent to 204.4 J/m^2, or EFD level of approximately 205 dB re $(1\mu Pa)^2 \bullet s$, where specific impedance of water has been set equal to $\rho c = 1.5 \times 10^6$ $kg \bullet m^{-2} \bullet s^{-1}$.

The onset of slight lung injury for a small animal (e.g., a dolphin calf) has been calculated using the *U.S.S. Churchill* FEIS (DoN 2001) methodology and is indexed to 13 psi-ms for a 27 lb (12.2 kg) animal on the surface. This is the conservative case since the positive impulse needed to cause injury is proportional to animal mass and therefore larger animals require higher impulse to cause the onset of injury. The methodology used in the *U.S.S. Churchill* FEIS (DoN 2001) is usually referred to as the "Goertner modified positive impulse method" and two different time criteria are used to calculate the positive impulse at any range. The first is the time interval between the direct path arrival and the surface-reflected arrival from the explosion to the position of the animal. The other time interval is 20 percent of the lung volume resonance period for the animal's length/mass and it is calculated at the animal's depth. The lesser of these two time periods are used in the calculations as recommended by Goertner (1982). Since all of the explosions proposed in this document occur approximately 10-15 ft (3.0-4.6 m) below the surface in solid rock, there is no methodology to use the Goertner approach to calculate positive impulse. Thus this criterion is not applicable and can not be exceeded.

It should be noted that all of these impulsive criteria are for a single explosion. Methodologies have been devised to extend these criteria to multiple explosives (DON, 2004 and Federal Register 22Apr2004). Effectively, those criteria which involve energy determine the size of their zone of influence by summing the energy from subsequent explosions. However, since the explosion proposed here occur typically separated by six or more hours, it is very unlikely that the same animals will be present nearby. Therefore, this energy addition is not necessary.

The sea turtle safety range calculations used in the *U.S.S. Seawolf* and *U.S.S. Churchill* FEISs are not used here because these explosions are in rock, do not produce a bubble (and the subsequent lower frequency acoustic energy spectrum), expend much more of their energy in mechanical rock breaking, the explosion is distributed three dimensionally and partially vented to the atmosphere. Those calculations would be too conservative to reasonably represent this situation. For the purposes of this report, the dolphin potential impact levels are assumed adequate for sea turtles too.

In-Water Coherent Source Criteria

In-water coherent source criteria commonly in use today are based on studies which began to be published in 1997 and continue to this day. "Behavioral Responses and Temporary Shift in Masked Hearing Threshold of Bottlenose Dolphins, *Tursiops truncatus*, to 1-second tones of 141 to 203 dB re 1 μPa" (Ridgway et al. 1997) is one of the first of a series of comprehensive studies of the effect of underwater acoustic noise on marine mammals. During this study, researchers observed behavioral modifications and temporary shifts in the hearing sensitivity of bottlenose dolphins exposed to 1-second tones at frequencies between 3 and 75 kHz. More recent work (Schlundt et al. 2000) extended the data to 400 Hz, included work with beluga whales, and used masking noise to create a consistent ambient noise environment. The conclusions of these studies are that temporary shifts in the hearing levels of odontocetes were observed at the average

RLs of 195 dB.

A re-evaluation of the results in these studies has produced an as-yet unpublished (either in peer-reviewed scientific papers or as Regulator/NMFS-reviewed environmental compliance documents) estimate of 190 dB as a threshold for changes in behavior. Additionally, NOAA/NMFS is working to define and publish criteria for Level A and Level B harassment. However, those criteria are not yet available. Therefore, for the purpose of this analysis, the 190 dB change in behavior criteria will be assumed as an appropriate reference value representing Level B harassment sound pressure.

Current thought is that total received energy may be a more appropriate metric for determining the RLs at which "Change in Behavior," "Temporary Threshold Shift (TTS)" and "Permanent Threshold Shift (PTS)" occur. By using a total received energy approach, both pulse-length and multiple received pulses are accounted for. For cetaceans (i.e., whales, dolphins and porpoises – see glossary), the selected levels for these metrics that were used in the impact analyses are as follows:

Change in Behavior (Level B):	190 dB re $(1\mu Pa)^2 \cdot s$
Temporary Threshold Shift:	195 dB re $(1\mu Pa)^2 \cdot s$
Permanent Threshold Shift (Level A):	215 dB re $(1\mu Pa)^2 \cdot s$

<u>In-Water Broad-Band (Non-Impulsive) Source Criteria</u>

In-water impulsive source criteria commonly in use today are: a) Level A sound pressure level (SPL) for pinnipeds of 190 dB re 1µPa, b) Level A sound pressure level (SPL) for cetaceans of 180 dB re 1µPa, and c) Level B sound pressure level (SPL) for all species of 160 dB re 1µPa. The Level A criteria are commonly used for pile driving Incidental Harassment Authorizations (IHA) (e.g., Federal Register, 2007, Federal Register 2006a), while both Level A and B criteria are cited for pile driving and seismic exploration (airgun work) (e.g., Federal Register, 2006b, Federal Register, 2002). For this analysis, these criteria are used, assuming that they are for a one second equivalent signal.

Since several of the noises produced during the construct (e.g., drilling and dredging) are: a) broad-band signals, b) typically longer than 1 second in length, and c) non-impulsive in nature (i.e., that do not contain a shock wave like explosives), their equivalent energy source level will need to be calculated by summing their acoustic energy over the length of the signal using the equation:

$$SL(energy) = SL\ (pressure) + 10 * LOG\ (duration\ of\ the\ signal)$$

For example a hydraulic excavator with an in-air, A-weighted, pressure source level of 98 dBA re 20 µPa @ 1 m, may excavates for 10 seconds and the takes 20 seconds to reposition. Its equivalent in-water energy SL is 134 dBA re 1 μPa^2-s @ 1 m (i.e., 98 + 26 + 10*LOG(10s) = 98 + 26 + 10 = 134), assuming a perfect transfer of in-air energy into

the water.

<u>In-Air Broad-Band Source Criteria for Pinnipeds</u>

A conservative estimate of SEL at which TTS may be elicited in harbor seals, California sea lions and northern elephant seals has been determined to be 145 dB re 20μPa^2-s and 165 dB re 20μPa^2-s, respectively (Federal Register, 2007b). For this analysis, a Level A threshold for Hawaiian monk seals is assumed to be 165 dBA re 20μPa^2-s. Additionally, SEL of 100 dBA are identified as the disturbance (i.e., Level B) criteria for hauled out elephant seal, harbor seals, and California sea lions. Thus, a SEL of 100 dBA is assumed to be the Level B threshold for Hawaiian monk seals and other marine mammals. Additionally, this value will be used conservatively for sea turtles which are basking or beached. (Otherwise sea turtles are assumed to spend less than 1% of their time with their heads above water, so in-water thresholds should apply then.)

1.3 Planned Operations and Explosives Employment

During the proposed construction of the Kona Kai Ola 800 slip small boat harbor, there will be numerous sources of anthropogenic noise. For the purpose of this analysis, only the three loudest sources are examined. They are: a) explosive blasting of the harbor, b) mechanical dredging of the broken rock, and c) the drilling of piling hole. Numerous other sources will be present, including: jackhammers, vehicle, pneumatic tools, backhoes, etc, but these sources are all nominally 8-10 dB less in source level than the three selected above. The following is a discussion of the source level for each of these three sources.

<u>Explosives</u>

The excavation of the Marina Basin will employ blasting with a standard explosive (usually ammonium nitrate boosted with a petroleum based fuel). The rock to be blasted is drilled with 3" or 4"diameter holes to a depth of 10' to 20'. The holes are drilled on a grid spacing of 7' by 7' or 8' by 8' depending on the toughness of the material being removed and are filled with the explosive. Each hole is set to detonate in a pattern to most efficiently break up and remove the material to be excavated. Time delays on the order of milliseconds are used to realize the correct blast pattern and to minimize ground vibrations and air shock waves. Total weight of explosives used per drilled hole typically varies from 30 to 60 pounds, and for each blast ranges from 3,000 to 7500 pounds (Moffatt and Nichol, 2007).

The explosive is detonated near the top of the hole and burns downward at several thousand meters per second. While the shockwave precedes outward in all directions horizontally it essentially forms a downward beam vertically. The direction of this beam relative to the vertical is a function of the relative burn speed to the speed of sound in the material surrounding the ballast hole. Since the times of detonation of the individual holes are time delayed the pressures do not add and therefore in the far field because each shock wave has already passed and dissipated before the next hole is detonated. Therefore, the highest pressure achieved in any blast is no more than that created by a single hole of explosives. The material to be removed from the basin is on the order of 2.8 million cubic yards and if it all needs to be blasted to break it free of the bedrock. Therefore, it will take about 500 blast fields of 120 blast holes per field to complete the job.

The resulting acoustic energy from a blast is transmitted through the air, ground and water. For a single explosive in water, numerous tests have been performed to quantify the source level produced as a function of the Net Explosive Weight (NET). NET is defined as the equivalent weight of TNT that the explosive material represents. It was estimated that the largest explosive source used in this project will be 120 holes, with each hole containing 60 pounds NET. The worst case was assumed wherein the blast holes were in water. The resulting Source Level (SL) is found as follows from a formula given by URICK (1982) for in-water explosions as follows:

$$\text{Pressure} = 2.16 \times 10^4\,((\text{NET})^{1/3}/3.182)^{1.13}$$

This is the pressure produced by a single hole in pounds per square inch (psi) at a range of 1 meter (3.182').

$$\text{Pressure} = 2.16 \times 10^4\,((60)^{1/3}/3.182)^{1.13} = 27{,}296 \text{ psi} = 1.9 \times 10^{14}\ \mu\text{Pa}$$

$$\text{SL} = 20 \log P = 280.3 \text{ dB re } 1\ \mu\text{Pa @ 1m.}$$

This estimate of the source level is conservative because it assumed a single point explosion where if fact the explosive in a drill hole is spread out over 10' to 20'of depth.

While SL is a measure of the intensity in an acoustic pressure wave another parameter called Energy Flux Density (EFD) is also of importance in determining the effects on marine mammals.

For plane waves in sea water, EFD is the time integral of the squared pressure divided by the acoustic impedance of sea water. For simplicity it can be assumed the acoustic impedance is the same throughout the sound field. EFD has units of joules per meter squared or pound force per square inch. In-water EFD levels are by convention expressed in "dB re 1 μPa^2-s" (Urick, 1983). For a NET of 60 pounds the resulting total EFD is 245.6 dB re 1 μPa^2-s @ 1m. This value is also know as the Energy Source Level (ESL). The highest 1/3rd octave EFD is 235 dB re 1 μPa^2-s @ 1m for a frequency of 200-234 Hz. The total energy (EFD) for all 120 blast holes is 265 dB re 1 μPa^2-s and the highest 1/3rd octave is 255 dB re 1 μPa^2-s.

All of the above explosive source level calculation are for in-ground or in-water conditions. The actuality of the Kona Kai Ola site is that effectively all of the bedrock is

old lava flows that have numerous cracks and pockets throughout its structure. Core drill samples of the site show that effectively all rock at an elevation of 0.0 feet or below is essential filled with water. The in-air SL for an explosion just above a blast hole is estimated by: a) starting with the in ground SL, b) reduce it by the spherical spreading of the energy as it propagates upward through the rock (e.g., -7 dB), c) approximate the energy loss crossing the ground/air interface (e.g., -10 dB) and d) correcting for the normal in-air reference units (-26 dB). Therefore, the in-air explosive SL is:

$$\text{SL (in-air)} = 280.3 - 7 - 10 - 26 = 237.3 \text{ dB re } 1\ \mu\text{Pa @ 1m}$$

Dredging and Rock Drilling

Moffatt and Nichol Inc. the contractor designated to complete the harbor excavation provided in-air source levels for their rock drills and hydraulic excavators. The nominal, in-air SL value that were provided for these activities are 96 and 86 dBA re 20 μPa @ 1m respectively for the rock drills and the excavators. These values were measured in-air. Correcting these values to what the in-ground SLs are, is the reverse of the process above for explosives with one additional correction to remove the A-weighting (assuming a 200 Hz signal a 11 dB correction is added). Therefore their in-ground SLs are: 150 and 140 dB re 1 μPa @ 1m.

It should be noted that each source has two different source levels depending on the medium that the sound will be traveling through. The values shown here are based on the empirical formulae that have been derived historically for explosions in air and in water. Since the acoustic impedance of soil is similar to that of water, the empirical formulae for water are also used for the ground paths. For the water and ground paths, the empirical formulae for ordnance detonations were identified by Arons (1949) and repeated in Richardson (1995). For the air paths, the procedure in ANSI standard S2.20 was used.

As previously discussed in Section 1.2 of this report, under the "In-Water Broad-Band Source Criteria" sub-section, the duration for a single dredge haul is estimated at 10 seconds, with 20 or more second of repositioning time. Thus about 10 dB needs to be added to both dredging SLs to correct for their length.

Similarly, the drilling SLs need to be corrected for duration. The following information was provided by Moffatt and Nichol (Moffatt and Nichol, 2007):

> "Approximately 500 marina guide piles are anticipated for the 800-boat, 45-acre marina. Typical depth of pile is estimated to be 10 ft deep into the basin floor. The piles will need to be drilled and grouted in to place from a truck mounted drill rig (either staged on land or from a small barge). Drilling production rates are anticipated to be at a rate of approximately 3 vertical linear feet per hour for a 2 in. diameter hole, or 3 piles per day per

rig. If two rigs are assumed to be on site, the duration would be 84 working days assuming a 10 hour day; with four rigs, 42 working days, etc"

For the purpose f this analysis, it is assumed that there will be typically two rigs working throughout most of the project, therefore it will take about 84 days to complete the drilling. Also, it is assumed that these rigs are widely separated in the harbor and that their acoustics energies do not add. It is planned and assumed in this analysis that all drilling will be completed prior to the remove of the dam, thus no marine animals should be in the immediate vicinity of the drilling. But animals on the beach or just offshore could potentially be exposed for a period of time prior to moving away. A 600 s (or 10 minute) period of time was selected as a reasonable maximum period, during which an animal could be exposed before moving away. This would add 27.8 dB (i.e., 10* Log(600)= 27.8 dB) to the drilling source levels.

Table 1, is a summary of the unweighted, in-air and in-water/ground SLs used for the three examined source types for the remainder of this analysis.

Table 1: Estimated Source Levels

Source Type	Unweighted In-Air SL (pressure in dB re 20 μPa @ 1m) (energy in dB re 20 μPa^2-s @ 1m)	Unweighted In-Water/Ground SL (pressure in dB re 1 μPa @ 1m) (energy in dB re 1 μPa^2-s @ 1m)
Explosives	237.3 (peak pressure) 222.0 (total energy/blast) 192.0 (1/3 octave energy/blast)	280.3 (peak pressure) 265.0 (total energy/blast) 235.0 (1/3 octave energy/blast)
Rock Drilling	134.8 (peak pressure)	177.8 (peak pressure)
Dredging	107.0 (peak pressure)	150.0 (peak pressure)

2.0 MODELING METHODOLOGY

Acoustic propagation models were used to predict the in-air and in-water noise levels for each type of noise. In general, these models utilize various approaches (i.e., solutions or approximate solutions of the wave equation) to estimate the effects of the transmission medium and boundaries on an acoustic signal transmitted at a source and "heard" at a receiver. Typical environmental effects include attenuation, reflection, refraction and result in modification of the signal as it propagates to the receivers.

2.1 Airborne Transmission Modeling

The model used to estimate in-air acoustic propagation was the Navy Standard Comprehensive Acoustic System Simulation (CASS) / Gaussian Ray Bundle (GRAB) model (Keenan, 2000). This model is a range dependent program that computes the TL associated with the potential propagation paths between a source and a receiver. Gaussian Beam models have been demonstrated to successfully model the complex atmospheric sound propagation (Gabillet, 1993). The underwater acoustic model identified here was modified to account for the differences between air and water propagation.

TL is the loss in intensity of sound as it travels from the position of the event to the position of the prediction point. TL in air is greatly affected by temperature, humidity, wind speed and direction, and most particularly by obstructions and vegetation. Consequently, the TL can have a large variance depending on the aforementioned parameters. Likewise, in water, TL is affected by temperature, salinity, pressure, wind speed, and surface roughness.

Due to the variability of these environmental parameters, it was necessary to examine them both seasonally and diurnally. The details of those investigations are provided in Section 3.1, but for the purposes of understanding the overall modeling it should be understood that conservative values (i.e., cases that result in relatively low TL and higher RL at the modeled sites) were utilized throughout the modeling. It should be noted that the typical construction day begins at daybreak and continues for about 12 hours, completing at about 18:00 PM, local time. Although night work could continue under lighting, this analysis assumed all work occurred during daylight hours. Therefore nighttime environmental factors were not closely examined. However, a brief examination of them showed that relatively small changes in predicted TL may occur.

For the modeling reported on here, a single air radiosonde profile was selected for the numerous model runs. This profile was from the summer season (August). It was selected because it showed the strongest near surface ducting or trapping of acoustic energy near the ground. All other profiles showed more near surface warming which resulted in upward refracting of acoustic energy, and greatly reduced predicted levels at the modeled receiver sites. Effectively, for these other cases, any anthropogenic, near-surface noise rapidly refracts (bends) upward and propagates into the atmosphere with minimal energy returning to the ground at the receiver points.

Since the Navy Standard CASS / GRAB model is a range dependent model (i.e., it is able to incorporate the effects of new environmental data in the TL estimations from the source to the receiver), critical environmental data such as ground elevation were digitized on a grid with a resolution of approximately 000 yards (91.4 m).

2.2 Seismic (In-ground) Modeling

Noise propagated via the ground to the water

An analysis was performed to determine the TL of seismic energy transferred from the detonations of high explosives, via the ground and coupled into the ocean. The energy transferred from a detonation will produce a shockwave in the rock around the explosion. The energy in this shockwave while in the earth is called "seismic" energy. Unlike acoustic energy in air or water, both being transferred via a single wave mechanism, seismic energy is contained in two different wave mechanisms consisting of compressional waves (P-waves – see glossary) and shear waves (S-waves – see glossary). For the weathered surface layer on land (soil), the velocity of the P-waves are about 500 m/s in loose soil and about 2500 m/s in consolidated sands and sediment under the water, and about 4000 m/s in limestone (coral). For the basalt, encountered by the drilled cores of this site (MACTEC, 2006) the sound velocity was estimated at 5,300 ms (USGS, 1985 and Hamilton, 1980). Additionally, this basalt was found to have a vesicles volume percentage of between 2-10 % and an attenuation value of 0.02 dB/km.

For the acoustic modeling of the ground, the basic basalt acoustic parameters were used, but a nominal 5% vesicle volume value was used. The vesicles were assumed to be 100% sea water with a sound speed corresponding to that measure at the same depth from an offshore sound velocity profle.

As was done for air, the CASS/GRAB model was implemented to examine the ray-paths and transmission loss resulting from sound propagation through the lava as it proceeds to the ocean. Conservatively, the great variance in the seismic propagation was ignored. For example, a layer of "dark gray, poorly graded sand" encountered at a depth of about 60 ft below sea level was not modeled, not were the presence of air or gas vesicles in the basalt. The effect of ignoring these scattering mechanisms is to underestimate TL and thus conservatively estimate the sound field at any point.

The resultant TL is equally applicable to both pressure and energy calculations.

2.3 Modeling of Airborne Transmission into the Ocean

Propagation of acoustic energy from air into water has been by examined by numerous studies which have attempted to predict this propagation in the presence of waves, water-entrained bubble plumes, biologics, etc. In the simplified case of a flat (i.e., waveless) ocean, the most important parameter controlling air to water transmission is the relative difference of the sound speeds of air and water (Urick, 1983 and Richardson 1995). Effectively, because the speed of sound in water is nearly five times that of sound in air, only sound waves striking the ocean at very steep angle can penetrate into the ocean. The angle that separates the sound that penetrates into the ocean from that which does not, is called the "critical angle." Typically, this critical angle is about 11.5° from the vertical. This means that any sound striking the ocean from an angle greater than 11.5°, is almost entirely reflected off the oceans surface and back into the air. A very small portion of the energy may "effervesce" into the ocean, but this would only be a few percent of the total energy and it would be a greatly reduced level (i.e., 20-40 dB or more reduction in the level of the incident sound level).

It must be remembered that the above discussion is for an idealized calm, flat ocean. In the presence of waves, the normal vectors to the waves' surfaces (i.e., the vertical line which points away from the wave for that particular point on the wave's surface) vary over the surface of the wave and with the size and shape of the wave. This is analogous to the "glints" of sunlight seen on the ocean in the presence of waves.

For moderate sea states, typical in the vicinity of the Kona Kai Ola project site (i.e., sea states from 0 to 3, with wave heights less than 1.25 m (4 ft) (Bowditch 1995)), it is conservatively estimated that only about 10% of the in-air sound enters the water (McCormick, 1972). This is effectively a 10 dB reduction of the acoustic signal as it penetrates into the ocean at angles greater that the critical angle with the flat ocean. At higher sea states (i.e., sea states from 4 or 5, with wave heights 1.25 – 4 m (4-13 ft)), perhaps 20% of the in-air sound enters the water (i.e., a 7 dB reduction of acoustic energy). For even higher sea states such as can occur with high gale or hurricane winds, crashing waves and entrained air bubble plumes effectively limit sound transmission into the water.

2.4 In-Water Modeling

The Navy Standard Comprehensive Acoustic System Simulation (CASS) / Gaussian Ray Bundle (GRAB) model (Keenan, 2000) was also used to model in-water acoustic propagation. This model has been extensively tested and validated for in-water acoustic modeling, and as part of the Navy's Oceanographic and Atmospheric Master Library (OAML) it has be validated for frequencies as low as 50 Hz to over 100 kHz.

3.0 ENVIRONMENTAL AND SOURCE PARAMETERS

3.1 In-Air Parameters

The most critical environmental parameter in determining the atmospheric propagation is the speed of sound in the atmosphere for the Kona Kai Ola project site. The National Climatic Data Center (NCDC), a part of the National Oceanic and Atmospheric Administration (NOAA), maintains an archive of radiosonde data (NOAA, 2004) that includes all of the information required to calculate the sound speed in air as a function of altitude (i.e., altitude, temperature, dew point temperature, air pressure and wind speed and direction) for numerous site throughout the US.

In that database, the closest site in the Hawaiian Islands to the Kona Kai Ola site is the Hilo, Hawaii site. Radiosonde data were extracted for Hilo for the following months as representative of the seasons in parentheses:

February 2007	(winter),
May 2007	(spring),
August 2006	(summer),
November 2006	(fall).

From each month, two typical and representative day-time profiles were identified and used in subsequent analyses. Figure 2 shows the selected sound speed profiles, while Figure 3 is a close up of the lowest 1,000 m (3,281 ft) of those profiles. These sound speeds were derived from the NCDC radiosonde data using the equations identified by Cramer (1993). All data start at an elevation of 10 m (33 ft) because this is the elevation of the Hilo site. For this modeling analysis, it was assumed the trend of sound speed continued linearly to sea level and the lowest altitude sound speed slope was therefore extrapolated to an elevation of zero.

In Figures 2 and 3, all of the sound speeds generally show a decrease as altitude increases. This would cause acoustic energy to refract upwards. However, of the sound speeds also have a slight increase in speed for the elevations up to about 200 ft (61 m). This configuration could cause a near surface duct or trapping of sound. Conservatively, the August sound speed profile was used in all subsequent modeling since shows the strongest duct and it would provide the most acoustic energy arriving at the receiving sites. Combinations of wind, turbulence, and density differences and other scattering mechanisms in the air could allow acoustic energy in these other profiles to reach the receiver sites, but they would be expected to have been reduced by 5-10 dB or more from the August propagation which best allows energy to be trapped near the ground.

It should be noted that although these radiosondes are from the Hilo site, they appear to be fairly representative of the island of Hawaii.

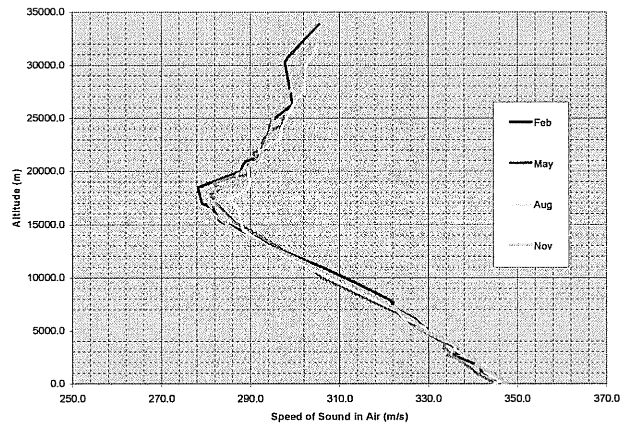

Figure 2 Sound Speed in Air for Hilo Site

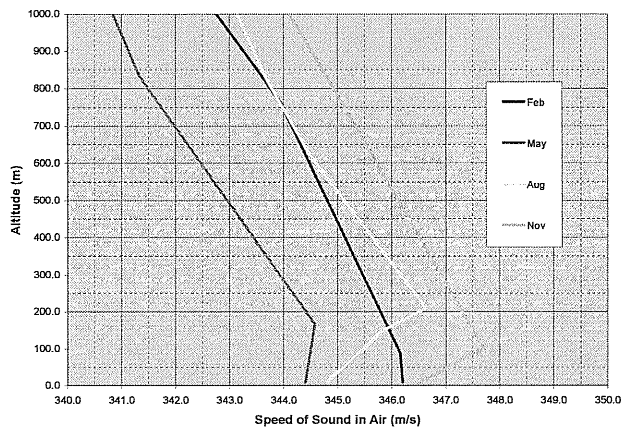

Figure 3 Enlargement of Sound Speed in Air for Hilo Site

The final in-air environmental parameter that needs to be addressed is the plant and tree ground cover for the area. For the modeled area three types of ground cover were assumed: grass, sand, and water. The ground attenuation for the grass, sand, and water categories was conservatively assumed to be zero. This appears to be a conservative value since there is some vegetation present in photographs of the area.

3.2 Seismic Parameters

At the Kona Kai Ola project site, seismic propagation occurs in the following materials and at the listed speeds of sound used in this analysis:

Speed of sound in loose soil/sand:	500 m/s
Speed of sound in loose basalt rock and sand:	2500 m/s
Speed of sound in basalt:	5300 m/s

3.3 In-Water Parameters

The primary water parameters required for the CASS/GRAB acoustic modeling were the sound velocity profiles (SVPs), the bathymetric contours and the ocean surface conditions,

The SVPs were obtained from the Generalized Digital Environmental Model (GDEM), Web Version 3.0, Database Version 3.0 (GDEM, 2007). The site selected for these profiles was 19.3°N 157.0° W. Figure 4 shows representative SVPs for each of the four seasons, while Figure 5 provides an enlargement of the upper 500 ft (152 m) of ocean. Effectively the SVP is an iso-velocity sound speed in the shallow depths throughout most of the year.

The bathymetry used was hand digitized from National Oceanic and Atmospheric Administration (NOAA) charts available in the MAPTECH , Region 40 nautical chart pack. The bathymetry was hand digitized to a resolution of 100 m grid using the best charts available in the MAPTECH package.

The ocean surface parameter selected was a mild wind of 5-10 knots.

The in-water receivers are modeled at a depth of 10 ft (3.1 m).

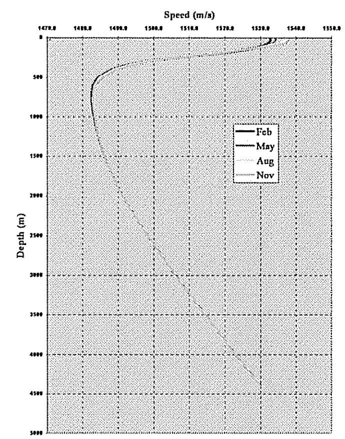

Figure 4: Sound Speed in Water for the Site

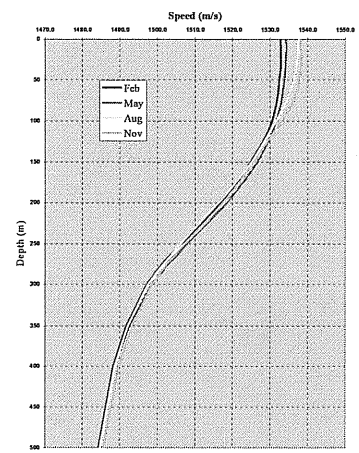

Figure 5: Enlargement of Sound Speed in Water for the Site

4.0 AIM MODELING

For the in-water integration the propagation of the acoustic energy from the explosive blasting and the distribution and movement of marine animals, the Marine Acoustics, Inc. (MAI) developed Acoustic Integration Model (AIM©) was used. In 1998, AIM© was endorsed by peer review at both the NMFS Acoustic Criteria Workshop and SURTASS LFA Sonar Scientific Working Group; additional details concerning AIM© can be found in "*Application of the Acoustic Integration Model (AIM) to predict and minimize environmental impacts*" (Frankel, et al., 2002). In 2006 -2007 a review was conducted of AIM by the Center for Independent Excellence at the behest of NOAA. The final report of that review was submitted to Dr. Stephen K. Brown (Stephen.K.Brown@noaa.gov) this year and is awaiting publishing.

AIM has the capability to use many standard acoustic propagation models. For this project the U.S. Navy standard Parabolic Equation (PE) model was selected for the in-water propagation. The results of this acoustic model had been compared with those produced by CASS/GRAB for several important depth cases, and the results were comparable (i.e., nominally within about 2-3 dB).

A listing of the marine mammals expected to visit the Kona Kai Ola project area along with their expected densities is provided in Table 5. The estimation of animal densities is a critical parameter in the estimation of potential impacts and it therefore receives a thorough review of the most current data available by the MAI biologists before the modeling is performed. There are two sources with slightly different density data for some species, which were used to derive the densities in Table 5. Typically, the average of the two densities was used. However, when only one source was available, it was used.

The Acoustic Integration Model © (AIM) uses simulated animals, called animats, in its simulations to predict acoustic exposure as a result of activities associated with the construction of the Kona Kai Ola project. The movements of animals is recreated in the simulation as an animat, and each animat monitors the received sound level. Different animals will experience the environment differently, as so do the animats. In this way, specific-species exposures can be predicted.

All of the movement parameters (e.g., speed, depth of dive) for each of the animats was taken from the existing document on Animal Behavior (Frankel and Vigness-Raposa 2006). The animats were limited to move within a defined subarea, to prevent the animats from moving away from the source of sound, and potentially reducing its predicted impact. That subarea was defined to the north by the 20° N latitude line and to the south by the 19° 10' N latitude line. The western boundary was 156°30' W and the eastern boundary was the coastline. A listing of the movement parameters used in this analysis appears in Table 2.

Table 2: Representative Marine Mammal Behavior Modeling

Species	Depth Range	Approx. Portion of Time in Depth Zone	Range of Course Changes	Average Speed
Bottlenose Dolphins	0 – 5 m	40%	0 – 30°	12 km/hr
	5 – 15 m	5%	0°	12 km/hr
	15 - 200 m	55%	0 – 30°	15 km/hr
Beaked Whales	0 m	10%	0 – 10°	5 km/hr
	5 – 120 m	5%	0°	5 km/hr
	120 - 1453 m	85%	0 – 30°	11 km/hr
Sperm Whales	0 – 10 m	12%	0 – 20°	2 km/hr
	10 – 300 m	5%	0°	2 km/hr
	300 - 1453 m	83%	0 – 10°	12 km/hr
Fin Whales	0 – 5 m	6%	0 – 20°	8 km/hr
	5 – 50 m	2%	0°	8 km/hr
	50 - 100 m	92%	0 – 10°	8 km/hr

Within this subarea, the depth preferences of each species was set to best approximate their natural local distribution

Humpback whales were limited to depths greater than 10 meters, to keep them in the water, and the offshore limit was 200 meters. The offshore depth limit is based on numerous reports that indicate that most whales are found within the 100 fathom line (Mobley et al. 1999; Mobley 2004).

In some cases, there are insufficient data to create animats for individual species. In these cases, it is necessary to "lump" data from similar species to create a composite animat. This was done for shortfin pilot whales, melon-headed whales and pygymy killer whales, which were modeled as "blackfish". False killer whales have been included in this grouping in the past. However, recent data indicate that false killer whales may dive less deeply than other species (Ligon and Baird 2001; Alves et al. 2006). Therefore, they were split into a separate group. All of these species are typically found in deeper water, and therefore these animats were programmed to remain in water deeper than 100 meters.

Bottlenose dolphins were limited to waters between 10 and 1,000 meters in depth. Bottlenose dolphins are typically considered shallow water animals (Cañadas et al. 2002), but the narrow shelves of Kona led to an increase in the allowable depth. Furthermore, the majority of Bottlenose dolphins in Hawaii were seen within the 1000 meter contour (Mobley et al. 2000; Baird et al. 2006a).

Most rough-toothed dolphins and, Risso's dolphins in Hawaii were seen in waters deeper than 1000 meters during aerial surveys (Mobley et al. 2000). However, this value was reduced to 500 meters, to allow for occasional forays into shallower water.

Kogia distributions were limited based on (Baird 2005) which found Kogia in waters between 600 and 3,200 meters. These limits were expanded to 400 and 4,500 meters to allow for variations in behavior.

Sperm whales were limited to 1,000 meters, as they are only found offshore off Kona.

Killer whales were allowed to roam from 10 to 4,500 meters, since they could potentially feed on any species.

Monk seals were allowed to move between 10 and 1,000 meters. They were limited from further offshore movement, since they are benthic feeders, and are known to dive to depths in excess of 500 meters (Parrish et al. 2002).

Beaked whales were limited to depths of 400 metes or deeper. Beaked whales in Hawaii have been seen in water 633 meters deep (Baird et al. 2006b), and this value was made slightly shallower to allow for occasional nearshore forays.

Striped and Spotted dolphins followed the normal Stenella behavioral pattern. However, for Kona, daytime and nighttime spinner dolphin animats were created. Daytime spinners were limited to water depths of 100 meter or less, while the nighttime spinner dolphin animats were restricted to water depths between 50 and 4,500 meters, which is when they forage offshore.

AIM model runs were not conducted for sea turtles, because of the lack of density values for these species. If they become available, these runs could be completed at a later date.

5.0 RESULTS

The results from the atmospheric propagation model include ray plots and TL plots for each source/receiver combination. A sample of ray plot is provided for an explosive source at source site #1 and receiver sites #5 (the final channel buoy) as Figures 4. The up-ward refracting rays are very obvious, but also the rays trapped near the ground can be seen for the few rays that start out at near horizontal angles.

Figure 5 shows a representative TL curve for the case of a source at source site #1 and received at receiver site #5. The TL curves for five different elevations are shown: sea level, 50, 100, 200 and 500 ft above sea level. Finally, this figure shows the TL for the completely airborne transmission path between the source and the receiver at sea level. The distance between source site #1 and receiver site #5 is 0.27 nm (0.5 km). TL for this path is found by: a) entering the figure at a range value of 0.27 nm, b) moving up to the intersection with the 0 ft elevation curve (the height of receiver #5), as is shown by the red dotted line, and c) reading the TL as shown by the solid red line. The resulting TL is 102 dB. This TL value and those for each source/receiver combination are provided in Table 3.

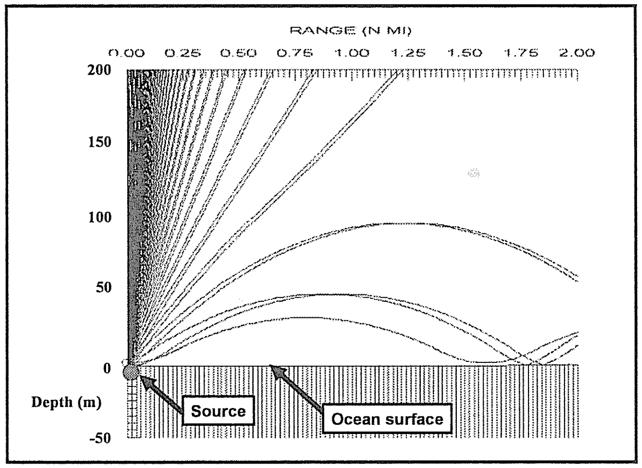

Figure 6: Ray Plot from the Explosives Source Site #1 to Receiver Site #5

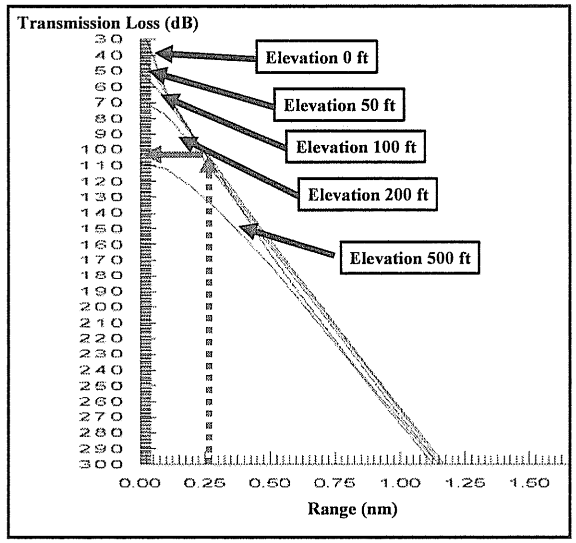

Figure 7: TL Plot from Source Site #1 to Receiver Site #5

Source	Receiver	TL (dB) to a Receiver in: Air	Water
1	1	70.0	55.0
	2	80.0	101.0
	3	110.0	89.0
	4	130.0	107.0
	5	102.0	86.0
2	1	95.0	77.0
	2	97.0	98.0
	3	105.0	87.0
	4	122.0	102.0
	5	116.0	112.0
3	1	138.0	112.0
	2	138.0	133.0
	3	117.0	98.0
	4	110.0	89.0
	5	149.0	138.0
4	1	100.0	81.0
	2	116.0	112.0
	3	140.0	114.0
	4	157.0	128.0
	5	138.0	114.0
5	1	108.0	87.0
	2	115.0	111.0
	3	128.0	104.0
	4	139.0	113.0
	5	130.0	124.0
6	1	145.0	116.0
	2	156.0	146.0
	3	152.0	120.0
	4	145.0	116.0
	5	175.0	155.0
7	1	70.0	55.0
	2	71.0	57.0
	3	117.0	98.0
	4	149.0	118.0
	5	109.0	91.0

Table 3: Transmission Loss for Source / Receiver Combinations

Table 4 provides the resulting RLs at each receiver site for each of the sources sites. The sources have been broken up by type (i.e., explosives, drilling, and dredging), and also by the location of the receiver at each site (i.e., the receivers for the three "In-Air" columns are located 1 ft (0.3 m) above the ground, while the "In-Water" receivers are 10 ft (3.0 m) deep in the water). The values in this table were derived by convolving the SLs from Table 1 with the TL from Table 3 and the correct conversions for reference pressure, and weighting.

		In-Air RL (dBA re 20 uPa)			In-Water RL (218 dB re 1 uPa)		
Source	Receiver	Explosives	Drilling	Dredging	Explosives	Drilling	Dredging
1	1	156.3	Amb.	Amb.	225.3	111.8	95.0
	2	146.3	Amb.	Amb.	179.3	65.8	Amb.
	3	116.3	Amb.	Amb.	191.3	77.8	61.0
	4	96.3	Amb.	Amb.	173.3	59.8	Amb.
	5	124.3	Amb.	Amb.	194.3	80.8	64.0
2	1	131.3	Amb.	Amb.	203.3	89.8	73.0
	2	129.3	Amb.	Amb.	182.3	68.8	Amb.
	3	121.3	Amb.	Amb.	193.3	79.8	63.0
	4	104.3	Amb.	Amb.	178.3	64.8	Amb.
	5	110.3	Amb.	Amb.	168.3	Amb.	Amb.
3	1	88.3	Amb.	Amb.	168.3	Amb.	Amb.
	2	88.3	Amb.	Amb.	147.3	Amb.	Amb.
	3	109.3	Amb.	Amb.	182.3	68.8	Amb.
	4	116.3	Amb.	Amb.	191.3	77.8	61.0
	5	77.3	Amb.	Amb.	142.3	Amb.	Amb.
4	1	126.3	Amb.	Amb.	199.3	85.8	69.0
	2	110.3	Amb.	Amb.	168.3	Amb.	Amb.
	3	86.3	Amb.	Amb.	166.3	Amb.	Amb.
	4	69.3	Amb.	Amb.	152.3	Amb.	Amb.
	5	88.3	Amb.	Amb.	166.3	Amb.	Amb.
5	1	118.3	Amb.	Amb.	193.3	79.8	63.0
	2	111.3	Amb.	Amb.	169.3	55.8	Amb.
	3	98.3	Amb.	Amb.	176.3	62.8	Amb.
	4	87.3	Amb.	Amb.	167.3	Amb.	Amb.
	5	96.3	Amb.	Amb.	156.3	Amb.	Amb.
6	1	81.3	Amb.	Amb.	164.3	Amb.	Amb.
	2	70.3	Amb.	Amb.	134.3	Amb.	Amb.
	3	74.3	Amb.	Amb.	160.3	Amb.	Amb.
	4	81.3	Amb.	Amb.	164.3	Amb.	Amb.
	5	51.3	Amb.	Amb.	125.3	Amb.	Amb.
7	1	156.3	Amb.	Amb.	225.3	111.8	95.0
	2	155.3	Amb.	Amb.	223.3	109.8	93.0
	3	109.3	Amb.	Amb.	182.3	68.8	Amb.
	4	77.3	Amb.	Amb.	162.3	Amb.	Amb.
	5	117.3	Amb.	Amb.	189.3	75.8	59.0

Table 4: Estimated Received Levels

Notes: The estimates of Ambient Noise Levels are 55 dB re 20 μPa in-air and 55 dB re 1 μPa in-water

It should be noted at this point that in some cases the above method of calculation will result in a RL that is below the ambient noise level. For simplicity, the overall average ambient noise level for this document are assumed to be 55 dB re 20 μPa for the in-air case and 55 dB re 1 μPa for the in-water case. In Table 4, when the received signal is below these ambient noise level estimates a value of "Amb." is entered on the table, implying that the noise is hidden in the background noise.

As can be seen in Table 4, all RL values for all of the in-water RLs for the explosive sources are below even the MMPA Level A criteria in Section 1.2, which is: a) about 165 dBA for the in-air case, b) an equivalent to about 218 dB re 1 μPa for the explosive in-water case, and c) 180 dB for the non-explosive in-water case. However, the in-air explosive Level A threshold is almost reached for the very short-ranged situation (e.g., sources #1 and 7 to receivers #1 and 2). Additionally, there are many cases where the Level B criteria are exceeded. In Table 4, these cell are color coded red. Please note that the drilling and dredging activities result in fairly low RLs at the receivers, and are often at or below ambient noise.

The red colored cells show conditions where Level B takes could theoretically occur. However, it must be remembered that for a take to occur an animal must be present to receive the acoustic transmission. Further analysis with the AIM model will determine the likelihood of potential impacts occurring.

AIM Impacts Results

Table 5 below shows the results of the AIM model runs. As can be seen there is a negligible probability of any Level A takes of any species, even without any mitigation, because all of the values in the Level A column are "<0.0001" takes. Similarly, the probability of any Level B takes is negligible because the highest estimated Level B take value is 0.0136 (for 100 shots or 0.068 for all 500 shots [explosive blasts]) for humpback whales. However, a note of caution is in order. Since the modeling is based on average densities off the coast of the Island of Hawaii, it cannot predict an unusual occurrence such as a pod of Spinner dolphin that has come into the bay and remains there during a blasting event. While this is a very small probability for any one point in time, it still does happen. If this scenario occurred as a blasting shot was detonated, Level B takes could occur. Therefore, mitigation should be in place to ensure a detonation does not occur unless the bay has been visually observed to be clear of mammals.

Table 5: Acoustic Impact on Marine Mammals

SPECIES (Common name)	DENSITY Animals / km^2	Level A Takes # per 100 shots	Level B Takes # per 100 shots
Blainville's beaked whale	0.00010	<0.0001	<0.0001
Blue Whale	0.00000	<0.0001	<0.0001
Bottlenose dolphin	0.00058	<0.0001	<0.0001
Bryde's whale	0.00019	<0.0001	<0.0001
Cuvier's beaked whale	0.00034	<0.0001	<0.0001
Dwarf sperm whale	0.00714	<0.0001	0.0004
False killer whale	0.00010	<0.0001	<0.0001
Fin whale	0.00000	<0.0001	<0.0001
Fraser's dolphin	0.00417	<0.0001	0.0002
Humpback whale	0.26940	<0.0001	0.0136
Killer whale	0.00014	<0.0001	<0.0001
Longman's beaked whale	0.00041	<0.0001	<0.0001
Melon-headed whale	0.00165	<0.0001	<0.0001
North Pacific minke whale	0.00000	<0.0001	<0.0001
Pantropical spotted dolphin	0.03040	<0.0001	0.0014
Pygmy killer whale	0.00449	<0.0001	0.0002
Pygmy sperm whale	0.00291	<0.0001	<0.0001
Risso's dolphin	0.00241	<0.0001	0.0001
Rough-toothed dolphin	0.00488	<0.0001	<0.0001
Sei whale	0.00000	<0.0001	<0.0001
Short-finned pilot whale	0.01930	<0.0001	0.0009
Sperm whale	0.00080	<0.0001	<0.0001
Spinner dolphin **	0.02565	<0.0001	0.0012
Striped dolphin	0.00310	<0.0001	0.0002
Hawaiian monk seal	0.00000	<0.0001	<0.0001

6.0 CONCLUSIONS

The variability of the modeled/predicted RLs at the receiver sites are directly dependent on the modeled TL (i.e., the variability of the sources levels for each type of source is minimal). In conducting this analysis, the best available scientific, environmental, geologic, and meteorological data were obtained and used to calculate the TLs and subsequently to predict the RLs at the five receiver sites. Additionally, throughout this analysis, conservative assumptions were made. Therefore, the results presented here do not represent the full range of TL, which could occur, but an estimate of the typical nominal minimum TL (and therefore nominal maximum RLs) that can be expected for most days throughout the year. The results are not a "worst case" result, because there could be cases with stronger near-ground cooling or wind conditions which could increase the RLs, but days with these conditions would be infrequent and only represent an estimated 10-15 dB higher RL for the in-air case. Similarly, environmental conditions could greatly increase the TL, and effectively make the noise from the modeled sources indistinguishable from ambient noise. Therefore, great care will need to be exercised if or when comparing these results with *in situ* measurements. As a minimum, adequate environmental measurements (including radiosondes, sea state/wave height, wind speed, and direction, air and water ambient noise levels, etc) will need to be obtained in order to make comparisons to the modeled results presented here.

Table 6 provides a summary of the three construction noise sources examined, the thresholds used to evaluate Level A and B potential impacts for each propagation medium, and the approximate range within which the thresholds may be exceeded.

Table 6: Summary of Sources, Thresholds and Ranges Impacted

		Level A		Level B	
Source type	**Propagation Medium**	**Limiting Threshold Used**	**Approx. Range (m)**	**Limiting Threshold Used**	**Approx. Range (m)**
Explosives	Air	165 dB *	200	100 dBA ***	731
	Water/ground	205 dB *	200	218 dB **	300
Drilling	Air	165 dB *	< 1	100 dBA ***	15
	Water/ground	180 dB **	< 1	160 dB **	8
Dredging	Air	165 dB *	< 1	100 dBA ***	< 1
	Water/ground	180 dB **	< 1	160 dB **	< 1

Notes: * re 1 μPa^2-s ** re 1 µPa *** re 20 µPa

What this means to the Kona Kai Ola project is represented graphically in Figure 8. In this figure the estimated maximum extent of the Level A and B thresholds for both the in-air and in-water cases are shown overlaid on a map of the Kona Kai Ola project. The solid red line shows the 200 m Level A and B threshold for both the in-air and in-water case. It should be remembered that this line is for all potential blast events, when in actuality the 200 m radius is from an individual event only. Similarly, the Level B curves are presented. Also shown on this figure are red and dark blue dotted lines. The red line indicates that any blast occurring to the south (left on this figure) of this line will not project a pressure field where any sound level exceeds the threshold either in the existing harbor, or on the beaches. The blue line is for the Level B, in-water threshold. Effectively, nearly two-thirds of the harbor can be excavated without potentially impacting marine mammals or sea turtles.

In-Air Conclusions

The results in Section 5 show the estimated nominal, but conservative RLs for the modeled sites. These results for the individual source/receiver combinations show that the criteria for Level A impacts to marine mammals for either in-air or in-water conditions at the receiver sites were never exceeded. However, the high in-air receive level in the vicinity of the current harbor channel when the explosive source was at locations farthest north and closest to the existing harbor, indicate that, as one would expect, extreme caution must be taken within about 200 meters (656 ft) of the explosion. This condition mandates that a safety range out to at least 200 meters (656 ft) of the

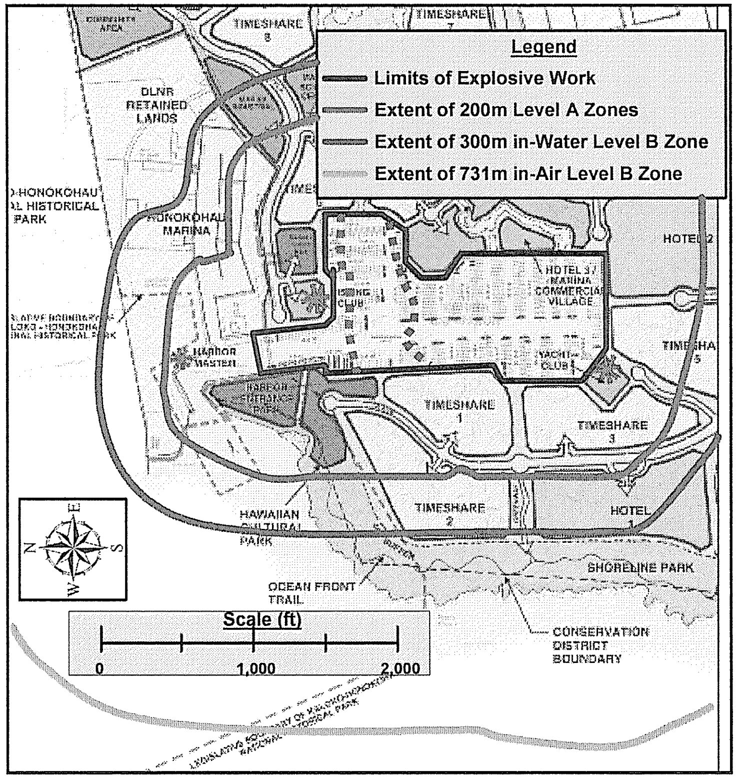

Figure 8: Threshold Level Curves Plotted on the Project

source be shown to be clear of all marine mammals and sea turtle prior to each blast to preclude potential Level A takes. Inside this range from an explosive blast, in-air Level A levels for marine mammals could potentially be exceeded.

Further, the in-air RLs for the explosive sources often exceed the assumed 100 dBA re 20 µPa threshold for Level B harassment of pinnipeds, other marine mammals or sea turtles. This typically appears to be true for ranges out to about 0.4 nm (i.e., 800 yds [731 m]). This threshold is nominally for pinnipeds, but it should be extended to marine mammals and sea turtles (when basking or beached) too. Therefore, an in-air safety buffer of at least 731 m from any explosive source is proposed, that should be maintained and found clear of marine mammals and sea turtle prior to any blasts. It should be noted that although a receiver site was not modeled specifically in the existing harbor, Figure 8 indicates that much of that harbor is within the range for Level A and B impacts for blasts conducted in the northern third of the new harbor and that extra care should be taken to ensure that no marine mammals or basking or beached sea turtles are in the existing harbor prior to any blast.

Although the possibility exist for Level B impacts to marine mammals, the marine mammal distribution and movement as predicted by the AIM model, indicates that this is very unlikely situation. Therefore, it is expected that there will be much less than 0.5 Level B takes due to in-air threshold, with or without mitigation, but the mitigation safety buffer must still be enforced to preclude the unlikely possibility of marine mammals or basking or beached sea turtles being near the explosive sources when they are used.

Finally, the in-air drilling and dredging noise rapidly attenuates to ambient level and the modeling indicates that it would be difficult to hear these noises at any of the receivers. Therefore, there contribution to the overall noise level outside of the construction site is negligible.

In-Water Conclusions

The results of the in-water thresholds are very similar to those for in-air. The possibility of a Level A in-water take only occurs for the explosive sources and when the animal is within about 200m (656 ft) of the explosion. This can only occur when the explosives are at the northern most position (i.e., near the existing harbor).

The most restrictive Level B explosive in-water threshold is the 12 psi (pressure) criterion. The modeling shows that it is only exceeded when a receiver is closer than 300 m (984 ft) from the explosive source. Thus, if the in-water safety buffer of 300 m is necessary to preclude Level B takes. Because of the harbor's position inland, much of this 300 m buffer occurs over land or in the very shallow water (i.e., less than 5 fathom, or 30 ft [9.1 m] deep) , especially for the portions of the harbor farthest inland. Therefore, the possibility of potential impacts is small as predicted by the AIM model.

Also, even thought the drilling and dredging activities seem to have a better (i.e., less loss) propagation path through the basalt and potentially may be slightly easier to hear above background ambient noise, their levels remain within about 30 dB of ambient noise and approximately 50 dB below the 160 dB broad-band threshold.

7.0 REFERENCES

Biological and AIM References

Alves F, Freitas L, Dinis A (2006) Occurrence and diving behaviour of false killer whale off Madeira archipelago (NE Atlantic). In: ECS 2006, Gydnia, Poland

Baird RW (2005) Sightings of dwarf (*Kogia sima*) and pygmy (*K. breviceps*) sperm whales from the main Hawaiian Islands. Pacific Science 59:461-466

Baird RW, Schorr GS, Webster DL, Mahaffy SD, Douglas AB, Gorgone AM, McSweeny DJ (2006a) A survey for odontocete cetaceans off Kaua'i and Ni'ihau, Hawai'i, during October and November 2005: Evidence for population structure and site fidelity. Pacific Islands Fisheries Science Center, pp 17

Baird RW, Webster DL, McSweeney DJ, Ligon AD, Schorr GS, Barlow J (2006b) Diving behaviour of Cuvier's (*Ziphius cavirostris*) and Blainville's (*Mesoplodon densirostris*) beaked whales in Hawai'i. Canadian Journal of Zoology 84:1120-1128

Cañadas A, Sagarminaga R, Garcia TS (2002) Cetacean distribution related with depth and slope in the Mediterranean waters off southern Spain. Deep Sea Research Part I Oceanographic Research Papers 49:2053-2073

Frankel AS, Vigness-Raposa KV (2006) Marine Animal Behavioral Analysis. Marine Acoustics, Inc., Annapolis, pp 63

Ligon AD, Baird RW (2001) Diving behaviour of false killer whales off Maui and Lana'i, Hawai'i. In: 14th Biennial Conference on the Biology of Marine Mammals, Vancouver

Mobley JR, jr, Bauer GB, Herman LM (1999) Changes over a ten-year interval in the distribution and relative abundance of humpback whales (*Megaptera novaeangliae*) wintering in Hawaiian waters. Aquatic Mammals 25:63-72

Mobley JR, jr, Spitz SS, Forney KA, Grotefendt R, Forestell PH (2000) Distribution and abundance of odontocete species in Hawaiian waters: preliminary results of 1993-98 aerial surveys. Southwest Fisheries Science Center

Mobley JR, jr, (2004) Results of marine mammal surveys on U.S. Navy underwater ranges in Hawaii and Bahamas. Office of Naval Research, Arlington, pp 27

Parrish FA, Abernathy K, Marshall GJ, Buhleier BM (2002) Hawaiian monk seals (*Monachus schauinslandi*) foraging in deep-water coral beds. Marine Mammal Science 18:244-258

Acoustic and Environmental Parameter References

American National Standards Institute (ANSI), "Estimating Air Blast Characteristics for Single Point Explosions in Air, with a Guide to Evaluation of Atmospheric Propagation and Effects, ANSI S2.20-1983 (R-1989)," Acoust.Soc. Amer., New York, NY, 1983.

Arons, A. B., D. R. Yennie, and T.P. Cotter. 1949. Long Range Shock Propagationm in Underwater Explosion Phenomena II, *U.S. Navy Dept. Bur. Ord. NAVORD Rep. 478*.

Aylor, D. 1972. "Noise Reduction by Vegetation and Ground," *J. Acoust. Soc. Am.*, Vol. **51**, pp. 201-209.

Bowditch, N. 1995 Edition. American Practical Navigator. Defense Mapping Agency Hydrographic Center, 1995.

Cramer, O. 1993. "The Variation of the Specific Heat Ratio and the Speed of Sound in Air with Temperature, Pressure, Humidity and CO2 Concentration," *J. Acoust. Soc. Am.*, Vol. 93(5), pp. 2510-2516.

DoN, 1998. "Final Environmental Impact Statement Shock Testing the Seawolf Submarine", Department of the Navy, May 1998.

DoN, 2001b. "Final Environmental Impact Statement Shock Testing the USS Churchill", Department of the Navy, February 2001.

DoN, 2004. "Overseas Environmental Assessment - Virtual At-Sea Training/Integrated Maritime Portable Acoustic Scoring and Simulator System," Department of the Navy, May 2004.

FAA Order 1050.1D. "Policies and Procedures for Considering Environmental Impacts"," Criteria for evaluation of aviation generated noise", http://www.awp.faa.gov/atenviro/CRITERIA.htm, 7 Jul 2004.

Federal Register 2001. "Taking Marine Mammals Incident to Specified Activity;____". NOAA, Federal Register Vol. __, No. __, pp ___-___, 14 June, 2001 ##### Western Geophysical

Federal Register 2004. "Taking and Importing Marine Mammals; Taking Marine Mammals Incident to Conducting Precision Strike Weapon (PSW) Testing and Training by Eglin Air Force Base in the Gulf of Mexico. NOAA, Federal Register Vol 69, No. 78, pp21816-21825, 22Apr2004.

Federal Register 2006a. "Taking Marine Mammals Incident to Specified Activity; Harbor Redevelopment Project, Moss Landing Harbor, California". NOAA, Federal Register Vol. 71, No. 214, pp 64944-64946, 6 November, 2006.

Federal Register 2006b. "Taking Marine Mammals Incident to Specified Activity; Construction of the Knik Arm Bridge". NOAA, Federal Register Vol. 71, No. 163, pp 49433-49436, 23 August, 2006.

Federal Register 2007. "Taking Marine Mammals Incident to Specified Activity; Construction of the East Span of the San Francisco-Oakland Bay Bridge". NOAA, Federal Register Vol. 72, No. 3, pp 532-535, 5 January, 2007.

Federal Register 2007b. "Taking Marine Mammals Incident to Missile Launch Operations from San Nicholas Island, CA.". NOAA, Federal Register Vol. 68, No. 169, pp 52132-52140, 2 September, 2007.

Finneran, J.J., Donald A. Carder and Sam Ridgway. 2002a. "Low Frequency Acoustic Pressure, Velocity and Intensity Thresholds in a Bottlenose Dolphin *(Tursiops truncates)* and White Whale *(Delphinapterus* leucas)". *J. Acoust. Soc. Am.*, Vol. 111 No. 1, pp 447-456.

Finneran, J.J., Carolyn E. Schlundt, Randall Dear Donald A. Carder and Sam Ridgway. 2002b. "Temporary Shift in Masked Hearing Threshold in Odontocetes After Exposure to Single Under Water Impulses from Seismic Watergun". *J. Acoust. Soc. Am.*, Vol. **111** (6), pp 2929-2940.

GDEM, 2007. Generalized Digital Environmental Model, Web Version 3.0, Database Version 3.0, https://128.160.23.42/gdemv/gdemv.html, May 2007.

Gaspin, J. B. 1983. "Safe Swimmer Ranges from Bottom Explosions", NSWC TR 83-84, Naval Surface Center, Dahlgren, VA.

Gabillet Y., H. Schroeder, G. A. Daigle and A. L'Esperance. 1993 "Application of Gaussian Beam Approach to Sound Propagation in the Atmosphere," *J. Accoust. Soc. Am.*, Vol. **93**, pp. 3105-3116.

Goertner, J. F. 1982. Prediction of Underwater Explosion Safe Ranges for Sea Mammals. NSWC/WOL TR 82-188, Naval Ordnance Laboratory, Silver Spring, MD.

Hamilton, Edwin, 1980. "Geoacoustic modeling of the ocean sea floor," *J. Accoust. Soc. Am.*, Vol. **68(5)**, pp. 1313-1340.

Keenan, Ruth and D. Brown, E. McCarthy, H. Weinberg, L. Gainey and G. Brooke. 2000. "Software Design Description for the Comprehensive Acoustic System Simulation (CASS Version 3.0) with the Gaussian Ray Bundle Model (GRAB Version 2.0) NUWC-NPT Technical Document 11,231, 1 June 2000.

Langenheim and Clague. Generalized geologic map of Oahu, http://walrus.wr.usgs.gov/pacmaps/ou_index.html.

MACTEC, 2006. Technical Report Drawings of the Test Borings and Observation Wells for Kona Kai Ola. MACTEC Engineering and Consulting, Inc. AIEA, HI, October 2006.

McCormick, M. E. 1972. Ocean Wave Mechanics. Wiley-Interscience Publications, John Wiley & Sons, Inc, NY, 1972.

Moffatt and Nichol, 2007. Personal communication with Mr. Robert Sherwood of Moffatt and Nichols Inc. May, 2007

NOAA. 2004. "FSL/NCDC Radiosonde Data Archive." At website http://raob.fsl.noaa.gov/Raob_software.html.

NOAA. 2004b. "Remote Autonomous Weather Stations Homepage" At website http://fs.fed.us/RAWS/.

Piercy, J. E., and G. A. Daigle. 1997. Encyclopedia of Acoustics, Chapter 32 edited by M. J. Crocker, Wiley-Interscience Publications, John Wiley & Sons, Inc, NY, 1997.

Richardson, W.J., C.R. Greene Jr., C.I. Malme, and D.H. Thomson. 1995. Marine Mammals and Noise. Academic Press, San Diego, CA.

Ridgway, S. H., D. A. Carder, R. R. Smith, T. Kamolnick, C. E. Schlundt, and W. R. Elsberry. 1997. "Behavioral Responses and Temporary Shift in Masked Hearing Threshold of Bottlenose Dolphins, *Tursiops truncatus*, to 1-second Tones of 141 to 201 dB re 1 uPa". No. Technical Report 1751. Naval Command, Control and Ocean Surveillance Center, RDT&E Division D3503, San Diego, CA.

Ridgway, S. H., E. G. Weaver, J. G. McCormick, J. Palin, and J. H. Anderson. 1969. Hearing in the giant sea turtles. *J. Acoust. Soc. Am.*, **59**(Suppl.1):S46.

Schlundt, C. E., J. J. Finneran, D. A. Carder and S. H. Ridgway 2000. "Temporary Shift in Masked Hearing Threshold of Bottlenose Dolphins, *Tursiops truncatus*, and white whales, *Delphinapterus leucas*, after exposure to intense tones". , J. Acoustic Soc. Am. **107** (6).

Sutherland, L. C., and G. A. Daigle, Handbook of Acoustic Measurements and Noise Control, Chapter 3, Acoustic Society of America, Woodburn, NY, 1998.

Urick, R.J. 1983. Principles of Underwater Sound 3rd ed. McGraw-Hill, New York.

USGS, 1985. "Basalts from the 1877 Submarine Eruption of Mauna Loa, Hawaii: New Data on the Variation of Palagonitization Rate with Temperature" by James G. Moore, Daniel J. Fornari, and David A. Clague, U.S. Geological Survey Bulletin 1663.

APPENDIX A

GLOSSARY OF TERMS

GLOSSARY

Acoustics: The scientific study of sound, especially of its generation, transmission, and reception.

Ambient noise: The typical or persistent environmental background noise present in the ocean.

Anthropogenic noise: Noise related to or produced by human activities.

Baleen: The filtering plates that hang from the upper jaw of baleen whales.

Baleen whales: The filter-feeding whales, also known as mysticetes.

Cetacean: Of or belonging to the order Cetacea, which includes aquatic mammals with anterior flippers, no posterior limbs, and a dorsal fin; such as whales, dolphins and porpoise.

Compression wave (or "P-wave"): is a wave in which the restoring force is provided by compression in the material through which the wave travels. P-waves are the mechanism that transfers sound through liquids and gasses and is one of the two mechanisms for the transfer of sound in solids.

Decibel (dB): A unit used to express the relative difference in power, usually between acoustic or electrical signals, equal to ten times the common logarithm of the ratio of the two levels.

Endangered species: Defined in 16 U.S.C. 1532 as any species that is in danger of extinction throughout all or a significant portion of its range (other than a species of Class Insecta designated as a pest). Federally endangered species are listed in 50 CFR 17.11 and 17.12.

Harassment: Under the Marine Mammal Protection Act, any act of pursuit, torment, or annoyance that has the potential to:

- Injure a marine mammal or marine mammal stock in the wild; or
- Disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.

Hertz (Hz): The unit of measure of frequency in cycles per second. 1,000 Hz is usually referred to as 1 kiloHertz (kHz).

Impedance (acoustic): The product of density and sound speed.

Mysticete: Any of several whales having symmetrical skulls, paired blow holes, and plates of

whale bone (baleen plates) instead of teeth of the suborder Mysticeti. Filter-feeding whales, also referred to as baleen whales.

Odontocete: Any of the toothed whales (without baleen plates) having a single blow hole and asymmetric skull of the suborder Odontoceti, such as orcas, dolphins, and porpoises.

Otariid: One of three families of Pinnipedia having small but well formed ears (known as "eared" seals) including eared seals, sea lions, and fur seals.

Permanent threshold shift (PTS): The deterioration of hearing due to prolonged or repeated exposure sounds which accelerate the normal process of gradual hearing loss (Kryter, 1985), and the permanent hearing damage due to brief exposure to extremely high sound levels (Richardson et al., 1995b)

Pinniped: Of or belonging to the Pinnipedia, an order of aquatic mammals that include seals, sea lions, walruses and similar animals having fin-like flippers for locomotion. They are carnivorous and "haul out" on shore to have their pups.

Received level (RL): The level of sound that arrives at the receiver, or listening device (hydrophone). It is measured in decibels referenced to 1 micropascal root-mean-square (rms). Put simply, the received level is the source level minus the TLs from the sound traveling through the water.

Reflection: Process by which a traveling wave is deflected by a boundary between two media. Angle of reflection equals angle of incidence. (Richardson et al, 1995b)

Refraction: Bending of a sound wave passing through a boundary between two media; may also occur when physical properties of a single medium change along the propagation path (Richardson et al., 1995b).

Salinity: A measure of the quantity of dissolved salts in seawater. It is formally defined as the total amount of dissolved solids in seawater in parts per thousand (‰) by weight when all the carbonate has been converted to oxide, the bromide and iodide to chloride, and all organic matter is completely oxidized.

Shear Wave (or "s-wave"): is a wave in an elastic material in which the restoring force is provided by shear in the material through which the wave travels. Shear waves only propagate in solids.

SONAR: An acronym for SOund NAvigation and Ranging. It includes any system that uses underwater sound, or acoustics, for observations and communications. There are two broad types of sonar:

- **Passive sonar** detects the sound created by an object (source) in the water. This is a one-way transmission of sound waves traveling through the water from the source to the receiver; and
- **Active sonar** detects objects by creating a sound pulse, or ping, that transmits through the water and reflects off the target, returning in the form of an echo. This is a two-way transmission (source to reflector to receiver) and is a form of echolocation.

Sound pressure level (SPL): Twenty times the logarithm to the base 10 of the ratio of the pressure to the reference pressure, in decibels at a specific point. The reference pressure shall be explicitly stated. SPL is usually measured in decibels referenced to 1 micropascal (rms).

Sound speed: Sound speed is the velocity that sound waves travel through a medium. Sound speed through seawater is approximately 1,500 meters per second (4,920 feet per second). It varies with water temperature, salinity, and depth (pressure). Sound speed increases with increases in temperature and pressure (depth), and to a lesser extent with increase in salinity. This change in speed as sound travels through water causes the travel path to bend in the direction of lower velocity.

Sound speed profile (SSP): The sound speed profile (SSP) is a graphic representation of the sound speed versus depth of the ocean. These profiles vary with latitude, season, and time of day.

Source Level (SL): The sound transmitted into the water by a sound source, such as an active sonar ping. SL is usually measured in decibels referenced to 1 micropascal at 1 m (3.28 ft).

Take: To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt any of these activities.

Temporary threshold shift (TTS): Temporary increases in threshold occurring after exposure to high noise levels, which can last from minutes to hours to days (Richardson et al., 1995b).

Transmission loss (TL): Energy losses as the pressure wave, or sound, travels through the water, the associated wavefront diminishes due to the spreading of the sound over an increasingly larger volume and the absorption of some of the energy by seawater.

Threatened species: Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Threatened species are listed in 50 CFR 17.12.

APPENDIX B

LIST OF ACRONYMS

LIST OF ACRONYMS

dB	Decibels
dBA	"A" weighted sound level
dB//1μPa@1m	Decibels referenced to one micropascal measured at one meter from center of source
CASS	Comprehensive Acoustic System Simulation
°T	Bearing in degrees True
EFD	Energy Flux Density
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
ft	feet
GRAB	Gaussian Ray Bundle
HE	High Explosive
hr	hour
Hz	Hertz
kg	kilogram
kHz	kilo Hertz
km	kilometer
kt	knots (nautical miles per hour)
kyd	kiloyard
LF	Low frequency (100 – 1,000 Hz)
m	meter
MF	Mid-frequency (1,000 – 10,000 Hz)
ms	millisecond
MMPA	Marine Mammal Protection Act
NCDC	National Climatic Data Center
NDAA	National Defense Authorization Act
NEW	Net Explosive Weight
nm	nautical mile
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
psi	pounds per square inch
PTS	Permanent Threshold Shift
RL	Received Level
sec	second
SI	International System of Units
TL	Transmission Loss
TM	Tympanic Membrane
TTS	Temporary Threshold Shift
μPa	micropascal
USFWS	U.S. Fish and Wildlife Service
yds	yards
ZOI	Zone of Influence

Attachment 5

2 Alternatives Analysis

~~In typical land development projects, the initial planning process includes the exploration of alternatives to development objectives. In the EIS process, these alternatives are presented with a disclosure of reasons for the dismissal of non-preferred alternatives.~~

~~Kona Kai Ola does not follow this same pattern of alternatives evaluation.~~ As discussed in Section 1.4, the proposed Kona Kai Ola project is the result of agreements between JDI and the State DLNR and DHHL. The agreements and leases between the State and JDI stipulate the parameters of development for this site in terms of uses, quantities and size of many features, resulting in a limited range of land uses. Unlike a private property project, JDI is required to meet the criteria outlined in the agreements, thereby affording less flexibility in options and uses. From the developer's perspective, the agreements must also provide sufficient flexibility to allow for a development product that responds to market needs and provides a reasonable rate of return on the private investment.

The agreements between JDI and DLNR specify that the proposed harbor basin is to be 45 acres and accommodate 800 slips. This development proposal is the subject of this EIS. In response to DEIS comments, additional water quality studies and modeling were conducted. These studies determined that the water circulation in a 45-acre 800-slip marina would be insufficient to maintain the required standard of water quality. The models of water circulation suggest that a new 25-acre harbor basin could successfully maintain required water quality in the new harbor. Comments on the DEIS from DLNR, from other government agencies, the neighbors and the general community also called for the consideration of alternatives in the EIS, including a project with a smaller harbor basin and less density of hotel and time-share units.

In response to these comments on the DEIS, three alternatives are evaluated in this Final EIS and include Alternative 1, which is a plan with a 25-acre 400-slip harbor basin including a decrease in hotel and time-share units; Alternative 2, which is an alternative that had been previously discussed but not included in the proposed project, that includes an 800-slip harbor and a golf course; and Alternative 3, the no-project alternative. Each alternative is included in the EIS with an evaluation of their potential impacts. These project alternatives are presented to compare the levels of impacts and mitigation measures of the proposed project and alternative development schemes pursuant to requirements set forth in Chapter 343, HRS.

~~JDI is required to provide a new marina basin not less than 45 acres and a minimum of 800 new boat slips. Further, the agreements provide the following options for land uses at the project site:~~

- ~~Golf Course~~
- ~~Retail Commercial Facilities~~
- ~~Hotel Development Parcels~~
- ~~Marina Development Parcels~~
- ~~Community Benefit Development Parcels~~

~~JDI is not pursuing the golf course option and is proposing instead to create various water features throughout the project site. All other optional uses have been incorporated in Kona Kai Ola.~~

2.1 Project Alternatives

2.1.1 Alternative 1: 400-Slip Marina

Studies conducted in response to DEIS comments found the construction and operation of an 800-slip marina may significantly impact the water quality within the marina and along the shoreline. Specifically, the Harbor Water Quality Modeling Study, as contained in Appendix U, found that the water circulation in a 45-acre 800-slip harbor was insufficient to maintain an acceptable level of water quality. Further, the existing harbor channel, which would serve both the existing and new harbors, could not adequately serve the increased boat traffic generated by an 800-slip marina during peak traffic. Mitigation measures to accommodate peak boat traffic included the widening of the existing channel, an action that would entail a complex process of Federal and State approvals and encounter significant environmental concern.

Concerns related to the proposed density of hotel and time-share units were also expressed in comments to the DEIS from members of the public, neighbors to the project site, especially the Kaniohale Community Association, and government agencies. Common themes in DEIS comments were related to impacts regarding traffic, project requirements of potable water and infrastructure systems, including sewer, drainage, utility and solid waste systems, and socioeconomic impacts.

In response to the water quality study results, and to the DEIS comments, an alternative plan was developed with a smaller marina with less boat slips, and a related decrease in hotel and time share units. Illustrated in Figure G, Alternative 1 reflects this lesser density project, and features a 400-slip marina encompassing 25 acres. For the purposes of the Alternative 1 analysis, JDI assumed 1,100 time-share units and 400 hotel rooms. Project components include:

- 400 hotel units on 34 acres
- 1,100 time-share units on 106 acres
- 143 acres of commercial uses
- 11 acres of marina support facilities
- 214 acres of parks, roads, open spaces, swim lagoons and community use areas

In addition, Alternative 1 would include the construction of a new intersection of Kealakehe Parkway with Queen Ka'ahumanu Highway, and the extension of Kealakehe Parkway to join Kuakini Highway to cross the lands of Queen Lili'uokalani Trust, and connecting with Kuakini Highway in Kailua-Kona. This is a significant off-site infrastructure improvement and is included in the agreements between the State and JDI.

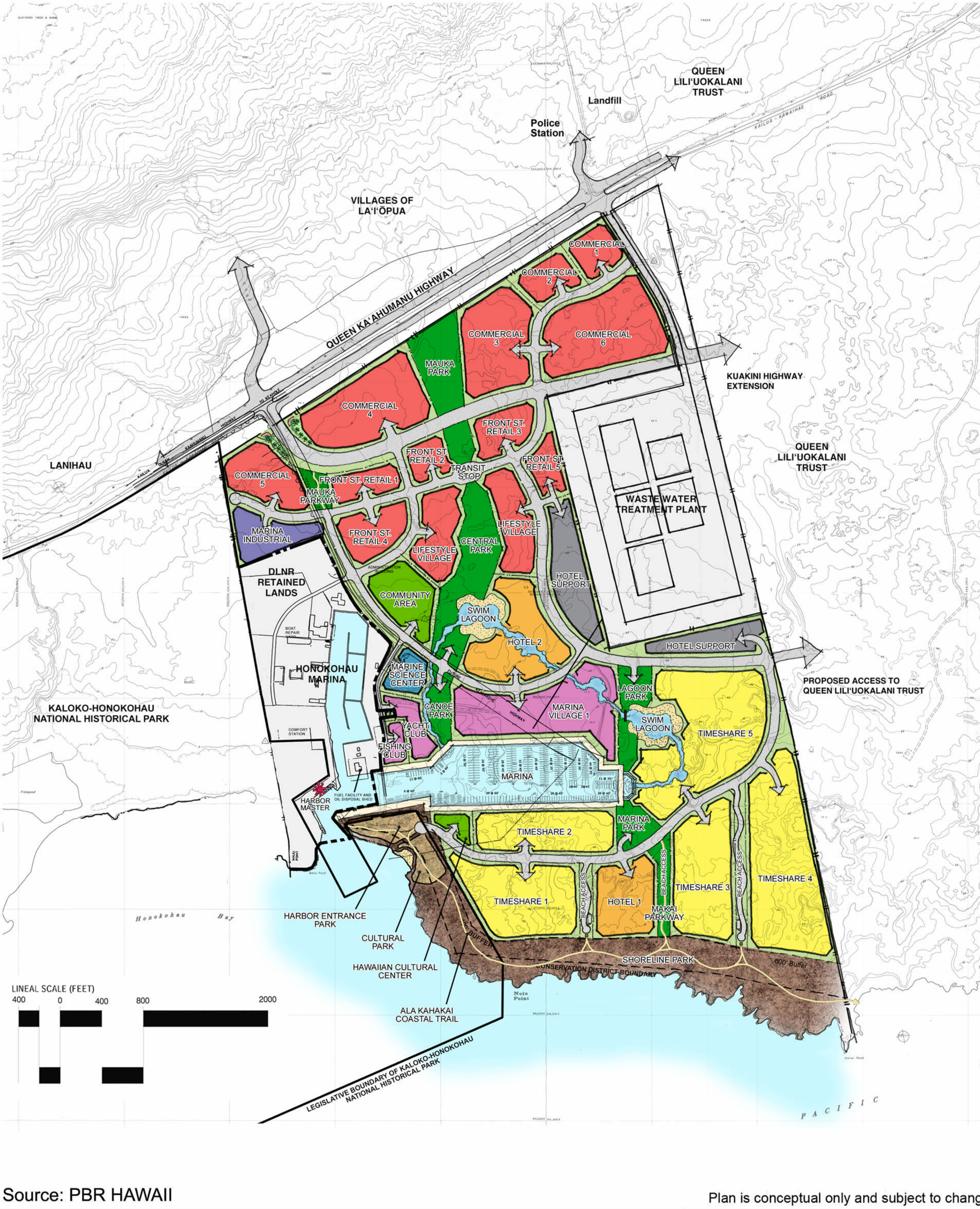

Figure G: Alternative 1: 400-Slip Marina

LEGEND

- TIME SHARE
- HOTEL
- RETAIL / COMMERCIAL
- MARINA RETAIL
- MARINA SUPPORT / COMMERCIAL
- MARINE SCIENCE CENTER
- COMMUNITY AREA / CULTURAL CENTER
- SWIM LAGOON
- MARINA
- UTILITIES
- PARKS & GREEN SPACE
- SHORELINE
- HARBOR ENTRANCE PARK / CULTURAL PARK

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Like the proposed project, Alternative 1 would have a strong ocean orientation, and project components that support this theme would include various water features including seawater lagoons and a marine science center. The new Alternative 1 harbor would include a yacht club, fishing club, a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. The coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and ‘Alula for community use. Additional Alternative 1 community areas would include facilities and space for community use, including programs of the Kona Kai Ola Community Foundation, which supports community programs in health care, culture, education, and employment training for the local community, especially to native Hawaiians. Like the original proposed plan, Alternative 1 includes 40 percent of the land in parks, roads, open spaces, swim lagoons and community use areas.

2.1.2 Alternative 2: Golf Course Feature

Alternative 2 was among the alternatives discussed at a community charrette in September 2003. It includes a golf course, which is a permitted use in the DLNR agreement and DHHL lease. As Figure H illustrates, an 18-hole championship golf course would occupy 222 acres on the southern portion of the project site. As with the proposed project, Alternative 2 includes an 800-slip marina on a minimum of 45 acres.

To support the economic viability of the project, other Alternative 2 uses include:

- Golf course clubhouse on three acres
- 1,570 visitor units on 88 acres fronting the marina
- 118 acres of commercial uses
- 23 acres of community uses

Community uses in Alternative 2 include an amphitheater, a canoe facilities park, a community health center, a Hawaiian cultural center and fishing village, a marine science center and employment training center. The sea water lagoon features contained in the proposed project and Alternative 1 are not included in this alternative.

2.1.3 Alternative 3: No Action

In Alternative 3, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.

~~The economic viability and sustainability of the project is determined by the density and uses proposed. Because JDI is obligated to develop an 800-slip marina for the State, complete road improvements, and provide various public enhancement features at its own expense, the density proposed for the income generating features of the development must be sufficient to provide an acceptable level of economic return for JDI. The market study, which is discussed in Section 4.6, reviewed various development schemes and determined that the currently proposed density and mix is the optimum to meet the anticipated financing and development cost obligations for the public features associated with the development.~~

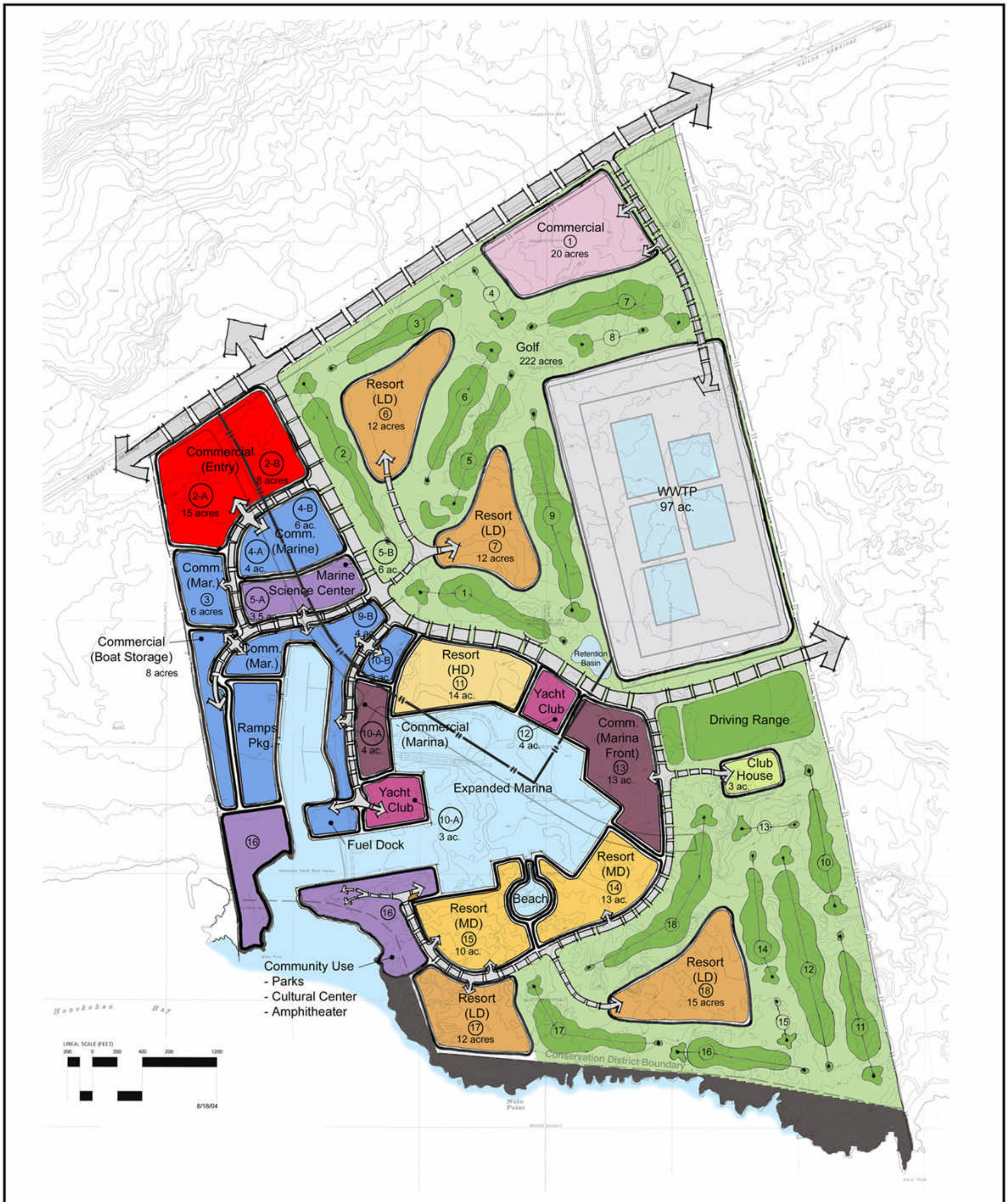

Figure H. Alternative 2: Golf Course Alternative

Legend

2.2 Alternatives Analysis

As discussed in Section 2.1, the proposed Kona Kai Ola project (also referred to as "proposed project") is defined by development requirements related for a marina and the related uses that would be needed to generate a reasonable rate of return that covers development costs.

Beginning with Section 2.2.1, the alternative development concepts are comparatively assessed for potential impacts that may reasonably be expected to result from each alternative. Following is an overview of the primary observations of such assessment.

Alternative 1 includes half of the State-required boat slips and 60 percent of the proposed hotel and time-share units and, due to the decreased density, this alternative would generate significantly less environmental and socio-economic impacts. A harbor water quality model found the reduction of the volume of the new marina basin by about half (approximately 25 acres) significantly improved the water circulation and quality. Further, the reduced number of boat slips would generate less boat traffic, thereby reducing congestion and the need to mitigate impacts further by the widening of the existing harbor channel.

A project with fewer hotel and time-share units and increased commercial space with a longer (14 years) absorption period would change the mix of employment offered by the project, and slightly increase the overall employment count. The public costs/benefits associated with Alternative 1 would change, compared to the proposed project, with a general increase in tax collections, and a general decrease in per capita costs. Detailed discussion of Alternative 1 potential economic impacts are provided in Section 4.6.6. Comparisons of levels of impact are presented throughout this FEIS.

While this analysis might indicate that the 25-acre marina in Alternative 1 would be the more prudent choice, the DLNR agreement establishes the minimum size and slip capacity of the marina at 45 acres and 800 slips, respectively. Amendments to the DLNR agreement would be required in order to allow Alternative 1 to proceed as the preferred alternative. Hence, selection of the preferred alternative is an unresolved issue at the writing of this FEIS.

Alternative 2, the golf course alternative, was not previously considered to be the preferred alternative primarily because market conditions at the time of project development might not likely support another golf course. Further, DHHL has a strategy goal to have more revenue-generating activities on the commercial lease lands within the project area. In addition, concerns have been expressed as to environmental impacts of coastal golf courses, including the potential adverse impact on Kona's water supply if potable water is used for golf course irrigation.

While Alternative 3, the no-project alternative, would not generate adverse impacts related to development of these lands associated with the construction and long-term operations, it would also not allow for an expanded public marina that would meet public need and generate income for the public sector. Further, the no-project alternative would foreclose the opportunity to create a master-planned State-initiated development that would result in increased tax revenue, recreation options and community facilities. Crucial privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities, and public access would not be contributed.

~~Hence, the only valid alternative to the proposed project is the no-action alternative. In this alternative, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.~~

~~The no-project alternative would therefore not generate adverse impacts associated with the construction and long-term operations would not occur.~~

~~Likewise, the creation of a master-planned state-initiated development, resulting in increased employment, tax revenue, recreation options and community facilities, would not be created. Privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities and public access would not be contributed.~~

Further, the creation of revenue-producing businesses on the DHHL property to fund homestead programs would not occur, resulting in fewer potential benefits for Hawaiians.

Hence, the agreements and leases between the State and JDI indicate that the no-action alternative is not in the public interest~~has been rejected at this time~~.

2.2.1 Impact Comparison

Grading and Excavation

The proposed project requires grading and excavation. Both actions may impact groundwater due to rainfall runoff during construction. Alternative 1 would require a significantly smaller excavation for the marina basin and would therefore carry a lesser risk of potential adverse effects on water quality. Alternative 2 would require the same basin excavation as the proposed project, and would also include extensive grading and filling to build the golf course, the latter of which would generate additional impacts. Alternative 3 would result in no change to the geography, topography and geology.

Further discussion on grading and excavation is contained in Section 3.3.

Natural Drainage

Most precipitation infiltrates into the porous ground at the site, and no significant sheet flow is likely. Alternative 1 would generate similar levels of impacts on natural drainage as those of the proposed project and thus require similar mitigation measures. The golf course in Alternative 2 would not be as porous since the site would be graded, soil would be placed, and grass and other landscaping would be grown. Sheet flow and runoff can occur on a golf course, and drainage patterns might change. Alternative 3 would result in no change to the existing natural drainage pattern. Further discussion on natural drainage is contained in Section 3.4.

Air Quality

Air quality will be affected by construction activities, as well as pollutants from vehicular, industrial, natural, and agricultural sources. Alternative 1 would generate less construction air quality impacts than the proposed project due to the reduced amount of intensive groundwork associated with the smaller marina basin and fewer long-term impacts by reducing traffic 35 and 40 percent during, respectively, AM and PM peak traffic times. Construction of Alternative 2 would result in fugitive dust and exhaust from equipment and is expected to generate the same level of air quality impact as the proposed project. Alternative 3 would result in no change to existing air quality. Further discussion on air quality is contained in Section 3.5.

Terrestrial Environment

To provide additional habitat for shorebirds and some visiting seabirds, the project proposes to construct a brackishwater pond area suitable for avian fauna, including stilts, coots and ducks. While habitat expansion is beneficial, there is also a possibility that these species may be exposed to activity that may harm them. Alternative 1 would not include a brackish water pond, but will include 5 acres of seawater features, which is 74 percent less than the 19 acres of seawater features in the proposed project. While this would reduce beneficial impacts, it would also decrease exposure to potentially harmful activity. Alternative 2 does not include the brackish water pond features, but would include drainage retention basins that would attract avian fauna and expose them to chemicals used to maintain golf course landscaping. While Alternative 3 would result in no increase in potentially harmful activity, it would also not provide additional habitat for avian fauna. Further discussion on the terrestrial environment is contained in Section 3.7.

Groundwater

Groundwater at the project site occurs as a thin basal brackish water lens. It is influenced by tides and varies in flow direction and salt content. The existing Honokōhau Harbor acts as a drainage point for local groundwater. Any impact to groundwater flow from the proposed harbor is likely to be localized. The proposed marina basin will not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance.

There will be differences in the flow to the marina entrance between the proposed project and Alternative 1. Alternative 1, being smaller in size, will have less impact on groundwater flow than the proposed marina. Alternative 2 will have a similar impact to groundwater quality as the proposed project. Alternative 2 may also impact water quality by contributing nutrients and biocides to the groundwater from the golf course. Alternative 3 would result in no change in existing groundwater conditions. Further discussion on groundwater is contained in Section 3.8.1.

Surface Water

There are no significant natural freshwater streams or ponds at the site, but there are brackish anchialine pools. Surface water at the project site will be influenced by rainfall. Runoff typically percolates rapidly through the permeable ground. The proposed project will include some impermeable surfaces, which together with building roofs, will change runoff and seepage patterns.

Alternative 1 is a lower density project that is expected to have proportionally less impact on surface water and runoff patterns and less potential impact on water quality than the proposed project. Alternative 2 would have more impact on surface water quality than the proposed project due to fertilizers and biocides carried by runoff from the golf course. Alternative 3 would result in no change to surface water conditions. Further discussion on surface water is contained in Section 3.8.2.

Nearshore Environment and Coastal Waters

The potential adverse impacts to the marine environment from the proposed project are due to the construction of an 800-slip marina and the resulting inflow of higher salinity seawater and inadequate water circulation, both of which are anticipated to impair water quality to the extent of falling below applicable standards. One possible mitigation measure is to significantly reduce the size of the marina expansion.

The reduced marina size (from 45 to 25 acres) and reduced lagoon acreage in Alternative 1 are expected to result in a proportionate reduction in seawater discharging into the new harbor and increased water circulation. Alternative 2 includes the same marina basin size and is therefore subject to the same factors that are expected to adversely affect water quality.

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water quality in the proposed harbor depends on several components. These include salinity, nutrients, and sediments that come from the ocean, rainfall runoff, water features with marine animals, and dust. The smaller project offered as Alternative 1 is expected to produce a reduced amount of pollutants and reduce the risk of adverse impact upon water quality.

It is notable that the 45-acre marina basin planned in the proposed project and Alternative 2 only becomes viable from a water quality impact standpoint if the additional brackish groundwater inflow into the new marina exceeds 60 mgd. The resulting flushing from such inflow would be expected to better maintain water quality. However, it is unclear whether 60 mgd of brackish groundwater would be available. As proposed in Alternative 1, reduction of the volume of the new marina basin by 45 percent will significantly improve the flushing and water quality because the lower volume can be flushed by the available groundwater flow.

In addition, there could be higher rainfall runoff from the Alternative 2 golf course into the harbor, because the grassed golf course will be less porous than the natural surface. The golf course will also require relatively high levels of fertilizer, biocides, and irrigation, all of which could contribute to adverse water quality impacts.

Further discussion on nearshore environment and coastal waters is contained in Section 3.9.1.

Anchialine Pools

Anchialine pools are located north of Honokōhau Harbor, and south of the harbor on the project site. The marine life in these pools is sensitive to groundwater quality, and changes due to construction and operation of the project could degrade the viability of the pool ecosystem. In the southern complex, 3 anchialine pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction in the proposed project and Alternatives 1 and 2.

Predicting the extent of change in groundwater flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is therefore extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Due to the uncertainty of changes in groundwater flow and quality due to marina construction, the variability in impacts between the proposed project and Alternatives 1 and 2 is unknown at this time. Alternative 3 would result in no change in groundwater flow. While this would eliminate the potential for adverse impacts, Alternative 3 would also continue the pattern of existing degradation related to human activity and the introduction of alien species. Further discussion on anchialine pools is contained in Section 3.9.2.

Marine Fishing Impacts

The proposed marina will increase the number of boats in the area and it is reasonable to assume that a portion of these new boats will engage in fishing activities. The increase in boats in the area would be primarily related to the marlin and tuna / pelagic fishery, coral reefs due to extractive fisheries, and SCUBA activities. The pressure on fish and invertebrate stocks is expected to increase with or without the marina. Harbor expansion provides the opportunity to address existing conditions to consolidate, focus, and fund management and enforcement activities at one location.

Compared to the proposed project, Alternative 1 would result in a 21 percent decrease in boat traffic, thereby lessening the potential for marine fishing impacts. The level of impacts in Alternative 2 would be similar to that of the proposed project. Alternative 3 would result in no change in existing marine fishing conditions, and no opportunity to address already existing pressure on fish and invertebrate stocks. Further discussion on marine fishing impacts is contained in Section 3.9.3.

Cultural and Archaeological Resources

The proposed project will integrate cultural and archaeological resources in the overall development. Archaeological sites recommended for preservation will be preserved, and cultural practices will be encouraged. Kona Kai Ola includes a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. Proposed is a 400-foot shoreline setback that would serve as a buffer between the ocean and developed areas. This coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use.

Alternative 1 would contain all of the cultural archaeological features and the shoreline setback area would be 400 feet in the northern portion of the site and increase to 600 feet in the southern portion. Alternative 2 would preserve cultural and archaeological resources, but does not include a 400-foot shoreline setback. Alternative 3 would result in no change to existing cultural and archaeological resources and no addition of cultural and community facilities and activities. Further discussion on cultural and archaeological resources is contained in, respectively, Sections 4.1 and 4.2.

Noise

Project-generated noise is due to construction equipment and blasting, boats, marina activities, vehicle traffic, and the Kealakehe Wastewater Treatment Plant operations. Alternative 1 would generate less noise impacts due to reduced construction activities, fewer boats, less traffic and less on-site activity. Alternative 2 would also generate less noise due to reduced traffic and less on-site activity, but noise related to the excavation of the marina basin and an increase in the number of boats would be similar to that of the proposed project. Further discussion on noise impacts is presented in Section 4.4.

Socioeconomic Impacts

The proposed project will generate an increase in de facto population of an estimated 5,321 persons due to the increase in hotel and time-share units. The estimated de facto population increase in Alternative 1 is 37 percent less, at 3,363 persons, than the proposed project. The de facto population increase in Alternative 2 is similar to Alternative 1.

Employment in the commercial components will nearly double in Alternative 1, from a stabilized level of 1,429 full-time equivalent (FTE) positions in the proposed project to 2,740 in the Alternative 1.

Under Alternative 1, the total operating economic activity at Kona Kai Ola will increase due to the added commercial space more than off-setting the fewer visitor units, moving upward from $557.6 million per year to circa $814.3 million annually. The total base economic impact resulting from development and operation of Alternative 1 will similarly be higher by between 35 and 45 percent than that of the proposed project.

Alternative 1, which has a reduced marina size of 25 acres, and fewer hotel and time-share units, would have a meaningful market standing, create significant economic opportunities, and provide a net benefit to State and County revenues. From a market perspective, a smaller Kona Kai Ola would still be the only mixed use community in the Keahole to Kailua-Kona Corridor offering competitive hotel and time-share product.

The estimated absorption periods for marketable components of Alternative 1 are generally shorter than those for the same components in the proposed project. Marina slips under Alternative 1 are estimated to be absorbed within 2 years after groundbreaking, as compared with 9 years for absorption of slips in the proposed project. Hotel rooms under Alternative 1 are estimated to be absorbed within 4 years after groundbreaking, as compared with 7 years under the proposed project. Time-share units would be absorbed within 10 years under Alternative 1, while 15 years are projected under the proposed project. Due to the planned increase in commercial facilities under Alternative 1, the absorption period of commercial space is estimated at 14 years, as compared with 8 years for absorption of such facilities under the proposed project.

The State and County will still both receive a net benefit (tax receipts relative to public expenditures) annually on a stabilized basis under the Alternative 1. The County net benefits will be some $12.2 million per year under the Alternative 1 versus $14.9 million under the proposed project. The State net benefits will increase under the Alternative 1 to about $37.5 million annually, up substantially from the $11.4 million in the proposed project.

Due to the lower de facto population at build-out, the effective stabilized public costs for both the State and County will decline meaningfully under the Alternative 1, dropping from $7.7 million annually for the County and $36.5 million for the State, to $4.9 million and $23 million per year, respectively.

Alternative 3 would result in no increase in de facto population and improvement to economic conditions. Further discussion on social and economic impacts are contained in, respectively, Sections 4.5 and 4.6.

Vehicular Traffic

The proposed project will impact the nearby road network that currently is congested during peak traffic times. The proposed project includes roadway improvements that would reduce the impact and improve roadway conditions for the regional community.

Alternative 1 includes the same roadway system improvements as the proposed project, yet would reduce vehicular traffic by 35 percent when compared to the proposed project. Alternative 2 would have similar traffic conditions and roadway improvements as Alternative 1. Alternative 3 would result in no increase in traffic and no roadway improvements.

Marina Traffic Study

The increase in boat traffic due to the proposed 800-slip marina would cause entrance channel congestion during varying combinations of existing and new marina peak traffic flow. Worst case conditions of active sport fishing weekend and summer holiday recreational traffic result in traffic volumes exceeding capacity over a short afternoon period. Mitigation to address boat traffic in the proposed project include widening the entrance channel, traffic control, implementation of a permanent traffic control tower, or limiting vessel size.

Alternative 1 would result in a 21 percent reduction in boat traffic congestion under average existing conditions and ten percent reduction during peak existing conditions. The reduction to 400 slips also reduces the impacts of congestion at the entrance channel, thereby reducing the need for any modifications to the entrance channel.

Alternative 2 would have the same level of boat traffic as the proposed project. Alternative 3 would not meet the demand for additional boat slips and would not generate additional boat traffic. Further discussion on marina traffic is contained in Section 4.8.

Police, Fire and Medical Services

The proposed project will impact police, fire and medical services due to an increase in de facto population and increased on-site activity. Alternatives 1 and 2 would have similar levels of impact as the proposed project due to increased on-site activity. Further discussion on police, fire and medical services are contained, respectively, in Sections 4.10.1, 4.10.2 and 4.10.3.

Drainage and Storm Water Facilities

The proposed project will increase drainage flows, quantities, velocities, erosion, and sediment runoff.

Alternative 1 involves a reduction of the project density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces associated with hotel and time-share development and to the creation of more open space. However, roadway areas will increase by about 30 percent in Alternative 1. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings. The golf course in Alternative 2 may also change drainage characteristics from those of the proposed project and may not reduce impacts. Alternative 3 would result in no change in existing conditions and no improvements to drainage infrastructure. Further discussion on drainage and storm water facilities is contained in Section 4.10.5

Wastewater Facilities

The proposed development is located within the service area of the Kealakehe WWTP and a sewer system will be installed that connects to the WWTP. The sewer system will be comprised of a network of gravity sewers, force mains, and pumping stations which collect and convey wastewater to the existing Kealakehe WWTP. Project improvements will incorporate the usage of recycled / R1 water. Improvements implemented by the proposed project will also accommodate the needs of the regional service population.

Alternative 1 would generate approximately 10 percent less wastewater flow than the proposed project. Wastewater flow in Alternative 2 is undetermined. Alternative 3 would result in no additional flow, as well as no improvements that will benefit the regional community. Further discussion on wastewater facilities is contained in Section 4.10.6.

Potable Water Facilities

The proposed project average daily water demand is estimated at 1.76 million gallons per day. Existing County sources are not adequate to meet this demand and source development is required. The developer is working with DLNR and two wells have been identified that will produce a sustainable yield that will serve the project. These wells will also serve water needs beyond the project.

Alternative 1 would result in net decrease of about five percent of potable water demand. Alternative 2 may have a lower water demand than the proposed project as long as potable water is not used for irrigation. Alternative 3 would result in no additional flow, as well as no source development that will benefit the regional community. Further discussion on potable water facilities is contained in Section 4.10.8.

Energy and Communications

Regarding Alternative 1, preliminary estimates for electrical, telecommunications, and cable resulted in a net demand load that remains similar to the proposed project. Further discussion on energy and communications is contained in Section 4.10.9.1.

The proposed project will increase the demand for electrical energy and telecommunications. The demand would be reduced in Alternative 1 because the number of boat slips and units would decrease. Similarly, Alternative 2 would have fewer units than the proposed project and therefore reduce energy demands. Further reduction in energy demand for either alternative could be achieved by using seawater air conditioning (SWAC) and other energy reduction measures, as planned by the developer. Further discussion on energy and telecommunications is contained in Section 4.10.9.2.

Water Features and Lagoons

The proposed project includes a brackishwater pond, lagoons, and marine life exhibits supplied by clean seawater. The water features in Alternative 1 would significantly decrease by 74 percent from 19 acres in the proposed project to five acres in Alternative 1. This decrease in water features would result in a corresponding decrease in water source requirements and seawater discharge. Alternative 2 does not include the seawater features. Alternative 3 would result in no additional demand for water source requirements and seawater discharge.

2.2.2 Conformance with Public Plans and Policies

State of Hawai‘i

Chapter 343, Hawai‘i Revised Statutes

Compliance with this chapter is effected, as described in Section 5.1.1 in regard to the proposed project and the alternatives discussed.

- State Land Use Law, Chapter 205, Hawai‘i Revised Statutes

  The discussion in Section 5.1.2 is directly applicable to Alternative 1, the proposed project. Alternative 1 will involve a setback of 400 feet that increases to 600 feet along the southern portion of the project site’s shoreline area. Alternative 2 does not provide for such a setback, but may still require approvals from DLNR for cultural, recreational, and community uses and structures within the Conservation district.

- Coastal Zone Management Program, Chapter 205A, Hawai‘i Revised Statutes

  Recreational Resources:

  In addition to the discussion of consistency with the associated objective and policies, as described in Section 5.1.3, the reduction from the proposed project’s 800-slip marina to a 400-slip marina under Alternative 1 will still expand the region’s boating opportunities and support facilities. The existing harbor entrance will still be utilized under this alternative; however, potential risks relating to boat traffic and congestion in the marina entrance area will be reduced significantly. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities, and marine science center remain important recreational components under Alternative 1.

Alternative 2 includes a golf course component, which would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Alternative 2, like the proposed project, will expand the region's boating opportunities and support facilities through its 800-slip marina. However, the potential adverse impacts of increased boat traffic from the size of the marina are significant enough to offset the benefits of increased boating opportunities.

Coastal Ecosystems:

The discussion in Section 5.1.3 is directly applicable to Alternative 1.

Alternative 1 not only reduces the number of slips proposed by 50 percent, but it also reduces the size of the marina from 45 acres to 25 acres. The 25-acre marina will increase the body of water within the existing harbor, but to a significantly lesser extent than the proposed project's estimated increase, which is also applicable to the 45-acre size that is proposed for the marina under Alternative 2.

The findings of the Harbor Water Quality Modeling Study conclude that a reduction in the size of the harbor expansion is an alternative that will mitigate the risk of significant impacts upon water quality within the marina and existing harbor. Accordingly, the reduction in both the number of slips and the size of the marina basin under Alternative 1, in combination with proper facilities design, public education, and enforcement of harbor rules and regulations, would result in fewer long-term impacts to water quality and coastal ecosystems. Short-term (construction-related) impacts would likely remain the same although the reduction in the total acreage of excavation is expected to result in a shorter duration of such impacts.

In addition to its 800-slip marina and potential adverse impacts upon water quality and the marine environment, Alternative 2 includes a golf course component, which has the potential to impact coastal ecosystems by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Economic Uses

Although reduced in the number of slips, the smaller marina under Alternative 1 will nevertheless serve public demand for more boating facilities in West Hawai‘i and is consistent with the objective and policies and discussion set forth in Section 5.1.3. The economic impacts of Alternative 2, while comparable to those of the proposed project's marina development, are notably marginal as to the golf course component, based on the marketability analysis that indicates a condition of saturation within the region.

Coastal Hazards

The discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Tsunami risks mainly affect the large shoreline setback area that is proposed for the project and Alternative 1. Alternative 2 projects a transient accommodation site that is partially within the tsunami hazard zone and thus carries a higher hazard risk. However, the essential requirement for these alternatives, as well as the proposed project, is a well-prepared and properly implemented evacuation plan.

Beach Protection

Discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Alternative 1 and, to a lesser extent, Alternative 2, will retain the shoreline area in its natural condition.

Similar to the proposed project, Alternative 1 provides for a shoreline setback of considerable width within which no structure, except for possible culturally-related structures, would be allowed. Alternatives 1 and 2 will thus be designed to avoid erosion of structures and minimize interference with natural shoreline processes.

Marine Resources

The discussion in Section 5.1.3 is also applicable to Alternative 1 which is described to be an alternative that is specifically projected to mitigate anticipated adverse impacts on water quality and the marine environment that might otherwise result from the original harbor design and scale, which is also incorporated in Alternative 2 . The reduced marina size under Alternative 1 is projected to meet water quality standards and enable greater compliance with the objective and policies addressed in this section.

Alternative 2 includes a golf course component and thus the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Hawai'i State Plans, Chapter 226, Hawai'i Revised Statutes

Section 226-4 (State goals), 5 (Objectives and policies for population, and 6 (Objective and policies for economy in general):

The discussion in Section 5.1.4 is applicable to Alternatives 1 and 2, in addition to the proposed project. These development concepts generally conform to the goals, objectives, and policies set forth in these sections because they will provide some degree of economic viability, stability, and sustainability for future generations. Kona Kai Ola will convert essentially vacant land into a mixed-use development with a distinctive marina and boating element, providing a wide range of recreational, business, and employment opportunities to the community.

Section 226-8 Objective and policies for the economy – the visitor industry:

Alternatives 1 and 2 will be consistent with the State's economic objective and policies relating to the tourism industry for the same reasons that are discussed in regard to the proposed project in Section 5.1.4. They will incorporate JDI's commitment to sustainability principles in the planning and design of the development concepts in Alternatives 1 and 2. Although the total hotel and time-share unit count is reduced to approximately 1,500 in Alternatives 1 and 2, the transient accommodations component of these alternatives will still further the State's objective and policies for increased visitor industry employment opportunities and training, foster better visitor understanding of Hawai'i's cultural values, and contribute to the synergism of this mixed-use project concept that addresses the needs of the neighboring community, as well as the visitor industry.

Section 226-11 Objectives and policies for the physical environment: land-based, shoreline and marine resources:

Alternative 1 is expected to involve less potential adverse impacts upon these environmental resources than the proposed project. Likewise, and Alternative 2 would have less adverse impact because of its reduction in the size of the marina and in the total hotel and time-share unit count. Alternative 1 carries less potential risk to water quality and related impacts upon the marine environment and anchialine pool ecosystems. Although approximately three anchialine pools are expected to be destroyed, the great majority of pools will be preserved within and outside of the proposed 400-foot shoreline setback.

The golf course component in Alternative 2 has the potential to impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the marina basin and nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools by introducing the chemicals into the pond systems.

Section 226-12 Objective and policies for the physical environment: scenic, natural beauty, and historic resources:

The discussion in Section 5.1.4 is directly applicable to Alternative 1 and describes the compliance with the objective and policies addressed.

The golf course component of Alternative 2 would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area.

Just as with the proposed project, Alternatives 1 and 2 would also be designed to blend with the natural terrain and to honor and protect the cultural history, resources, and practices of these lands.

Section 226-13 Objectives and policies for the physical environment: land, air and water quality:

As stated above, because of the reduction in both the number of slips and the size of the marina basin, with proper facilities design, public education and enforcement of harbor rules and regulations, Alternative 1 is anticipated to cause fewer long-term impacts to water quality than either the proposed project or Alternative 2. Based on the findings of the Harbor Water Quality Modeling Study, water quality resulting from a reduced marina basin size as proposed under Alternative 1 is expected to be similar to existing conditions.

As previously noted, Alternative 2 has the potential to adversely impact water quality by increasing the nutrient loading in surface runoff and groundwater by introducing pesticides, herbicides and other chemicals common in golf course development and maintenance into the marina basin and nearshore waters surrounding the project site.

Section 226-14 Objectives and policies for facility systems - general:

Alternatives 1 and 2 will conform to the objective and policies of this section on the grounds that are discussed in regard to the proposed project in Section 5.1.4. The master-planning and phasing of the project concepts under these alternatives will be coordinated with associated public and private infrastructural planning and related private and public infrastructural financing. The cost of the marina construction and project-related infrastructure is to be borne by the developer, resulting in considerable savings for the public. In addition, the projected lease revenue from these public lands will provide additional public benefits by establishing a revenue stream for capital improvements and maintenance of a range of State facilities.

Section 226-15 Objectives and policies for facility systems - solid and liquid wastes:

In addition to the developer's commitment to sustainable development design, the project will involve upgrades to the County of Hawaiʻi's Kealakehe Wastewater Treatment Plant to meet current needs, as well as the project's future needs. This commitment is applicable to Alternatives 1 and 2, as well as the proposed project that is discussed in Section 5.1.4.

Section 226-16 Objectives and policies for facility systems – water:

The discussion of water conservation methods and the need to secure additional potable water sources in Section 5.1.4 is also applicable to Alternative 1 and demonstrates conformity to the objective and policies for water facilities. Alternative 2 involves greater irrigation demands in regard to its golf course component and greater potable water demands for human consumption than those for Alternative 1. Alternative 2 is expected to face more serious challenges in securing adequate and reliable sources of water.

Section 229-17 Objectives and policies for facility systems – transportation:

Alternatives 1 and 2 will conform to this objective and policies because they will present water transportation opportunities, including the possible use of transit water shuttles to Kailua-Kona, as described in regard to the proposed project in Section 5.1.4.

Section 226-18 Objectives and policies for facility systems – energy:

Alternatives 1 and 2 conform to these objective and policies through the use of energy efficient design and technology and commitment to the use and production of renewable energy to serve the project's needs. Solar energy production, solar hot water heating, and the use of deep cold seawater for cooling systems are currently identified as means of saving substantial electrical energy costs for the community and the developer.

Section 226-23 Objectives and policies for socio-cultural advancement – leisure:

Alternative 1 conforms to this objective and related policies for the reasons offered in Section 5.1.4 in regard to the proposed project. Alternative 1 will be of greater conformity with the policy regarding access to significant natural and cultural resources in light of the 400-600 foot shoreline setback that has been designed for this alternative.

Although it does not propose the considerable shoreline setback that is planned for Alternative 1, Alternative 2 is consistent with this objective and related policies in incorporating opportunities for shoreline-oriented activities, such as the walking trails. In addition, the golf course component adds a more passive recreation alternative to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Section 226-25 Objectives and policies for socio-cultural advancement-culture:

The discussion in Section 5.1.4 is relevant to Alternatives 1 and 2 and demonstrate their conformity the objective and policies of this section.

Both alternatives involve the preservation and protection of cultural features that have been identified by the Cultural Impact Assessment and archaeological studies for the project area. Both provide for public shoreline access, and both will continue the policy of close consultation with the local Hawaiian community and cultural and lineal descendants in the planning of cultural resource preservation and protection.

Section 226-103 Economic priority guidelines:

Alternatives 1 and 2 conform to these guidelines for the same reasons that are set forth in Section 5.1.4. They involve private investment in a public project that will create economic diversification through a mix of marina, industrial, commercial, visitor, and cultural facilities. This presents a wide range of entrepreneurial opportunities, long-term employment opportunities, and job training opportunities.

Section 226-104 Population growth and land resources priority guidelines:

As described in Section 5.1.4, the policy support for the proposed project also extends to the similar development concepts considered in Alternatives 1 and 2. Those alternatives conform to the guidelines of this section because they involve an urban development under parameters and within geographical bounds that are supported by the County's General Plan, a preliminary form of the Kona Community Development Plan, the County's Keahole to Kailua Regional Development Plan, and the reality of being located along the primary commercial/industrial corridor between Keahole Airport and Kailua-Kona. As with the proposed project, the development concepts of Alternatives 1 and 2 are essentially alternatives for the implementation and "in-filling" of the urban expansion area in North Kona.

DHHL Hawai'i Island Plan

This 2002 plan projects DHHL's Honokōhau makai lands for commercial use. As compared to the proposed project and Alternative 2, Alternative 1 presents an expanded commercial component that provides greater compliance with the plan, while addressing certain beneficiaries' concerns about the scale of the marina originally required in the Project. Alternative 2 also conforms to the recommended commercial uses in the makai lands but to a lesser degree than Alternative 1 because of its more limited commercial component. Like the proposed project, its marina size and number of slips raise environmental issues, as more specifically discussed in Part 3, and community concerns.

County of Hawai'i General Plan

HCGP Section 4 – Environmental Quality Goals, Policies and Courses of Action:

Alternative 1 is consistent with this section. It presents a reduction in both the number of slips and the size of the marina basin that, in combination with proper facilities design, public education and enforcement of harbor rules and regulations, would result in very few long term impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions.

Alternative 2 is the least consistent with this section. In addition to the potential significant impacts of its 800 slip marina basin, its golf course component has the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides and other chemicals common in golf course use and management into the nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools beyond their current conditions by introducing such substances into the pool systems.

HCGP Section 7 – Natural Beauty Goals and Policies:

Alternative 2 conforms to some degree with this section. Its golf course component would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area, as demonstrated in other makai golf courses within the region.

HCGP Section 8 – Natural Resources and Shoreline:

Alternative 1 is most consistent with the goals and policies of this section. It would require considerably less marina excavation than the proposed project and Alternative 2 and would reduce the potential risk of long-term adverse impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions with the degree of reduction in marina basin size that is proposed under Alternative 1. This reduction is also expected to reduce potential impacts upon anchialine pools and their ecosytems, as well as shoreline and marine resources that are affected by water quality. Alternative 1 also retains the shoreline preservation and protection concepts that are proposed in and described for the Project.

HCGP Section 10 – Public Facilities Goals and Policies:

The discussion in Section 5.2.1. in relation to the proposed project is applicable to Alternatives 1 and 2. Improvements to public facilities are are integral to the Kona Kai Ola development. The provision of additional boat slips and numerous road improvements, including a makai extension of Kuakini Highway south to Kailua-Kona are incorporated into plans for the project’s development. In light of these elements, Alternatives 1 and 2 are consistent with the goals and policies of this section.

HCGP Section 11 – Public Utility Goals, Policies:

As with the proposed project, Alternatives 1 and 2 are consistent with the goals and policies of this section, based on the relevant grounds set forth in Section 5.2.1. The developer is committed to design, fund, and develop environmentally sensitive and energy efficient utility systems to the extent possible, as described previously in Part 5. Its master planning provides for the coordinated development of such systems with the objective of achieving significant savings for the public. As previously-mentioned example, the project development involves the upgrading of the Kealakehe Wastewater Treatment Plant.

HCGP Section 12 – Recreation:

Alternative 1 is consistent with the goals, policies, and courses of action for North Kona in this section.

Although the number of slips is reduced under Alternative 1, the region's boating opportunities and support facilities will still be expanded. The existing marina entrance would still be utilized under this alternative. However, concerns relating to increased activity leading to increased congestion in the marina entrance area would be mitigated to a certain extent. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities and marine science center remain important components of Alternative 1.

The golf course component of Alternative 2 would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola. Alternative 2 is also considered to be consistent with this section.

HCGP Section 13 and 13.2 – Transportation:

The reduced marina component under Alternative 1 will still provide transportation opportunities and provide for possible use of transit water shuttles to Kailua-Kona, although to a lesser degree than under the proposed project and Alternative 2 . However, in each scenario, internal people-movers are planned, and numerous roadway improvements are planned for coordination with public agencies, including but not limited to the construction of the Kuakini Highway extension between Honokōhau and Kailua-Kona. Accordingly, both Alternatives 1 and 2 are consistent with the goals, policies, and courses of action for North Kona under these sections of the General Plan.

HCGP Section 14.3 – Commercial Development:

For the reasons presented in the discussion under Section 226-104 of the State Plan, the planned commercial component under Alternatives 1 and 2 are consistent with this section.

HCGP Section 14.8 – Open Space:

Alternatives 1 and 2 are consistent with the goals and policies of this section. Alternative 1 provides a considerable (400-600 foot) shoreline setback along the entire ocean frontage of the project site as a means of protecting the area's scenic and open space resources, as well as natural and cultural resources. Although it does not incorporate the shoreline setback planned in Alternative 1, Alternative 2 provides a golf course component would contribute to the amount of open space that is currently proposed and allow additional view corridors to be created.

Community Development Plans

Community development plans are being formulated for different regions in the County in order to supplement the County's General Plan. The Kona Kai Ola project is located in the Kona Community Development Plan (CDP) area. Maps associated with the preliminary work phases

of the Kona CDP include the Kona Kai Ola project site within the “Preferred Urban Growth” boundary of the North Kona district. The Kona CDP process is guided by a Steering Committee composed of a broad cross-section of the community. The Steering Committee will eventually complete its work and recommend the CDP’s adoption.

After the DEIS was published, the Kona CDP has progressed to the development of plans for the major urban growth corridor north of Kailua-Kona. The Kona CDP has produced a draft plan showing a transit oriented development that includes a midlevel public transit corridor along the mauka residential elevation, and a makai transit corridor that runs along a proposed new frontage road just makai and parallel to Queen Kaahumanu Highway. The development plan for Alternative 1 includes the Kuakini Highway as part of this proposed frontage road and transit line from Kailua Kona to the Kealakehe area, along with a transit stop at Kona Kai Ola. The Alternative 1 plan also includes a road that could be extended to be part of the proposed frontage road should it be approved and implemented. In addition, the Kona CDP has continued to emphasize the principles of smart growth planning with mixed use urban areas where people can live, work, play and learn in the same region. Kona Kai Ola has been specifically designed to be consistent with this policy in order to provide a stable employment base close to where people live in the mauka residential areas already planned for DHHL and HHFDC lands.

It should be noted that currently and over the years, the 1990 Keāhole to Kailua Development Plan (K-to-K Plan) guides land use actions by the public and private sectors. It is intended to carry out the General Plan goals and policies related to the development of the portion of North Kona area, including the Kona Kai Ola site. The “Preferred Growth Plan” of the Keāhole to Kailua Development Plan identifies the project site as a new regional urban center to include commercial, civic, and financial business related uses, an expanded “Harbor Complex,” a shoreline road, and a shoreline park. The proposed project and the development concepts in Alternatives 1 and 2 are therefore consistent with the recommendations in the Keāhole to Kailua Development Plan.

Hawai‘i County Zoning

As shown on Figure AA, the project site is zoned “Open”. Under Section 25-5-160 of the Hawai‘i County Code, “The O (Open) district applies to areas that contribute to the general welfare, the full enjoyment, or the economic well-being of open land type use which has been established, or is proposed. The object of this district is to encourage development around it such as a golf course and park, and to protect investments which have been or shall be made in reliance upon the retention of such open type use, to buffer an otherwise incompatible land use or district, to preserve a valuable scenic vista or an area of special historical significance, or to protect and preserve submerged land, fishing ponds, and lakes (natural or artificial tide lands)”.

Some of the proposed uses at Kona Kai Ola are permitted uses in the Open zone such as:

- Heiau, historical areas, structures, and monuments;
- Natural features, phenomena, and vistas as tourist attractions;
- Private recreational uses involving no aboveground structure except dressing rooms and comfort stations;

- Public parks;
- Public uses and structures, as permitted under Section 25-4-11.

In addition to those uses permitted outright, the following uses are permitted after issuance of a use permit:

- Yacht harbors and boating facilities; provided that the use, in its entirety, is compatible with the stated purpose of the O district.
- Uses considered directly accessory to the uses permitted in this section shall also be permitted in the O district.

The proposed time-share and hotel units and commercial uses would not be consistent with the zoning designation of "Open". Project implementation therefore requires rezoning of portions of the project to the appropriate zoning category or use permits for certain uses.

Special Management Area

As shown in Figure AB, the entire project area up to the highway is within the coastal zone management zone known as the Special Management Area ("SMA"). At the County level, implementation of the CZM Program is through the review and administering of the SMA permit regulations. Kona Kai Ola complies with and implements the objectives and policies of the Coastal Zone Management (CZM) Program, and a full discussion is provided in Section 5.1.3. The development concepts in the proposed project and Alternatives 1 and 2 will be subject to applicable SMA rules and regulations.

LIFE OF THE LAND
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February 5, 2007

Dayan Vithanage
Oceanit
828 Fort St. Mall, Ste. 600
Honolulu, HI 96813

Linda Chinn
Department of Hawaiian Home Lands
1099 Alakea St., Ste. 2000
Honolulu, HI 96813

Office of Environmental Quality Control
235 S. Beretania St., Suite 702
Honolulu, Hawaii 96813

re: Kona Kai Ola DEIS

Aloha Dayan Vithanage,

My name is Henry Curtis and I am Executive Director of Life of the Land, Hawai`i's own environmental and community action group advocating for the people and the `aina since 1970. Our mission is to preserve and protect the life of the land through sustainable land use and energy policies and by promoting open government through research, education, advocacy, and litigation.

Hawai`i is facing an acute housing shortage for its working population. Many developers are proposing high-end apartment, condo, hotel and residential units. Few are proposing units for the working class. Including all proposed hotel units, marina slips, and time-share units what percentage of your units will be for people earning (a)60%, (b) 80%, (c)

100%, and (d) 140% of the median income for the County and the State of Hawai`i?

With each new high end development, it is often argued that we are raising the economic base to provide for additional working class residential units. (a) How many units has your company built in the last ten years? (b) What percentage were affordable? (c) How could that percentage be increased?

Will your development propose the integration of mixed income units or favor separating residential units by income class?

With record low levels of unemployment, where will you get the workers needed to (a) build and (b) operate your complex?

With the release of the IPCC 4th Assessment, current and future climate variability is making headlines. How will your project impact climate change? Specifically (a) what percentage of your electrical load will be provided by renewable energy? (b) What specific energy efficiency policies will you employ? (c) What is the increase in (1) air travel and (2) marine travel you anticipate during the building and during the use of your project? (d) What percentage of your commercial and residential units will be built at three feet above mean sea level or less?

Will your project lead to a decrease in isolated areas?

What percentage of the Anchialine ponds in Hawai`i MAY be affected as a result of the construction and use of your project?

How will your project affect (a) traffic congestion; (b) the loss of open space; (c) diverse agriculture (d) urban sprawl and (e) infrastructure?

The term sustainability is in vogue at the State Capitol this year. (a) How do you define sustainability? (b) Will your project lead to greater sustainability? (c) Can sustainability occur during periods of rapid economic and population growth? (d) Will you market your development to locals, on the mainland, and/or elsewhere? Please elaborate.

Mahalo,

Henry Curtis
Executive Director

July 23, 2007

Henry Curtis, Executive Director
c/o Life of the Land
76 N. King Street, Ste. 203
Honolulu, HI 96817

Dear Mr. Curtis:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Dated February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. We will respond to your comments in the order that they appear in your letter.

Page 1, Paragraph 2

The proposed project does not include residential units. It appears that you are seeking information as to the number of families whose household income falls within the affordable housing income guidelines that will stay in a hotel or time-share unit, or purchase or rent a boating slip at the proposed marina.

We do not have such projections at this time. However, the revenue generating components on lands owned by the State Department of Land and Natural Resources (DLNR) are essential for the financing of development costs of the marina and boating facilities that are proposed for the harbor expansion. It is to be expected that those revenue-generating components will be designed to capture the highest return practicable within the context of this type of project.

Page 2, Paragraph 1

Under Hawai‘i County Ordinance Chapter 11, Section 4 Affordable Housing Requirements, hotel uses generating more than 100 employees on a full-time equivalent basis must earn one affordable housing credit for every four full-time equivalent jobs created. Kona Kai Ola developers are interested in pursuing housing opportunities for workforce housing in the lands mauka of the project site in the same or adjacent ahupua‘a.

Section 4.6.5, Workforce Housing, has been added to the EIS, as follows:

> As discussed in Section 4.6.3.2, implementation of the Kona Kai Ola master plan will create a total of 3,842 on-site full time equivalent employment positions in the operating businesses of the development. The project is estimated to be operational around 2012,

> following completion of infrastructure and Phase I construction, and will continue until the community reaches build-out and stabilization in 2026.
>
> Approximately 45 percent of the jobs will be entry level positions with an average annual wage of $20,000 in current dollars. Another 40 percent will be mid-level jobs with average yearly pay of $32,000, and, 15 percent will be management/high-skill positions with wages averaging $50,000.
>
> Approximately 2,147 of the jobs in the subject project will be filled by persons who have in-migrated to the Big Island. However, only a nominal portion would be specifically relocated to West Hawai‘i as a result of the development.
>
> The total net housing load created by Kona Kai Ola in-migrant workers will be 1,074 units. This in-migration will generate a need for a range of 625 to 859 affordable housing units, as follows:
>
> The most suitable location for workforce housing units is the Villages at La‘i‘Ōpua community, a DHHL project, or within the Hawai‘i Housing Finance and Development Corporation affordable housing development planned for Keahuolū. These are two State-owned undertakings directly across the highway in the same ahupua‘a. Locating workforce affordable housing units in these communities would substantially lessen the traffic impacts associated with a community subject workforce. Alternatively, the State lands adjacent to Waikoloa Village would be appropriate.

Page 2, Paragraph 2

The agreements between the State and JDI prohibit residential development at Kona Kai Ola.

As to the number of units and “affordable” units that we have built,” we must answer in the negative. Oceanit is a local company that focuses on ocean engineering and ocean science, environmental studies, and impact analysis. We are not housing builders and thus cannot provide you with a track record of housing development.

Page 2, Paragraph 3

Implementation of the Kona Kai Ola master plan will generate a total of 3,842 on-site full time equivalent employment positions in the operating businesses of the development. The project is estimated to be operational around 2012, following completion of infrastructure and Phase I construction, and will continue until the community reaches build-out and stabilization in 2026.

Approximately 2,147 of the jobs at Kona Kai Ola will be filled by persons who have in-migrated to the Big Island. However, only a nominal portion would be specifically relocated to West Hawai‘i as a result of the development.

Page 2, Paragraph 4

The vision for the project is to develop a project that has minimal impact on the environment by striving to significantly reduce water consumption, waste disposal, energy use, and carbon dioxide emissions. The following text has been added to the EIS to present goals related to temperature and energy efficiency:

Design Related Goals

- The development will maintain 40 percent of the total site area as open (including marina). Kona Kai Ola's original proposed site plans have set aside 40 percent of total site area as open space.
- The project site temperature will be reduced while maintaining an attractive environment for visitors and the community. By reducing the site temperature, the cooling requirements in buildings will be lessened and walking within the site will be more comfortable. A variety of different measures are being considered to reduce site temperature; these measures include site vegetation, incorporation of water features throughout the site, reduction of dark pavement, and shading of pathways.

Energy Related Goals

- The project will reduce building energy use by 50 percent, as compared to a building that does not incorporate energy efficient strategies (the comparison building is defined by using ASHRAE/IESNA Standard 90.1-2004). The project team has already begun analyzing the energy use in a typical time-share. Strategies to help reduce energy use include: incorporating significant wall and ceiling insulation, utilizing windows that allow daylight without allowing heat penetration, purchasing energy efficient lighting and appliances, designing the buildings to maximize natural ventilation, and using cold ocean water for air conditioning and cooling.
- The project will use renewable energy technologies on-site to provide the remaining 50 percent of overall building energy use. On Hawai'i Island, one of the most abundant resources is solar insolation. Given the year-round abundance of solar insolation, the use of solar thermal and photovoltaic technologies is feasible for the project. The development intends to integrate these technologies into each building's architectural features. Initial calculations show that the time-share segment can integrate enough solar technologies on each building's roof to completely offset time-share electricity demand.
- These measures will help to reduce the site's peak energy demand by 50 percent. By reducing the development's demand during the range of hours that most of the Hawai'i Island's citizens are using electricity, Kona Kai Ola can help HELCO reduce the probability of brownouts and blackouts. The reduction in peak energy demand can be achieved by using smart technologies that control energy use

Information regarding increase in air and marine travel during construction and operations is not available.

Page 2, Paragraph 5

The project site is not an isolated area. It is adjacent to major thoroughfares and in proximity of residential, commercial, and industrial uses.

Page 2, Paragraph 6

The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 parts per thousand (ppt) and that the anchialine biology would then perish.

In response to DEIS comments and to further study the pools south of the entrance channel of Honokōhau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design, in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. In addition, further comment on the groundwater hydrology effects on anchialine pools was prepared by Waimea Water Services.

The DEIS identified 22 anchialine pools. Further studies determined that three of these pools are actually part of an estuary complex with direct connection to the ocean. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of 20 m^2 would be eliminated due to the harbor construction.

While the second survey confirmed the presence of direct human use and disturbance, such as trash receptacles and toilet facilities, it found that the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickelweed and mangrove.

The additional studies indicate that the remaining pools may not increase in salinity to levels unhealthy for anchialine pool fauna. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally, but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Hence, the additional studies found that changes in groundwater quality may, or may not, impact biological communities in the anchialine and estuarine environment. In either case, the developer is committed to practicing good stewardship over the pools to be preserved and eliminating or reducing alien species to the extent practicable. The developer recognizes it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Mitigation measures to facilitate the long term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on this environment can be measured.

The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment and possible new pools. Section 3.9.2, Anchialine Ponds, summarizes findings of the additional studies and is contained in Attachment 1 of this letter.

Page 2, Paragraph 7

Traffic: With the project in place, it is estimated that about 1,500 trips will be generated during the AM peak period and about 3,400 trips will be generated during the PM peak period. With the project, traffic volume is estimated to be higher at all of the major intersections compared to traffic without the project. However the timing of the construction of road improvements will be changed with approval of the Kona Kai Ola project. The Kuakini Highway extension road is anticipated to be built within the first two years (Phase 1) and this is anticipated to be a more accelerated schedule than would occur without the Kona Kai Ola project.

Open space: The project will cause the loss of open space and this is discussed in Section 6, Irreversible and Irretrievable Commitment of Resources.

Diverse agriculture: The project will not affect "diverse" agriculture, except that long-term operations, which will include food establishments, would support the diversified agriculture industry through purchase of crops.

Urban sprawl: The project site is in an urbanized area with existing roadway connections. We do not believe that project implementation will contribute to urban sprawl.

Infrastructure: Kona Kai Ola will increase the demand for potable water, wastewater treatment, drainage facilities, and solid waste facilities, and increase vehicular traffic. Impacts generated by Kona Kai Ola will be mitigated through developer-funded improvements, and many of these improvements will benefit the wider community.

Page 2, Paragraph 8

Sustainable design is a process that requires integration and communication between all parties involved in the design and construction of a development. In a typical development, an owner works with an architect and site planner to design the development. Following a site's design, engineers are hired to design the structure and systems of a building. Eventually a contractor is brought in to construct the development. In this version of development, the designers and contractors work in isolation. In contrast, sustainable design requires that team members work together to understand how all pieces to a development fit within the whole. This integration allows project members to offer unique solutions to common design and construction problems while also integrating environmental concerns into a project.

JDI has made a corporate commitment to environmental sustainability in all its work. In Kona Kai Ola, JDI intends to incorporate the latest environmental design and technology to create an energy efficient, low environmental impact, sustainable development at Kona Kai Ola.

Kona Kai Ola is proposed as an integrated mixed-use community which is designed equally for visitors and residents, enhances existing marina, fishing and water recreational businesses, and provides a range of economic opportunities. Kona Kai Ola will be implemented over a 15-year period, and it is anticipated that the marketing of specific components will vary during this time frame.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering
Cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

The conditions with the project constructed were found to be phosphorous limited. Several simulations were performed including and excluding the inflow from the marine exhibits which provides an additional nitrogen load and also varying the location of this inflow. It was found that the inflow from the marine exhibits can have a beneficial effect on flushing, especially when positioned within the existing harbor basin. However, its effect is significantly less than the effect due to the brackish groundwater inflow. When the exhibit inflow is excluded or positioned at the east end of the new marina, its effect is small in terms of flushing due to its high salinity. From a water quality perspective, since the loads from the exhibit inflow consist primarily of nitrogen, it does not cause increased algae growth. However, this exhibit inflow does raise the concentrations of ammonia and nitrate in the system.

Simulation results indicate that under the conditions when the post-expansion system receives an additional brackish inflow into the new 25-acre marina on the order of 30 mgd or more, water quality within the harbor system and in the surrounding waters remained similar to existing conditions. These conditions are expected to occur based on the findings reported by Waimea Water Services (2007), which states that the proposed marina would exhibit the same or similar flushing action as the existing marina.

An additional mitigation measure proposed by Waimea Water Services (2007), if sufficient inflow is not intercepted, consists of drilling holes in the bottom of the new marina to enhance this inflow and facilitate flushing within the proposed system.

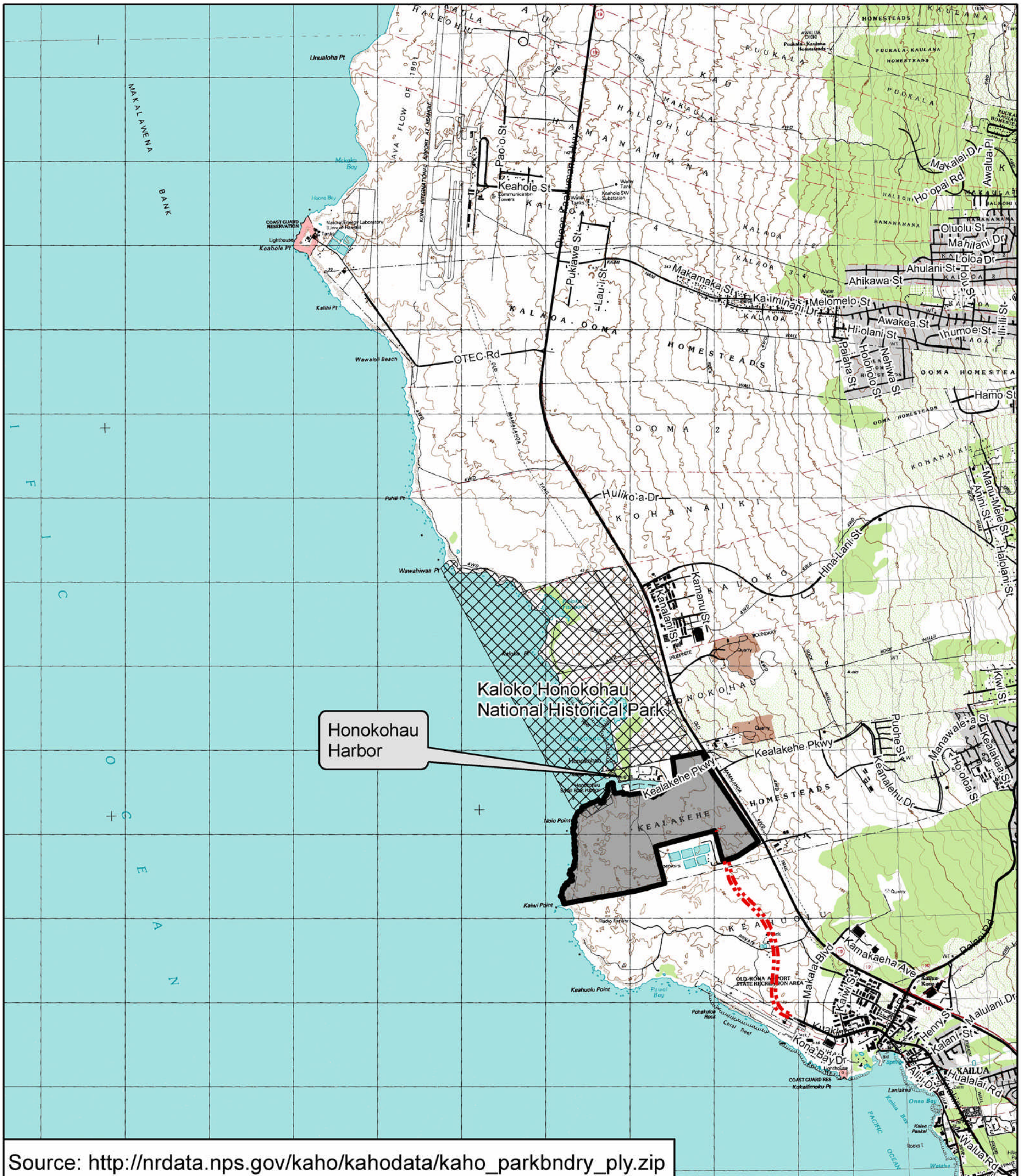
~~3.9.3~~3.9.2 Anchialine ~~Ponds~~ Pools

Two studies on anchialine pools were conducted in this EIS process. The anchialine ~~ponds~~ pools water quality studies and ~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute and is~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute in October 2006 and are included as Appendix ~~G~~H-1. That survey included pools located both north and south of Honokōhau Harbor. In response to DEIS comments and to further study the pools south of entrance channel of Honokōhau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2.

~~3.9.3.1~~3.9.2.1 Existing Conditions

Anchialine ~~ponds~~ pools exist in inland lava depressions near the ocean. Two anchialine ~~pond~~ pool complexes are located immediately to the north and south of the Honokōhau Harbor entrance channel. The complex to the north is located wholly within the designated boundaries of the Kaloko-Honokōhau National Historical Park as shown in Figure Q~~O~~. Many of the ~~ponds~~ pools in the southern complex are within the park administrative boundary as well. ~~Ponds~~ Pools in the northern complex show little evidence of anthropogenic impacts. Many contain typical vegetation and crustacean species in high abundance.

Figure R locates anchialine pools near the harbor entrance and pools~~Ponds~~ in the southern complex are depicted in Figure S.



Source: http://nrdata.nps.gov/kaho/kahodata/kaho_parkbndry_ply.zip

Figure Q: National Historical Park Service Legislative Boundary Map

Legend

- Project Site
- Proposed Parkway
- National Park Boundary

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JDI
JACOBY DEVELOPMENT, INC.

Source: Oceanic Institute

Figure R: Anchialine Pool Locations

N
W
E
S

0 2,000 4,000 Feet

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JACOBY DEVELOPMENT, INC.

Source: Aquatic Resources Management And Design

Figure S: Anchialine Pool Locations in Southern Complex

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JDI

JACOBY DEVELOPMENT, INC.

The 2006 study identified 22 pools in the southern complex. The 2007 study found that three of the 22 pools are part of an estuary complex with direct connection to the ocean. While there were several signs of direct human use and disturbance, such as trash receptacles and toilet facilities, the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickleweed and mangrove. ~~are moderately to heavily impacted, with many containing exotic fish that exclude the anchialine crustaceans. The ponds also show evidence of human impact, including discarded bottles, cans, wrappers, diapers, toilet paper, etc. Water quality conditions within the ponds generally reflect the conditions of the underlying groundwater.~~

~~Figure P locates anchialine ponds near the harbor entrance. The study conducted as a part of this EIS show that the anchialine ponds south of the harbor entrance are moderately to heavily impacted by human activities and introduced fish populations. The study found that the nitrogen phosphorus concentrations in these ponds are significantly higher compared to the ponds north of the harbor entrance. The sources of these additional nutrients are not known. Continuous influx of nutrients will eventually degrade the water quality to levels that could alter the pond ecology.~~

Biota surveys in the two pond systems clearly indicate that counts of typical pond denizens show a remarkable difference between the northern and southern ~~ponds~~ pools. In the northern ~~ponds~~ pools the number of *Halocaridina rubra* ranged from a low of 20–25 to too numerous to count. The biota rich pond bottoms appeared red due to the *Halocaridina rubra* numbers. The only other species visible was the predatory shrimp *Metabetaeus lohena*. In contrast, only four out of the 22 ~~ponds~~ pools examined in the southern pond complex showed a decreased presence of *Halocaridina rubra* (6 to 200) individuals in the pond, and three ~~ponds~~ pools contained *Metabetaeus lohena*. Eight of the ~~ponds~~ pools contained numbers of introduced minnows which is an apparent predator of *Halocaridina rubra* and *Metabetaeus lohena*.

The 2007 study found three of the pools identified in the 2006 study were part of an estuary complex with direct connection to the ocean, and that the southern complex contained 19 anchialine pools. The study further found that a majority of the southern pools are degraded biologically and physically, primarily due to the effects of introduced fish and plant species. Six pools are currently devoid of alien fish, but they face a high level of threat due to the proximity of pools that have these species. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction.

The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 ppt. and that the anchialine biology would then perish. There is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and final determination of anchialine salinity following the harbor construction. The assessment that all anchialine pools will be barren with the construction of the harbor may be premature. *Halocaridina rubra* (opae ula) are routinely drawn from high salinity wells at 30-32 ppt.

Within the 19 pools, native and non-native fauna included 14 species comprised of 5 fish, 2 mollusca, and 6 crustacea. Algae within the pools primarily consisted of a mixed assemblage of diatoms and cyanobacteria, with several pools dominated by matted filamentous *Cladophora*, sp. The darker cave/overhang pools and high tide pools had epilithic *Hildenbrandia* sp. covering the rock substrate. Riparian vegetation was dominated by introduced species consisting of Pickleweed (*Batis maritima*), Mangrove (*Rhyzophora mangle*), and Christmasberry (*Shinus terebenthifolius*). Only two species of native plants Akulikuli (*Sesuvium portulacastrum*) and Makaloa (*Cyperus laevigatus*) existed near the pools and comprised only few small patches and a single tuft (respectively).

Most of the hypogeal anchialine shrimp have adapted to the presence of minnows by foraging in the pools at night. During daylight hours, only the adult shrimp appear to coexist at low population levels with the smaller *P. reticulata*, but the larger *G. affinis* and *Oreochromis* prevent the daytime appearance of hypogeal shrimp due to predation.

The average salinity in Kealakehe pools is relatively high at 13.5 ppt compared to most other pools along the West Hawaiʻi coastline, having an average of approximately 7 ppt. This high salinity appears to be characteristic of this region, and is similar to the average of most pools within the adjacent ahupua'a of Honokōhau and Kaloko. The levels of nitrate-nitrogen levels are relatively high compared to other undeveloped areas, but fall in the range of some developed landscapes. Other water quality parameters, including pH and temperature, fall into normal ranges for anchialine pools.

This relatively high salinity is the likely reason aquatic insects were not found in any pools at Kealakehe. Though the rare damselfly *Megalagrion xanthomelas* has been observed and collected from Kaloko, a statewide assessment of its range has not found it to occur in water with salinity greater than 3ppt. However, there has been an unsubstantiated occurrence of the nymph in a pool of up to 8ppt (Polhemus, 1995).

Another species of concern is the hypogeal decapod shrimp *Metabetaeus lohena.* These shrimp are sometimes predatory on *H. rubra* but are more often opportunistic omnivores similar to *H. rubra.* Predusk and nocturnal sampling at high tide is clearly the optimal method to determine habitat range and population densities for this species. These shrimp were found in 13 of the 19 pools, 7 of which had *M. lohena* only at night. The occurrences of *H. rubra* were found in 16 of 19 sampled pools, 8 of which had ʻŌpaeʻula observed only at night. Consequently, despite having numerous degraded anchialine resources at Kealakehe, there are opportunities for many of the pools to be restored and enhanced to a level where large populations of anchialine shrimp and other native species may return to inhabit the pools as they likely have in the past.

~~As mentioned earlier, the southern ponds also had elevated concentrations of nutrients indicating water quality degradation. These factors indicate that if no restoration or maintenance activities are instituted to reserve these ponds, these ecosystems will degrade beyond recovery.~~

~~3.9.3.2~~3.9.2.2 Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

The anchialine ~~ponds~~ pools that are located north of the existing harbor are not likely to be impacted because no development activities are proposed north of the existing harbor. It is highly unlikely that existing groundwater flows to the Kaloko-Honokōhau pond system to the north of the existing harbor will be impacted by the proposed marina to the south.

Of the 19 pools in the southern complex, three would be eliminated due to harbor construction. Regarding the remaining pools, the DEIS noted that t~~T~~he change in the local groundwater flow pattern in the vicinity of the proposed marina ~~will~~ would impact the anchialine ~~ponds~~ pools that are located between the proposed marina and the shoreline south of the harbor entrance. The 2006 study (Appendix H-1) noted that t~~T~~he salinity of the anchialine ~~ponds~~ pools ~~will~~ would increase due to reduction of brackish groundwater, and that ~~. Some ponds will be excavated to make the new harbor basin. T~~those ~~ponds~~ pools that are not excavated will revert to full salinity, causing the loss of their habitat. ~~and associated aquatic flora and fauna. However, current investigations indicate that these ponds are already enriched by nutrients and the density of associated aquatic fauna is very low. In addition, trash from visitors, and introduction of minnows has already degraded the pond ecology.~~ Even without the potential impacts from the proposed marina construction, the pond ecology might change irreversibly from the nutrient input, human indifference and expansion of non native fauna species.

Further studies conducted in response to DEIS comments (Appendix H-2, and Appendix G-3) indicate that the remaining pools may not increase in salinity to levels unhealthy for *H. rubra* and *M. lohena* and other anchialine pool fauna. In addition, these studies determined that there are realistic mechanisms employed elsewhere that would mitigate changes due to groundwater changes. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore.

Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented. The mitigation plan will be based on the following objectives:

Objective 1 To preserve, maintain, and foster the long-term health and native ecological integrity of anchialine pools at Kealakehe.

Objective 2 To protect and promote cultural practices and traditions surrounding anchialine resources at Kealakehe.

Objective 3 To provide education, interpretation, and interactive opportunities for the community to learn about and appreciate the anchialine resources.

Objective 4 To acquire a pond manager to implement the program, conduct monitoring, research, and reporting, and provide education to the community about anchialine and estuarine resources.

Mitigation measures to facilitate the long-term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on the environment can be measured. The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment and possible new pools.

As a mitigation measure, bioretention, which is a Best Management Practice (BMP) is a feasible application for the proposed development. There is a probability that nutrients and other potential pollutants will runoff landscaping and impermeable surfaces such as roadways and parking lots during medium or high rainfall events. Some of these pollutants could enter the groundwater table and into anchialine pools and ultimately the ocean. As an alternative to directing runoff into the ground through drywells, storm water should be directed into bioretention areas such as constructed surface or subsurface wetlands, vegetated filter strips, grass swales, and planted buffer areas. Storm water held and moved through these living filter systems are essentially stripped of most potential pollutants, and allowed to slowly infiltrate back to the groundwater table.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Another mitigation measure that may be included in the management plan is salinity adjustment. In the 2006 assessment regarding the impact to the southern pools from the proposed construction of the harbor, it was stated that this construction would cause the salinity in the anchialine pools to become equivalent to the ocean at 35ppt. It was then concluded that the anchialine biology would perish.

However, there is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and a final determination of anchialine salinity following the harbor construction. The dynamics of groundwater movement through a porous lava medium both seaward and laterally along the coastline is an inexact science. This is compounded by the variations in water density, including stratification of salinity within the proposed harbor and capillary movement of low-density surface water through the substrata.

The assessment that all anchialine pools will be barren with the construction of the harbor may therefore be premature. *H. rubra* are routinely drawn from high salinity wells at 30 – 32 ppt and survive in this salinity for years. Further, high populations *H. rubra* and *M. lohena* have thrived and reproduced in pool salinities of 27ppt. If the pools do become full strength seawater at 35ppt, there exists uncertainty on the long-term effects to anchialine organisms, since there are no long-term studies or examples of native anchialine ecosystems at 35ppt. Native anchialine pool vegetation also has relatively high salinity tolerance.

If the salinity were expected to rise to 35 ppt, possible mitigation in the management plan will include methods to surcharge man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water. If sufficient volume is used, it is theoretically possible to lower salinity in adjacent natural anchialine pools. This surcharge method has been successfully used to raise salinity in anchialine pools and cause the salinity rise in adjacent pools of at least up to 10 meters away. Surcharging with low salinity should work as well or better since the lower density water will essentially float atop the higher salinity water at the surface layer, and move throughout the complex of natural pools. Surcharging may also be a viable mitigation to dilute and more rapidly disperse any pollutants that may be detected in the pools.

Another mitigation measure includes the creation of new anchialine pools. There is significant opportunity to create new anchialine pools and greatly expand the native habitat and resource. It has been demonstrated at several projects in West Hawai‘i that anchialine pools can be created and will be colonized with a full compliment of anchialine species endemic to the area. Anchialine pools are considered focal points of higher productivity relative to the subterranean groundwater habitat around them. Their productivity promotes an increase in population levels of anchialine species within the pools themselves and throughout the subterranean habitat surrounding them.

~~No realistic mechanisms are envisioned for re-injecting fresh water into these systems to maintain their ecological balance as an anchialine system. These ponds will be changed from a brackish water system to a marine system. But, those ponds in the area of the shoreline park and cultural park will be cleaned of vegetation and protected from other physical alteration. A buffer zone around these newly established marine ponds will be protected as well.~~

~~The anchialine pond shrimp (*Metabetaeus lohena)* and the orangeback damsel fly (*Megalagrion xanthomelas)* are listed as candidate endangered species in the Federal Register and were both recorded in surveys of these anchialine ponds done in 2004 by US Geological Survey Biological Resources Division and the NPS Inventory and Monitoring Program. Low numbers of *Metabetaeus lohena* were encountered in three of the 22 ponds surveyed in the southern pond complex. *Megalagrion xanthomelas* was not encountered in any of the southern pond complex ponds during the recent study. The low density of *Metabetaeus lohena* and the observed absence of *Megalagrion xanthomelas* may be due to the impacts from high nutrient input and general degradation of the ponds.~~

~~An attempt should be made to move as much of the existing population of *Metabetaeus lohena* from these anchialine ponds before they become too saline, to possible newly excavated ponds that may be developed off-site. These shrimp should not be introduced into existing populated ponds to avoid any potential pathogenic impacts to the healthy ponds.~~

~~Public education on the unique ecology of the anchialine ponds and the need for preserving their ecology will reduce future human impacts in other healthy ponds.~~

~~Further recommended mitigation includes restoration to degraded anchialine ponds off the project site, preferably those located at the adjacent Kaloko-Honokōhau National Historical Park.~~

Envelope PostMarked Feb 13, 07

Submitted by:
Tim Robertson
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We desperately need to expand and improve our harbor to better support current and future needs of the community. The Kona Kai Ola project is a great opportunity to modernize the business infrastructure for this specialty tourism offering utilized by locals and travelers. The creation of new, high quality jobs and the revenue this project will generate for the community makes great business sense. When you review the DEIS you will see that Jacoby have done an excellent job incorporating this project into the environment and that this project can be accomplished without negatively impacting the ecosystem and in some cases will be able to make improvements.

I agree with how we arrived at this juncture, the DLNR issued a RFP for a Multipurpose Harbor with 800 slips (I haven't had the opportunity to review the parameters behind the DLNR'S sizing model for the harbor)…Jacoby won based on an evaluation of their capabilities, experience and the content of their proposal.

- The scope of the RFP will not necessarily be the final project. As a matter of fact this is where the real work begins for the Kona Community, we need to be prepared to provide feedback and determine the ultimate requirements for this development based on what is best for the community.
    - Based on my experience in Logistics I would suggest a 400 slip harbor is more in order, at the same time reconfiguring the existing Harbor that would relocate 70 slips into the new side, so the net increase in slips is 330 units.
        - This is speculative without further details on the sizing model the DLNR used to develop the RFP.

If you're really concerned about the fishery, this harbor will not impact the Pacific Ocean in any measurable fashion. The foreign commercial fleets are 99% responsible for the collapse of all world wide stocks predicted by the year 2048. The authors of this study are 14 of the worlds leading Marine scientists, published in Journal Science…

An example of some of the jobs created by an expanded harbor and subsequent expanded fleet are REAL positions paying $30-40.00 per hour for boat smiths, mechanics and other technical support…NOT polishing brass and cleaning boats as those opposed have expressed.

I hear those opposed quoting scientific studies or information without names or footnotes. All I would ask for are the names of the studies or reference material so I can review their findings.

- The recurring theme we hear for those opposed to expanding the marina is that we need to STOP everything until more infrastructure has been built, again I would like to see a project plan or study from those opposed describing what is required and a timeline that deals with the natural growth of the community and more importantly how expanded infrastructure is funded.

- Right now the Marina project is at least 6 years away from creating any traffic or demands on Kona's infrastructure, this is more than enough time to make the necessary improvements our area desperately needs and this project CAN even fund these upgrades!

Our dilemma of how we deal with growth is not new, the tag line Smart Growth came from groups learning from others. The fact we have the luxury of seeing how hundreds of other communities have dealt with out very situation allows us to partake in Smart Growth which in short is organizing the right elements, creating the proper sequence and lastly plugging in the correct timelines.

I am not FOR or OPPOSED to this project, I am FOR what is best for the Kona community and its future. Developing this project PROPERLY will definitely help West Hawaii, but we need to deal in hard engineering not opinions to make the correct decisions throughout the life of the project.

The most important infrastructure expansion that must occur is to the staffing of the Planning & Engineering Departments for the Big Island. Without the required engineering resources in place we cannot properly evaluate the growth challenges we face over the next 25 years. Opposing new projects out of hand and believing in zero growth has led us to our current situation:

- Failing hospitals, that cannot service the community
- The worst school system in the nation
- An extreme shortage of staff and facilities for Police, fire and emergency services
- Traffic congestion with no master plan to manage the Islands current requirement let alone future islands traffic flow
- Virtually no middle income jobs or economy for those entering the job market

I appreciate everyone having an opinion they wish to express on this matter, but the only way to make good decisions for this project and others must be based on proven science and proper engineering.

From my passed experience in designing and engineering $1B+ distribution infrastructure rollouts for major companies like Wal-mart, Sysco, Blockbuster etc… across several countries with a variety of geographical and cultural challenges I understand there is only one chance to do things right. I have personally worked in unison with the Jacoby Group and seen their performance first hand. This experience makes me a strong advocate for them as a developer for this project because they have the resources, experience, knowledge, ethics and ability to provide what this community needs. They represent the type partner West Hawaii needs to work with to developing our community, I strongly suggest looking at the list of technologies types of projects they're involved.

- Geoplasma technology, converting waste into electricity with clean technology
- Learning Soft
- Shrimp Improvement Systems

- BioQuantix
- Whitney Labratories
- PhotoVoltaic technology
- Numerous Brown Field projects
- Marine based projects

The summary of the Kona Kai Ola project on the Jacoby web site provides best representation of their approach to this project and their goals for the community. (see below copy)

The 490-acre Kona Kai Ola, located on the Big Island's beautiful Kohala-Kona Coast, will be developed on lands leased from the Hawaii Department of Land and Natural Resources and the Department of Hawaiian Home Lands.

This master-planned, mixed-use community whose name means "the living sea" promises to be one of JDI's most prestigious smart growth projects to date. Not only will it provide economic benefits to the surrounding communities and the state of Hawaii, Kona Kai Ola will help residents preserve key aspects of their environment and culture. Kona Kai Ola's master plan – formulated with the community's input – will include an expanded marina, hotels, timeshares, retail space, a Hawaiian cultural center, a marine science center, a Hawaiian healing center, a big game fishing club, marine parks and diving facility.

The pedestrian-friendly Kona Kai Ola will include oceanside setbacks and greenspace that exceeds the minimum zoning requirements. The community will become a model for environmentally friendly development in Hawaii, especially as it is open to the surrounding community and celebrates the Hawaiian values of m_lama '_ina and m_lama ke kai, or care for the land and sea.

Among the environmentally friendly features planned is a master energy plan that includes inventive solutions such as a district cooling system using sea water air conditioning, photovoltaic panels (solar energy) to generate enough power to operate the chilled and hot water pumps during daytime, and use of renewable energy sources.

The potential benefits of such endeavors include reducing air emissions from utility generation, more efficient use of energy and reduction of landfill waste.

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July 23, 2007

Tim Robertson
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Kailua-Kona, Hawaiʻi 96740

Dear Mr. Robertson:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Dated February 13, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement.

We concur with your statements regarding the need to expand the existing Honokōhau Harbor, and share your belief that Kona Kai Ola will improve the economic environment with the addition of this mixed-use community. Your comment related to the incorporation of environmentally sound practices at Kona Kai Ola is accurate, and EIS Section 1.5.2, Project Sustainable Design, provides sustainability goals in the areas of design, energy, water, waste and transportation. Section 1.5.2, Project Sustainable Design, has been expanded to include specific project sustainability goals, and is contained in Attachment 1 of this letter.

Your suggestion regarding a 400-slip harbor is acknowledged and we have incorporated such suggestions in the EIS. As explained in the DEIS, the agreement between JDI and the State of Hawaii established a required scope and scale of the project for which the impact analysis was provided. Several comments have addressed the fact that alternatives other than the No Project Alternative were not addressed in the DEIS Section 2, Alternatives Analysis.

Kona Kai Ola is of the position that alternative actions other than a No Project alternative are not currently feasible without an amendment to the agreement with the State. Agency and public comments in response to the DEIS, as well as additional information generated as a result of inquiry into issues raised by the comments, have been helpful in identifying alternative actions that will serve the State's goal of providing additional marina slips for the Kona area. These alternative actions also serve to reduce or mitigate anticipated effects of the proposed development.

Thus, agencies such as the Land Division of the Department of Land and Natural Resources, the U.S. Department of the Interior Fish and Wildlife Service, and the Planning Department of the County of Hawaiʻi, and the Office of Environmental Quality Control (OEQC), as well as community organizations have commented that a reduced scale marina and related facilities should be considered.

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The OEQC has also asked that the alternative of a reduced scale project be evaluated under the assumption that DHHL may determine that a downsized project would be preferred.

In response to these comments on the DEIS and in consideration of measures to mitigate anticipated impacts, the EIS Section 2, Alternatives Analysis, has been revised to describe the following alternatives, which are discussed in more detail in the EIS:

- Alternative 1 is a project involving a 400-slip marina, 400 hotel units, 1,100 time-share units, and commercial and support facilities. This alternative would enhance water quality and avoid the need to widen the existing harbor entrance channel, as well as reduce traffic and socioeconomic impacts.
- Alternative 2 is an alternative that had been previously discussed, but not included in the proposed project that includes an 800-slip harbor and a golf course.
- Alternative 3 is the no-action alternative.

A comparison between impacts related to the proposed project concept and impacts related to Alternative 1 indicates that a reduction in the acreage and number of slips in the marina, as well as the reduction in hotel and time-share units, would generate less environmental, traffic, social and economic impacts. Although positive economic impacts would be reduced, Alternative 1 can be considered as a preferable alternative because of reduced environmental impacts. However, while it can be concluded that the 25-acre marina in Alternative 1 would be the preferred size, the DLNR agreement establishes the size of the marina at 45 acres and 800 slips. An amendment to the DLNR agreement is required in order to allow Alternative 1 to proceed. Hence, selection of Alternative 1 is an unresolved issue at this time.

The additional EIS text that includes the added EIS Section 2, Alternative Analysis, is contained in Attachment 2 of this letter.

We agree with your statements regarding impacts on regional fisheries. Further, your statement regarding employment related to marina support facilities is accurate.

Your statements regarding the 15-year implementation time frame reflects your understanding of the market of the various project components and the timing of improvements to the infrastructure system. For example, in Phase 1 of the project, JDI will not only provide access to the commercial parcel, but also address regional traffic issues through the improvements of the roadway system. JDI plans to improve the intersection of the Queen Ka‘ahumanu Highway and the Kealakehe WWTP Access Road. The Kealakehe WWTP Access Road is planned to be realigned and widened to an 80-foot road right-of-way (ROW) that will serve the Commercial Parcel No. 1 and eventually intersect with the proposed Kuakini Highway Extension to the west. Such improvements will ensure that project minimize its own impacts while improving existing conditions.

Regarding the need to improve public services and facilities, including those related to the medical, educational, police and fire protection, transportation systems, Kona Kai Ola will contribute to these systems through the increase of jobs and increases in real property tax, income tax, general excise tax and transient accommodation tax.

Finally, we appreciate your comments regarding JDI's experience, knowledge, ethics and abilities. Making an informed decision requires time and a sincere desire to understand the full picture, and your comments reflect your commitment to obtain accurate information.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

1.5.2 Project Sustainable Design

The U.S. General Services Administration defines sustainable design as a process that "seeks to reduce negative impacts on the environment, human health and comfort of building occupants, thereby improving building performance" (GSA 2006). Sustainable design is a process that requires integration and communication between all parties involved in the design and construction of a development. In a typical development, an owner works with an architect and site planner to design the development. Following a site's design, engineers are hired to design the structure and systems of a building. Eventually a contractor is brought in to construct the development. In this version of development, the designers and contractors work in isolation. In contrast, sustainable design requires that team members work together to understand how all pieces to a development fit within the whole. This integration allows project members to offer unique solutions to common design and construction problems while also integrating environmental concerns into a project.

JDI has made a corporate commitment to environmental sustainability in all its work. In Kona Kai Ola, JDI intends to incorporate the latest environmental design and technology to create an energy efficient, low environmental impact, sustainable development at Kona Kai Ola. The vision for the project is to develop a project that has minimal impact on the environment by striving to significantly reduce water consumption, waste disposal, energy use and carbon dioxide emissions.

One key to measuring the sustainability of the project's design and operation is to use the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. The LEED Green Building Rating System is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings. LEED gives building developers and operators the tools they need to have an immediate and measurable impact on their buildings' performance (LEED 2006). JDI has experience with the LEED certification process from its other projects both for individual buildings, and for large campus infrastructure as well. JDI intends to pursue, at a minimum, Silver LEED certification for its development of the Kona Kai Ola project.

At the project's onset, JDI developed goals related to design, energy, water, waste and transportation, and the following sections present goals in each of those areas.

~~Sustainable design principles include the ability to:~~

- ~~minimize non-renewable energy consumption~~
- ~~optimize site potential~~
- ~~use environmentally preferable products~~
- ~~protect and conserve water~~
- ~~enhance indoor environmental quality~~
- ~~optimize operational and maintenance practices~~

Attachment 2

2 Alternatives Analysis

~~In typical land development projects, the initial planning process includes the exploration of alternatives to development objectives. In the EIS process, these alternatives are presented with a disclosure of reasons for the dismissal of non-preferred alternatives.~~

~~Kona Kai Ola does not follow this same pattern of alternatives evaluation.~~ As discussed in Section 1.4, the proposed Kona Kai Ola project is the result of agreements between JDI and the State DLNR and DHHL. The agreements and leases between the State and JDI stipulate the parameters of development for this site in terms of uses, quantities and size of many features, resulting in a limited range of land uses. Unlike a private property project, JDI is required to meet the criteria outlined in the agreements, thereby affording less flexibility in options and uses. From the developer's perspective, the agreements must also provide sufficient flexibility to allow for a development product that responds to market needs and provides a reasonable rate of return on the private investment.

The agreements between JDI and DLNR specify that the proposed harbor basin is to be 45 acres and accommodate 800 slips. This development proposal is the subject of this EIS. In response to DEIS comments, additional water quality studies and modeling were conducted. These studies determined that the water circulation in a 45-acre 800-slip marina would be insufficient to maintain the required standard of water quality. The models of water circulation suggest that a new 25-acre harbor basin could successfully maintain required water quality in the new harbor. Comments on the DEIS from DLNR, from other government agencies, the neighbors and the general community also called for the consideration of alternatives in the EIS, including a project with a smaller harbor basin and less density of hotel and time-share units.

In response to these comments on the DEIS, three alternatives are evaluated in this Final EIS and include Alternative 1, which is a plan with a 25-acre 400-slip harbor basin including a decrease in hotel and time-share units; Alternative 2, which is an alternative that had been previously discussed but not included in the proposed project, that includes an 800-slip harbor and a golf course; and Alternative 3, the no-project alternative. Each alternative is included in the EIS with an evaluation of their potential impacts. These project alternatives are presented to compare the levels of impacts and mitigation measures of the proposed project and alternative development schemes pursuant to requirements set forth in Chapter 343, HRS.

~~JDI is required to provide a new marina basin not less than 45 acres and a minimum of 800 new boat slips. Further, the agreements provide the following options for land uses at the project site:~~

- ~~Golf Course~~
- ~~Retail Commercial Facilities~~
- ~~Hotel Development Parcels~~
- ~~Marina Development Parcels~~
- ~~Community Benefit Development Parcels~~

~~JDI is not pursuing the golf course option and is proposing instead to create various water features throughout the project site. All other optional uses have been incorporated in Kona Kai Ola.~~

2.1 Project Alternatives

2.1.1 Alternative 1: 400-Slip Marina

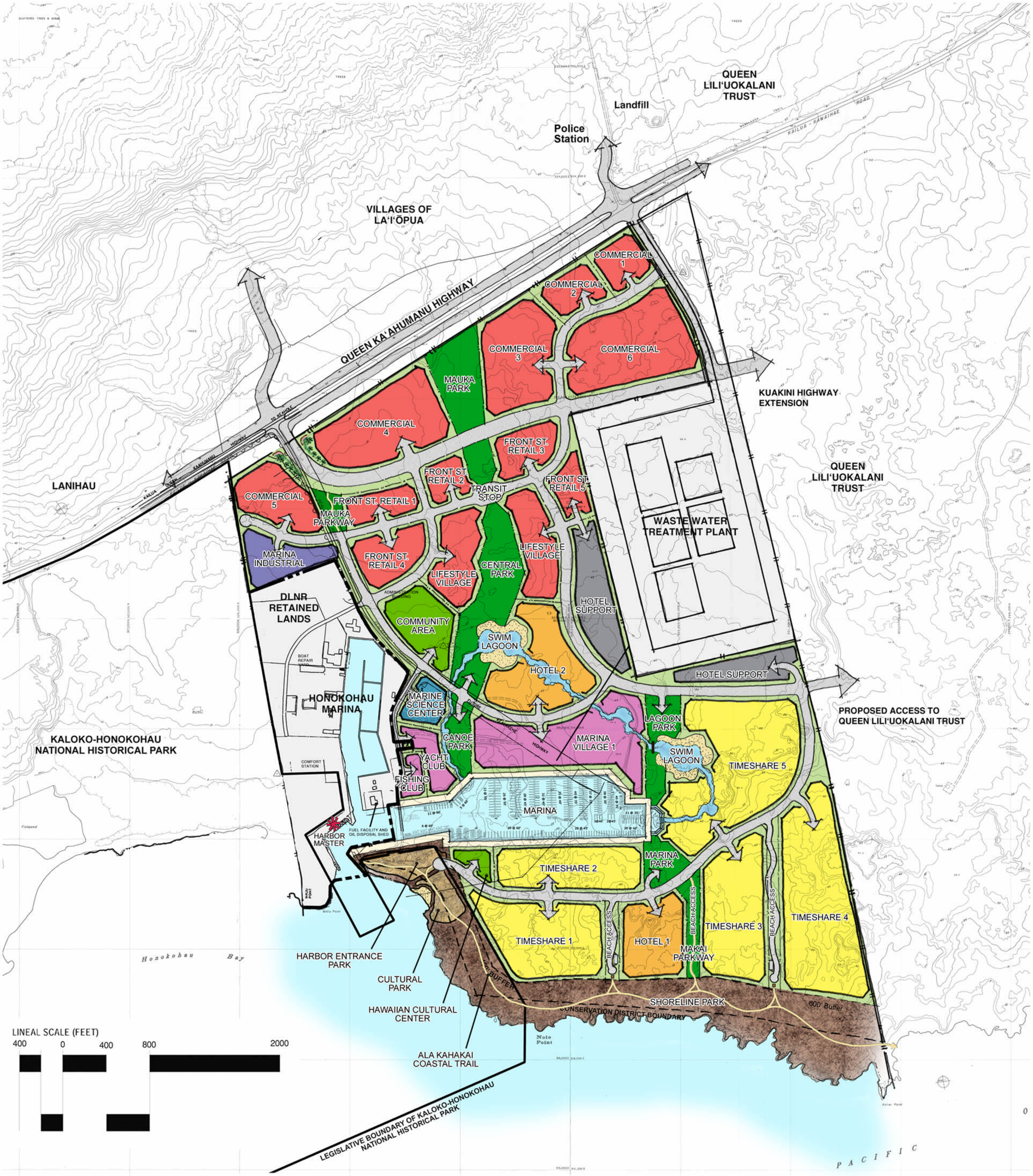
Studies conducted in response to DEIS comments found the construction and operation of an 800-slip marina may significantly impact the water quality within the marina and along the shoreline. Specifically, the Harbor Water Quality Modeling Study, as contained in Appendix U, found that the water circulation in a 45-acre 800-slip harbor was insufficient to maintain an acceptable level of water quality. Further, the existing harbor channel, which would serve both the existing and new harbors, could not adequately serve the increased boat traffic generated by an 800-slip marina during peak traffic. Mitigation measures to accommodate peak boat traffic included the widening of the existing channel, an action that would entail a complex process of Federal and State approvals and encounter significant environmental concern.

Concerns related to the proposed density of hotel and time-share units were also expressed in comments to the DEIS from members of the public, neighbors to the project site, especially the Kaniohale Community Association, and government agencies. Common themes in DEIS comments were related to impacts regarding traffic, project requirements of potable water and infrastructure systems, including sewer, drainage, utility and solid waste systems, and socioeconomic impacts.

In response to the water quality study results, and to the DEIS comments, an alternative plan was developed with a smaller marina with less boat slips, and a related decrease in hotel and time share units. Illustrated in Figure G, Alternative 1 reflects this lesser density project, and features a 400-slip marina encompassing 25 acres. For the purposes of the Alternative 1 analysis, JDI assumed 1,100 time-share units and 400 hotel rooms. Project components include:

- 400 hotel units on 34 acres
- 1,100 time-share units on 106 acres
- 143 acres of commercial uses
- 11 acres of marina support facilities
- 214 acres of parks, roads, open spaces, swim lagoons and community use areas

In addition, Alternative 1 would include the construction of a new intersection of Kealakehe Parkway with Queen Ka'ahumanu Highway, and the extension of Kealakehe Parkway to join Kuakini Highway to cross the lands of Queen Lili'uokalani Trust, and connecting with Kuakini Highway in Kailua-Kona. This is a significant off-site infrastructure improvement and is included in the agreements between the State and JDI.



Source: PBR HAWAII

Plan is conceptual only and subject to change

Figure G: Alternative 1: 400-Slip Marina

LEGEND

TIME SHARE	MARINA SUPPORT / COMMERCIAL	UTILITIES
HOTEL	MARINE SCIENCE CENTER	PARKS & GREEN SPACE
RETAIL / COMMERCIAL	COMMUNITY AREA / CULTURAL CENTER	SHORELINE
MARINA RETAIL	SWIM LAGOON	HARBOR ENTRANCE PARK / CULTURAL PARK
	MARINA	

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Like the proposed project, Alternative 1 would have a strong ocean orientation, and project components that support this theme would include various water features including seawater lagoons and a marine science center. The new Alternative 1 harbor would include a yacht club, fishing club, a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. The coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and ‘Alula for community use. Additional Alternative 1 community areas would include facilities and space for community use, including programs of the Kona Kai Ola Community Foundation, which supports community programs in health care, culture, education, and employment training for the local community, especially to native Hawaiians. Like the original proposed plan, Alternative 1 includes 40 percent of the land in parks, roads, open spaces, swim lagoons and community use areas.

2.1.2 Alternative 2: Golf Course Feature

Alternative 2 was among the alternatives discussed at a community charrette in September 2003. It includes a golf course, which is a permitted use in the DLNR agreement and DHHL lease. As Figure H illustrates, an 18-hole championship golf course would occupy 222 acres on the southern portion of the project site. As with the proposed project, Alternative 2 includes an 800-slip marina on a minimum of 45 acres.

To support the economic viability of the project, other Alternative 2 uses include:

- Golf course clubhouse on three acres
- 1,570 visitor units on 88 acres fronting the marina
- 118 acres of commercial uses
- 23 acres of community uses

Community uses in Alternative 2 include an amphitheater, a canoe facilities park, a community health center, a Hawaiian cultural center and fishing village, a marine science center and employment training center. The sea water lagoon features contained in the proposed project and Alternative 1 are not included in this alternative.

2.1.3 Alternative 3: No Action

In Alternative 3, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.

~~The economic viability and sustainability of the project is determined by the density and uses proposed. Because JDI is obligated to develop an 800-slip marina for the State, complete road improvements, and provide various public enhancement features at its own expense, the density proposed for the income generating features of the development must be sufficient to provide an acceptable level of economic return for JDI. The market study, which is discussed in Section 4.6, reviewed various development schemes and determined that the currently proposed density and mix is the optimum to meet the anticipated financing and development cost obligations for the public features associated with the development.~~

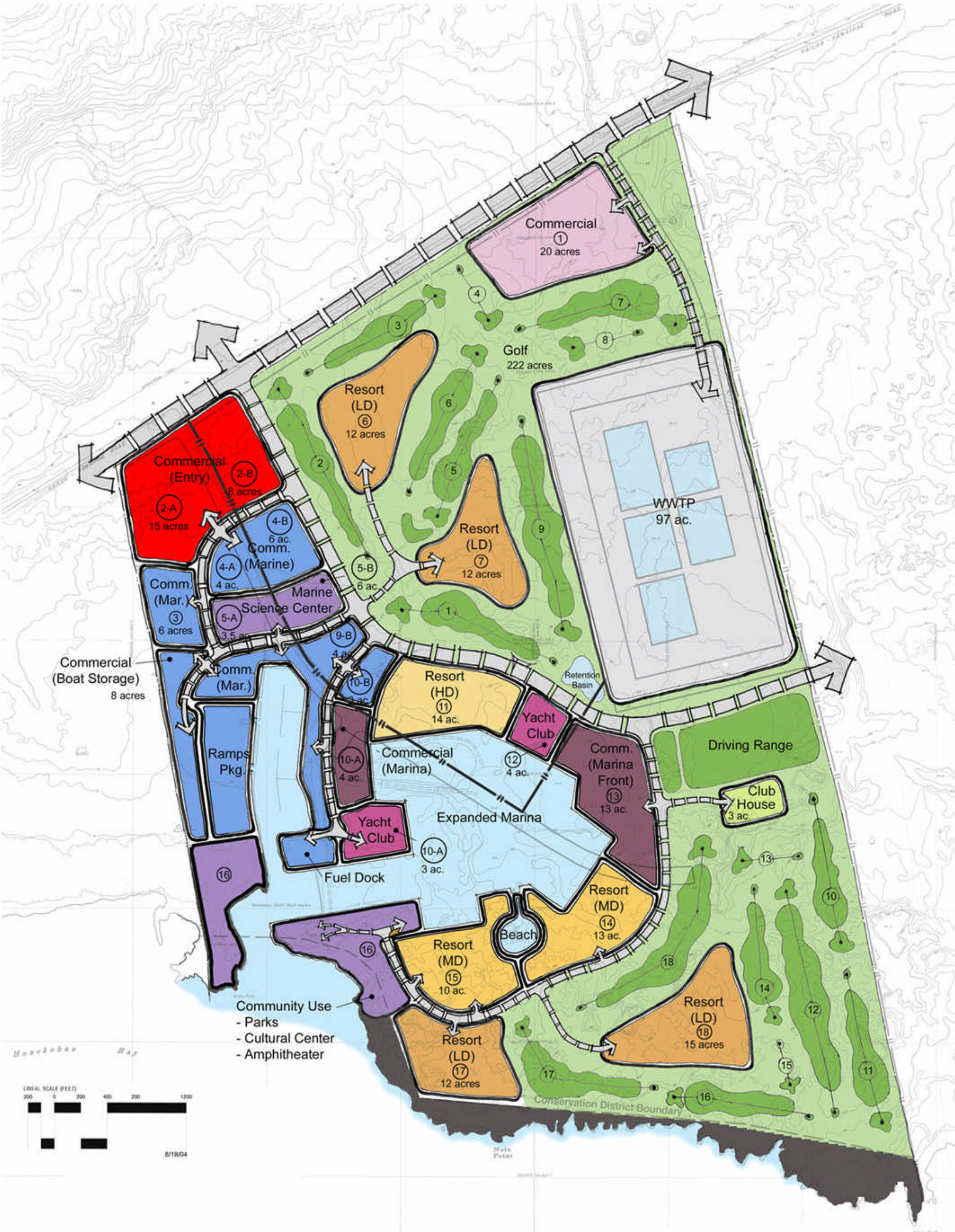

Figure H. Alternative 2: Golf Course Alternative

Legend

N E S W

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2.2 Alternatives Analysis

As discussed in Section 2.1, the proposed Kona Kai Ola project (also referred to as "proposed project") is defined by development requirements related for a marina and the related uses that would be needed to generate a reasonable rate of return that covers development costs.

Beginning with Section 2.2.1, the alternative development concepts are comparatively assessed for potential impacts that may reasonably be expected to result from each alternative. Following is an overview of the primary observations of such assessment.

Alternative 1 includes half of the State-required boat slips and 60 percent of the proposed hotel and time-share units and, due to the decreased density, this alternative would generate significantly less environmental and socio-economic impacts. A harbor water quality model found the reduction of the volume of the new marina basin by about half (approximately 25 acres) significantly improved the water circulation and quality. Further, the reduced number of boat slips would generate less boat traffic, thereby reducing congestion and the need to mitigate impacts further by the widening of the existing harbor channel.

A project with fewer hotel and time-share units and increased commercial space with a longer (14 years) absorption period would change the mix of employment offered by the project, and slightly increase the overall employment count. The public costs/benefits associated with Alternative 1 would change, compared to the proposed project, with a general increase in tax collections, and a general decrease in per capita costs. Detailed discussion of Alternative 1 potential economic impacts are provided in Section 4.6.6. Comparisons of levels of impact are presented throughout this FEIS.

While this analysis might indicate that the 25-acre marina in Alternative 1 would be the more prudent choice, the DLNR agreement establishes the minimum size and slip capacity of the marina at 45 acres and 800 slips, respectively. Amendments to the DLNR agreement would be required in order to allow Alternative 1 to proceed as the preferred alternative. Hence, selection of the preferred alternative is an unresolved issue at the writing of this FEIS.

Alternative 2, the golf course alternative, was not previously considered to be the preferred alternative primarily because market conditions at the time of project development might not likely support another golf course. Further, DHHL has a strategy goal to have more revenue-generating activities on the commercial lease lands within the project area. In addition, concerns have been expressed as to environmental impacts of coastal golf courses, including the potential adverse impact on Kona's water supply if potable water is used for golf course irrigation.

While Alternative 3, the no-project alternative, would not generate adverse impacts related to development of these lands associated with the construction and long-term operations, it would also not allow for an expanded public marina that would meet public need and generate income for the public sector. Further, the no-project alternative would foreclose the opportunity to create a master-planned State-initiated development that would result in increased tax revenue, recreation options and community facilities. Crucial privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities, and public access would not be contributed.

~~Hence, the only valid alternative to the proposed project is the no-action alternative. In this alternative, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.~~

~~The no-project alternative would therefore not generate adverse impacts associated with the construction and long-term operations would not occur.~~

~~Likewise, the creation of a master-planned state-initiated development, resulting in increased employment, tax revenue, recreation options and community facilities, would not be created. Privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities and public access would not be contributed.~~

Further, the creation of revenue-producing businesses on the DHHL property to fund homestead programs would not occur, resulting in fewer potential benefits for Hawaiians.

Hence, the agreements and leases between the State and JDI indicate that the no-action alternative is not in the public interest~~has been rejected at this time~~.

2.2.1 Impact Comparison

Grading and Excavation

The proposed project requires grading and excavation. Both actions may impact groundwater due to rainfall runoff during construction. Alternative 1 would require a significantly smaller excavation for the marina basin and would therefore carry a lesser risk of potential adverse effects on water quality. Alternative 2 would require the same basin excavation as the proposed project, and would also include extensive grading and filling to build the golf course, the latter of which would generate additional impacts. Alternative 3 would result in no change to the geography, topography and geology.

Further discussion on grading and excavation is contained in Section 3.3.

Natural Drainage

Most precipitation infiltrates into the porous ground at the site, and no significant sheet flow is likely. Alternative 1 would generate similar levels of impacts on natural drainage as those of the proposed project and thus require similar mitigation measures. The golf course in Alternative 2 would not be as porous since the site would be graded, soil would be placed, and grass and other landscaping would be grown. Sheet flow and runoff can occur on a golf course, and drainage patterns might change. Alternative 3 would result in no change to the existing natural drainage pattern. Further discussion on natural drainage is contained in Section 3.4.

Air Quality

Air quality will be affected by construction activities, as well as pollutants from vehicular, industrial, natural, and agricultural sources. Alternative 1 would generate less construction air quality impacts than the proposed project due to the reduced amount of intensive groundwork associated with the smaller marina basin and fewer long-term impacts by reducing traffic 35 and 40 percent during, respectively, AM and PM peak traffic times. Construction of Alternative 2 would result in fugitive dust and exhaust from equipment and is expected to generate the same level of air quality impact as the proposed project. Alternative 3 would result in no change to existing air quality. Further discussion on air quality is contained in Section 3.5.

Terrestrial Environment

To provide additional habitat for shorebirds and some visiting seabirds, the project proposes to construct a brackishwater pond area suitable for avian fauna, including stilts, coots and ducks. While habitat expansion is beneficial, there is also a possibility that these species may be exposed to activity that may harm them. Alternative 1 would not include a brackish water pond, but will include 5 acres of seawater features, which is 74 percent less than the 19 acres of seawater features in the proposed project. While this would reduce beneficial impacts, it would also decrease exposure to potentially harmful activity. Alternative 2 does not include the brackish water pond features, but would include drainage retention basins that would attract avian fauna and expose them to chemicals used to maintain golf course landscaping. While Alternative 3 would result in no increase in potentially harmful activity, it would also not provide additional habitat for avian fauna. Further discussion on the terrestrial environment is contained in Section 3.7.

Groundwater

Groundwater at the project site occurs as a thin basal brackish water lens. It is influenced by tides and varies in flow direction and salt content. The existing Honokōhau Harbor acts as a drainage point for local groundwater. Any impact to groundwater flow from the proposed harbor is likely to be localized. The proposed marina basin will not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance.

There will be differences in the flow to the marina entrance between the proposed project and Alternative 1. Alternative 1, being smaller in size, will have less impact on groundwater flow than the proposed marina. Alternative 2 will have a similar impact to groundwater quality as the proposed project. Alternative 2 may also impact water quality by contributing nutrients and biocides to the groundwater from the golf course. Alternative 3 would result in no change in existing groundwater conditions. Further discussion on groundwater is contained in Section 3.8.1.

Surface Water

There are no significant natural freshwater streams or ponds at the site, but there are brackish anchialine pools. Surface water at the project site will be influenced by rainfall. Runoff typically percolates rapidly through the permeable ground. The proposed project will include some impermeable surfaces, which together with building roofs, will change runoff and seepage patterns.

Alternative 1 is a lower density project that is expected to have proportionally less impact on surface water and runoff patterns and less potential impact on water quality than the proposed project. Alternative 2 would have more impact on surface water quality than the proposed project due to fertilizers and biocides carried by runoff from the golf course. Alternative 3 would result in no change to surface water conditions. Further discussion on surface water is contained in Section 3.8.2.

Nearshore Environment and Coastal Waters

The potential adverse impacts to the marine environment from the proposed project are due to the construction of an 800-slip marina and the resulting inflow of higher salinity seawater and inadequate water circulation, both of which are anticipated to impair water quality to the extent of falling below applicable standards. One possible mitigation measure is to significantly reduce the size of the marina expansion.

The reduced marina size (from 45 to 25 acres) and reduced lagoon acreage in Alternative 1 are expected to result in a proportionate reduction in seawater discharging into the new harbor and increased water circulation. Alternative 2 includes the same marina basin size and is therefore subject to the same factors that are expected to adversely affect water quality.

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water quality in the proposed harbor depends on several components. These include salinity, nutrients, and sediments that come from the ocean, rainfall runoff, water features with marine animals, and dust. The smaller project offered as Alternative 1 is expected to produce a reduced amount of pollutants and reduce the risk of adverse impact upon water quality.

It is notable that the 45-acre marina basin planned in the proposed project and Alternative 2 only becomes viable from a water quality impact standpoint if the additional brackish groundwater inflow into the new marina exceeds 60 mgd. The resulting flushing from such inflow would be expected to better maintain water quality. However, it is unclear whether 60 mgd of brackish groundwater would be available. As proposed in Alternative 1, reduction of the volume of the new marina basin by 45 percent will significantly improve the flushing and water quality because the lower volume can be flushed by the available groundwater flow.

In addition, there could be higher rainfall runoff from the Alternative 2 golf course into the harbor, because the grassed golf course will be less porous than the natural surface. The golf course will also require relatively high levels of fertilizer, biocides, and irrigation, all of which could contribute to adverse water quality impacts.

Further discussion on nearshore environment and coastal waters is contained in Section 3.9.1.

Anchialine Pools

Anchialine pools are located north of Honokōhau Harbor, and south of the harbor on the project site. The marine life in these pools is sensitive to groundwater quality, and changes due to construction and operation of the project could degrade the viability of the pool ecosystem. In the southern complex, 3 anchialine pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction in the proposed project and Alternatives 1 and 2.

Predicting the extent of change in groundwater flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is therefore extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Due to the uncertainty of changes in groundwater flow and quality due to marina construction, the variability in impacts between the proposed project and Alternatives 1 and 2 is unknown at this time. Alternative 3 would result in no change in groundwater flow. While this would eliminate the potential for adverse impacts, Alternative 3 would also continue the pattern of existing degradation related to human activity and the introduction of alien species. Further discussion on anchialine pools is contained in Section 3.9.2.

Marine Fishing Impacts

The proposed marina will increase the number of boats in the area and it is reasonable to assume that a portion of these new boats will engage in fishing activities. The increase in boats in the area would be primarily related to the marlin and tuna / pelagic fishery, coral reefs due to extractive fisheries, and SCUBA activities. The pressure on fish and invertebrate stocks is expected to increase with or without the marina. Harbor expansion provides the opportunity to address existing conditions to consolidate, focus, and fund management and enforcement activities at one location.

Compared to the proposed project, Alternative 1 would result in a 21 percent decrease in boat traffic, thereby lessening the potential for marine fishing impacts. The level of impacts in Alternative 2 would be similar to that of the proposed project. Alternative 3 would result in no change in existing marine fishing conditions, and no opportunity to address already existing pressure on fish and invertebrate stocks. Further discussion on marine fishing impacts is contained in Section 3.9.3.

Cultural and Archaeological Resources

The proposed project will integrate cultural and archaeological resources in the overall development. Archaeological sites recommended for preservation will be preserved, and cultural practices will be encouraged. Kona Kai Ola includes a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. Proposed is a 400-foot shoreline setback that would serve as a buffer between the ocean and developed areas. This coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use.

Alternative 1 would contain all of the cultural archaeological features and the shoreline setback area would be 400 feet in the northern portion of the site and increase to 600 feet in the southern portion. Alternative 2 would preserve cultural and archaeological resources, but does not include a 400-foot shoreline setback. Alternative 3 would result in no change to existing cultural and archaeological resources and no addition of cultural and community facilities and activities. Further discussion on cultural and archaeological resources is contained in, respectively, Sections 4.1 and 4.2.

Noise

Project-generated noise is due to construction equipment and blasting, boats, marina activities, vehicle traffic, and the Kealakehe Wastewater Treatment Plant operations. Alternative 1 would generate less noise impacts due to reduced construction activities, fewer boats, less traffic and less on-site activity. Alternative 2 would also generate less noise due to reduced traffic and less on-site activity, but noise related to the excavation of the marina basin and an increase in the number of boats would be similar to that of the proposed project. Further discussion on noise impacts is presented in Section 4.4.

Socioeconomic Impacts

The proposed project will generate an increase in de facto population of an estimated 5,321 persons due to the increase in hotel and time-share units. The estimated de facto population increase in Alternative 1 is 37 percent less, at 3,363 persons, than the proposed project. The de facto population increase in Alternative 2 is similar to Alternative 1.

Employment in the commercial components will nearly double in Alternative 1, from a stabilized level of 1,429 full-time equivalent (FTE) positions in the proposed project to 2,740 in the Alternative 1.

Under Alternative 1, the total operating economic activity at Kona Kai Ola will increase due to the added commercial space more than off-setting the fewer visitor units, moving upward from $557.6 million per year to circa $814.3 million annually. The total base economic impact resulting from development and operation of Alternative 1 will similarly be higher by between 35 and 45 percent than that of the proposed project.

Alternative 1, which has a reduced marina size of 25 acres, and fewer hotel and time-share units, would have a meaningful market standing, create significant economic opportunities, and provide a net benefit to State and County revenues. From a market perspective, a smaller Kona Kai Ola would still be the only mixed use community in the Keahole to Kailua-Kona Corridor offering competitive hotel and time-share product.

The estimated absorption periods for marketable components of Alternative 1 are generally shorter than those for the same components in the proposed project. Marina slips under Alternative 1 are estimated to be absorbed within 2 years after groundbreaking, as compared with 9 years for absorption of slips in the proposed project. Hotel rooms under Alternative 1 are estimated to be absorbed within 4 years after groundbreaking, as compared with 7 years under the proposed project. Time-share units would be absorbed within 10 years under Alternative 1, while 15 years are projected under the proposed project. Due to the planned increase in commercial facilities under Alternative 1, the absorption period of commercial space is estimated at 14 years, as compared with 8 years for absorption of such facilities under the proposed project.

The State and County will still both receive a net benefit (tax receipts relative to public expenditures) annually on a stabilized basis under the Alternative 1. The County net benefits will be some $12.2 million per year under the Alternative 1 versus $14.9 million under the proposed project. The State net benefits will increase under the Alternative 1 to about $37.5 million annually, up substantially from the $11.4 million in the proposed project.

Due to the lower de facto population at build-out, the effective stabilized public costs for both the State and County will decline meaningfully under the Alternative 1, dropping from $7.7 million annually for the County and $36.5 million for the State, to $4.9 million and $23 million per year, respectively.

Alternative 3 would result in no increase in de facto population and improvement to economic conditions. Further discussion on social and economic impacts are contained in, respectively, Sections 4.5 and 4.6.

Vehicular Traffic

The proposed project will impact the nearby road network that currently is congested during peak traffic times. The proposed project includes roadway improvements that would reduce the impact and improve roadway conditions for the regional community.

Alternative 1 includes the same roadway system improvements as the proposed project, yet would reduce vehicular traffic by 35 percent when compared to the proposed project. Alternative 2 would have similar traffic conditions and roadway improvements as Alternative 1. Alternative 3 would result in no increase in traffic and no roadway improvements.

Marina Traffic Study

The increase in boat traffic due to the proposed 800-slip marina would cause entrance channel congestion during varying combinations of existing and new marina peak traffic flow. Worst case conditions of active sport fishing weekend and summer holiday recreational traffic result in traffic volumes exceeding capacity over a short afternoon period. Mitigation to address boat traffic in the proposed project include widening the entrance channel, traffic control, implementation of a permanent traffic control tower, or limiting vessel size.

Alternative 1 would result in a 21 percent reduction in boat traffic congestion under average existing conditions and ten percent reduction during peak existing conditions. The reduction to 400 slips also reduces the impacts of congestion at the entrance channel, thereby reducing the need for any modifications to the entrance channel.

Alternative 2 would have the same level of boat traffic as the proposed project. Alternative 3 would not meet the demand for additional boat slips and would not generate additional boat traffic. Further discussion on marina traffic is contained in Section 4.8.

Police, Fire and Medical Services

The proposed project will impact police, fire and medical services due to an increase in de facto population and increased on-site activity. Alternatives 1 and 2 would have similar levels of impact as the proposed project due to increased on-site activity. Further discussion on police, fire and medical services are contained, respectively, in Sections 4.10.1, 4.10.2 and 4.10.3.

Drainage and Storm Water Facilities

The proposed project will increase drainage flows, quantities, velocities, erosion, and sediment runoff.

Alternative 1 involves a reduction of the project density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces associated with hotel and time-share development and to the creation of more open space. However, roadway areas will increase by about 30 percent in Alternative 1. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings. The golf course in Alternative 2 may also change drainage characteristics from those of the proposed project and may not reduce impacts. Alternative 3 would result in no change in existing conditions and no improvements to drainage infrastructure. Further discussion on drainage and storm water facilities is contained in Section 4.10.5

Wastewater Facilities

The proposed development is located within the service area of the Kealakehe WWTP and a sewer system will be installed that connects to the WWTP. The sewer system will be comprised of a network of gravity sewers, force mains, and pumping stations which collect and convey wastewater to the existing Kealakehe WWTP. Project improvements will incorporate the usage of recycled / R1 water. Improvements implemented by the proposed project will also accommodate the needs of the regional service population.

Alternative 1 would generate approximately 10 percent less wastewater flow than the proposed project. Wastewater flow in Alternative 2 is undetermined. Alternative 3 would result in no additional flow, as well as no improvements that will benefit the regional community. Further discussion on wastewater facilities is contained in Section 4.10.6.

Potable Water Facilities

The proposed project average daily water demand is estimated at 1.76 million gallons per day. Existing County sources are not adequate to meet this demand and source development is required. The developer is working with DLNR and two wells have been identified that will produce a sustainable yield that will serve the project. These wells will also serve water needs beyond the project.

Alternative 1 would result in net decrease of about five percent of potable water demand. Alternative 2 may have a lower water demand than the proposed project as long as potable water is not used for irrigation. Alternative 3 would result in no additional flow, as well as no source development that will benefit the regional community. Further discussion on potable water facilities is contained in Section 4.10.8.

Energy and Communications

Regarding Alternative 1, preliminary estimates for electrical, telecommunications, and cable resulted in a net demand load that remains similar to the proposed project. Further discussion on energy and communications is contained in Section 4.10.9.1.

The proposed project will increase the demand for electrical energy and telecommunications. The demand would be reduced in Alternative 1 because the number of boat slips and units would decrease. Similarly, Alternative 2 would have fewer units than the proposed project and therefore reduce energy demands. Further reduction in energy demand for either alternative could be achieved by using seawater air conditioning (SWAC) and other energy reduction measures, as planned by the developer. Further discussion on energy and telecommunications is contained in Section 4.10.9.2.

Water Features and Lagoons

The proposed project includes a brackishwater pond, lagoons, and marine life exhibits supplied by clean seawater. The water features in Alternative 1 would significantly decrease by 74 percent from 19 acres in the proposed project to five acres in Alternative 1. This decrease in water features would result in a corresponding decrease in water source requirements and seawater discharge. Alternative 2 does not include the seawater features. Alternative 3 would result in no additional demand for water source requirements and seawater discharge.

2.2.2 Conformance with Public Plans and Policies

State of Hawai'i

Chapter 343, Hawai'i Revised Statutes

Compliance with this chapter is effected, as described in Section 5.1.1 in regard to the proposed project and the alternatives discussed.

- State Land Use Law, Chapter 205, Hawai'i Revised Statutes

  The discussion in Section 5.1.2 is directly applicable to Alternative 1, the proposed project. Alternative 1 will involve a setback of 400 feet that increases to 600 feet along the southern portion of the project site's shoreline area. Alternative 2 does not provide for such a setback, but may still require approvals from DLNR for cultural, recreational, and community uses and structures within the Conservation district.

- Coastal Zone Management Program, Chapter 205A, Hawai'i Revised Statutes

  Recreational Resources:

  In addition to the discussion of consistency with the associated objective and policies, as described in Section 5.1.3, the reduction from the proposed project's 800-slip marina to a 400-slip marina under Alternative 1 will still expand the region's boating opportunities and support facilities. The existing harbor entrance will still be utilized under this alternative; however, potential risks relating to boat traffic and congestion in the marina entrance area will be reduced significantly. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities, and marine science center remain important recreational components under Alternative 1.

Alternative 2 includes a golf course component, which would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Alternative 2, like the proposed project, will expand the region's boating opportunities and support facilities through its 800-slip marina. However, the potential adverse impacts of increased boat traffic from the size of the marina are significant enough to offset the benefits of increased boating opportunities.

Coastal Ecosystems:

The discussion in Section 5.1.3 is directly applicable to Alternative 1.

Alternative 1 not only reduces the number of slips proposed by 50 percent, but it also reduces the size of the marina from 45 acres to 25 acres. The 25-acre marina will increase the body of water within the existing harbor, but to a significantly lesser extent than the proposed project's estimated increase, which is also applicable to the 45-acre size that is proposed for the marina under Alternative 2.

The findings of the Harbor Water Quality Modeling Study conclude that a reduction in the size of the harbor expansion is an alternative that will mitigate the risk of significant impacts upon water quality within the marina and existing harbor. Accordingly, the reduction in both the number of slips and the size of the marina basin under Alternative 1, in combination with proper facilities design, public education, and enforcement of harbor rules and regulations, would result in fewer long-term impacts to water quality and coastal ecosystems. Short-term (construction-related) impacts would likely remain the same although the reduction in the total acreage of excavation is expected to result in a shorter duration of such impacts.

In addition to its 800-slip marina and potential adverse impacts upon water quality and the marine environment, Alternative 2 includes a golf course component, which has the potential to impact coastal ecosystems by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Economic Uses

Although reduced in the number of slips, the smaller marina under Alternative 1 will nevertheless serve public demand for more boating facilities in West Hawai‘i and is consistent with the objective and policies and discussion set forth in Section 5.1.3. The economic impacts of Alternative 2, while comparable to those of the proposed project's marina development, are notably marginal as to the golf course component, based on the marketability analysis that indicates a condition of saturation within the region.

Coastal Hazards

The discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Tsunami risks mainly affect the large shoreline setback area that is proposed for the project and Alternative 1. Alternative 2 projects a transient accommodation site that is partially within the tsunami hazard zone and thus carries a higher hazard risk. However, the essential requirement for these alternatives, as well as the proposed project, is a well-prepared and properly implemented evacuation plan.

Beach Protection

Discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Alternative 1 and, to a lesser extent, Alternative 2, will retain the shoreline area in its natural condition.

Similar to the proposed project, Alternative 1 provides for a shoreline setback of considerable width within which no structure, except for possible culturally-related structures, would be allowed. Alternatives 1 and 2 will thus be designed to avoid erosion of structures and minimize interference with natural shoreline processes.

Marine Resources

The discussion in Section 5.1.3 is also applicable to Alternative 1 which is described to be an alternative that is specifically projected to mitigate anticipated adverse impacts on water quality and the marine environment that might otherwise result from the original harbor design and scale, which is also incorporated in Alternative 2 . The reduced marina size under Alternative 1 is projected to meet water quality standards and enable greater compliance with the objective and policies addressed in this section.

Alternative 2 includes a golf course component and thus the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Hawai‘i State Plans, Chapter 226, Hawai‘i Revised Statutes

Section 226-4 (State goals), 5 (Objectives and policies for population, and 6 (Objective and policies for economy in general):

The discussion in Section 5.1.4 is applicable to Alternatives 1 and 2, in addition to the proposed project. These development concepts generally conform to the goals, objectives, and policies set forth in these sections because they will provide some degree of economic viability, stability, and sustainability for future generations. Kona Kai Ola will convert essentially vacant land into a mixed-use development with a distinctive marina and boating element, providing a wide range of recreational, business, and employment opportunities to the community.

Section 226-8 Objective and policies for the economy – the visitor industry:

Alternatives 1 and 2 will be consistent with the State's economic objective and policies relating to the tourism industry for the same reasons that are discussed in regard to the proposed project in Section 5.1.4. They will incorporate JDI's commitment to sustainability principles in the planning and design of the development concepts in Alternatives 1 and 2. Although the total hotel and time-share unit count is reduced to approximately 1,500 in Alternatives 1 and 2, the transient accommodations component of these alternatives will still further the State's objective and policies for increased visitor industry employment opportunities and training, foster better visitor understanding of Hawai‘i's cultural values, and contribute to the synergism of this mixed-use project concept that addresses the needs of the neighboring community, as well as the visitor industry.

Section 226-11 Objectives and policies for the physical environment: land-based, shoreline and marine resources:

Alternative 1 is expected to involve less potential adverse impacts upon these environmental resources than the proposed project. Likewise, and Alternative 2 would have less adverse impact because of its reduction in the size of the marina and in the total hotel and time-share unit count. Alternative 1 carries less potential risk to water quality and related impacts upon the marine environment and anchialine pool ecosystems. Although approximately three anchialine pools are expected to be destroyed, the great majority of pools will be preserved within and outside of the proposed 400-foot shoreline setback.

The golf course component in Alternative 2 has the potential to impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the marina basin and nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools by introducing the chemicals into the pond systems.

Section 226-12 Objective and policies for the physical environment: scenic, natural beauty, and historic resources:

The discussion in Section 5.1.4 is directly applicable to Alternative 1 and describes the compliance with the objective and policies addressed.

The golf course component of Alternative 2 would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area.

Just as with the proposed project, Alternatives 1 and 2 would also be designed to blend with the natural terrain and to honor and protect the cultural history, resources, and practices of these lands.

Section 226-13 Objectives and policies for the physical environment: land, air and water quality:

As stated above, because of the reduction in both the number of slips and the size of the marina basin, with proper facilities design, public education and enforcement of harbor rules and regulations, Alternative 1 is anticipated to cause fewer long-term impacts to water quality than either the proposed project or Alternative 2. Based on the findings of the Harbor Water Quality Modeling Study, water quality resulting from a reduced marina basin size as proposed under Alternative 1 is expected to be similar to existing conditions.

As previously noted, Alternative 2 has the potential to adversely impact water quality by increasing the nutrient loading in surface runoff and groundwater by introducing pesticides, herbicides and other chemicals common in golf course development and maintenance into the marina basin and nearshore waters surrounding the project site.

Section 226-14 Objectives and policies for facility systems - general:

Alternatives 1 and 2 will conform to the objective and policies of this section on the grounds that are discussed in regard to the proposed project in Section 5.1.4. The master-planning and phasing of the project concepts under these alternatives will be coordinated with associated public and private infrastructural planning and related private and public infrastructural financing. The cost of the marina construction and project-related infrastructure is to be borne by the developer, resulting in considerable savings for the public. In addition, the projected lease revenue from these public lands will provide additional public benefits by establishing a revenue stream for capital improvements and maintenance of a range of State facilities.

Section 226-15 Objectives and policies for facility systems - solid and liquid wastes:

In addition to the developer's commitment to sustainable development design, the project will involve upgrades to the County of Hawai'i's Kealakehe Wastewater Treatment Plant to meet current needs, as well as the project's future needs. This commitment is applicable to Alternatives 1 and 2, as well as the proposed project that is discussed in Section 5.1.4.

Section 226-16 Objectives and policies for facility systems – water:

The discussion of water conservation methods and the need to secure additional potable water sources in Section 5.1.4 is also applicable to Alternative 1 and demonstrates conformity to the objective and policies for water facilities. Alternative 2 involves greater irrigation demands in regard to its golf course component and greater potable water demands for human consumption than those for Alternative 1. Alternative 2 is expected to face more serious challenges in securing adequate and reliable sources of water.

Section 229-17 Objectives and policies for facility systems – transportation:

Alternatives 1 and 2 will conform to this objective and policies because they will present water transportation opportunities, including the possible use of transit water shuttles to Kailua-Kona, as described in regard to the proposed project in Section 5.1.4.

Section 226-18 Objectives and policies for facility systems – energy:

Alternatives 1 and 2 conform to these objective and policies through the use of energy efficient design and technology and commitment to the use and production of renewable energy to serve the project’s needs. Solar energy production, solar hot water heating, and the use of deep cold seawater for cooling systems are currently identified as means of saving substantial electrical energy costs for the community and the developer.

Section 226-23 Objectives and policies for socio-cultural advancement – leisure:

Alternative 1 conforms to this objective and related policies for the reasons offered in Section 5.1.4 in regard to the proposed project. Alternative 1 will be of greater conformity with the policy regarding access to significant natural and cultural resources in light of the 400-600 foot shoreline setback that has been designed for this alternative.

Although it does not propose the considerable shoreline setback that is planned for Alternative 1, Alternative 2 is consistent with this objective and related policies in incorporating opportunities for shoreline-oriented activities, such as the walking trails. In addition, the golf course component adds a more passive recreation alternative to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Section 226-25 Objectives and policies for socio-cultural advancement-culture:

The discussion in Section 5.1.4 is relevant to Alternatives 1 and 2 and demonstrate their conformity the objective and policies of this section.

Both alternatives involve the preservation and protection of cultural features that have been identified by the Cultural Impact Assessment and archaeological studies for the project area. Both provide for public shoreline access, and both will continue the policy of close consultation with the local Hawaiian community and cultural and lineal descendants in the planning of cultural resource preservation and protection.

Section 226-103 Economic priority guidelines:

Alternatives 1 and 2 conform to these guidelines for the same reasons that are set forth in Section 5.1.4. They involve private investment in a public project that will create economic diversification through a mix of marina, industrial, commercial, visitor, and cultural facilities. This presents a wide range of entrepreneurial opportunities, long-term employment opportunities, and job training opportunities.

Section 226-104 Population growth and land resources priority guidelines:

As described in Section 5.1.4, the policy support for the proposed project also extends to the similar development concepts considered in Alternatives 1 and 2. Those alternatives conform to the guidelines of this section because they involve an urban development under parameters and within geographical bounds that are supported by the County's General Plan, a preliminary form of the Kona Community Development Plan, the County's Keahole to Kailua Regional Development Plan, and the reality of being located along the primary commercial/industrial corridor between Keahole Airport and Kailua-Kona. As with the proposed project, the development concepts of Alternatives 1 and 2 are essentially alternatives for the implementation and "in-filling" of the urban expansion area in North Kona.

DHHL Hawai'i Island Plan

This 2002 plan projects DHHL's Honokōhau makai lands for commercial use. As compared to the proposed project and Alternative 2, Alternative 1 presents an expanded commercial component that provides greater compliance with the plan, while addressing certain beneficiaries' concerns about the scale of the marina originally required in the Project. Alternative 2 also conforms to the recommended commercial uses in the makai lands but to a lesser degree than Alternative 1 because of its more limited commercial component. Like the proposed project, its marina size and number of slips raise environmental issues, as more specifically discussed in Part 3, and community concerns.

County of Hawai'i General Plan

HCGP Section 4 – Environmental Quality Goals, Policies and Courses of Action:

Alternative 1 is consistent with this section. It presents a reduction in both the number of slips and the size of the marina basin that, in combination with proper facilities design, public education and enforcement of harbor rules and regulations, would result in very few long term impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions.

Alternative 2 is the least consistent with this section. In addition to the potential significant impacts of its 800 slip marina basin, its golf course component has the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides and other chemicals common in golf course use and management into the nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools beyond their current conditions by introducing such substances into the pool systems.

HCGP Section 7 – Natural Beauty Goals and Policies:

Alternative 2 conforms to some degree with this section. Its golf course component would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area, as demonstrated in other makai golf courses within the region.

HCGP Section 8 – Natural Resources and Shoreline:

Alternative 1 is most consistent with the goals and policies of this section. It would require considerably less marina excavation than the proposed project and Alternative 2 and would reduce the potential risk of long-term adverse impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions with the degree of reduction in marina basin size that is proposed under Alternative 1. This reduction is also expected to reduce potential impacts upon anchialine pools and their ecosytems, as well as shoreline and marine resources that are affected by water quality. Alternative 1 also retains the shoreline preservation and protection concepts that are proposed in and described for the Project.

HCGP Section 10 – Public Facilities Goals and Policies:

The discussion in Section 5.2.1. in relation to the proposed project is applicable to Alternatives 1 and 2. Improvements to public facilities are are integral to the Kona Kai Ola development. The provision of additional boat slips and numerous road improvements, including a makai extension of Kuakini Highway south to Kailua-Kona are incorporated into plans for the project's development. In light of these elements, Alternatives 1 and 2 are consistent with the goals and policies of this section.

HCGP Section 11 – Public Utility Goals, Policies:

As with the proposed project, Alternatives 1 and 2 are consistent with the goals and policies of this section, based on the relevant grounds set forth in Section 5.2.1. The developer is committed to design, fund, and develop environmentally sensitive and energy efficient utility systems to the extent possible, as described previously in Part 5. Its master planning provides for the coordinated development of such systems with the objective of achieving significant savings for the public. As previously-mentioned example, the project development involves the upgrading of the Kealakehe Wastewater Treatment Plant.

HCGP Section 12 – Recreation:

Alternative 1 is consistent with the goals, policies, and courses of action for North Kona in this section.

Although the number of slips is reduced under Alternative 1, the region's boating opportunities and support facilities will still be expanded. The existing marina entrance would still be utilized under this alternative. However, concerns relating to increased activity leading to increased congestion in the marina entrance area would be mitigated to a certain extent. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities and marine science center remain important components of Alternative 1.

The golf course component of Alternative 2 would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola. Alternative 2 is also considered to be consistent with this section.

HCGP Section 13 and 13.2 – Transportation:

The reduced marina component under Alternative 1 will still provide transportation opportunities and provide for possible use of transit water shuttles to Kailua-Kona, although to a lesser degree than under the proposed project and Alternative 2 . However, in each scenario, internal people-movers are planned, and numerous roadway improvements are planned for coordination with public agencies, including but not limited to the construction of the Kuakini Highway extension between Honokōhau and Kailua-Kona. Accordingly, both Alternatives 1 and 2 are consistent with the goals, policies, and courses of action for North Kona under these sections of the General Plan.

HCGP Section 14.3 – Commercial Development:

For the reasons presented in the discussion under Section 226-104 of the State Plan, the planned commercial component under Alternatives 1 and 2 are consistent with this section.

HCGP Section 14.8 – Open Space:

Alternatives 1 and 2 are consistent with the goals and policies of this section. Alternative 1 provides a considerable (400-600 foot) shoreline setback along the entire ocean frontage of the project site as a means of protecting the area's scenic and open space resources, as well as natural and cultural resources. Although it does not incorporate the shoreline setback planned in Alternative 1, Alternative 2 provides a golf course component would contribute to the amount of open space that is currently proposed and allow additional view corridors to be created.

Community Development Plans

Community development plans are being formulated for different regions in the County in order to supplement the County's General Plan. The Kona Kai Ola project is located in the Kona Community Development Plan (CDP) area. Maps associated with the preliminary work phases

of the Kona CDP include the Kona Kai Ola project site within the “Preferred Urban Growth” boundary of the North Kona district. The Kona CDP process is guided by a Steering Committee composed of a broad cross-section of the community. The Steering Committee will eventually complete its work and recommend the CDP’s adoption.

After the DEIS was published, the Kona CDP has progressed to the development of plans for the major urban growth corridor north of Kailua-Kona. The Kona CDP has produced a draft plan showing a transit oriented development that includes a midlevel public transit corridor along the mauka residential elevation, and a makai transit corridor that runs along a proposed new frontage road just makai and parallel to Queen Kaahumanu Highway. The development plan for Alternative 1 includes the Kuakini Highway as part of this proposed frontage road and transit line from Kailua Kona to the Kealakehe area, along with a transit stop at Kona Kai Ola. The Alternative 1 plan also includes a road that could be extended to be part of the proposed frontage road should it be approved and implemented. In addition, the Kona CDP has continued to emphasize the principles of smart growth planning with mixed use urban areas where people can live, work, play and learn in the same region. Kona Kai Ola has been specifically designed to be consistent with this policy in order to provide a stable employment base close to where people live in the mauka residential areas already planned for DHHL and HHFDC lands.

It should be noted that currently and over the years, the 1990 Keāhole to Kailua Development Plan (K-to-K Plan) guides land use actions by the public and private sectors. It is intended to carry out the General Plan goals and policies related to the development of the portion of North Kona area, including the Kona Kai Ola site. The “Preferred Growth Plan” of the Keāhole to Kailua Development Plan identifies the project site as a new regional urban center to include commercial, civic, and financial business related uses, an expanded “Harbor Complex,” a shoreline road, and a shoreline park. The proposed project and the development concepts in Alternatives 1 and 2 are therefore consistent with the recommendations in the Keāhole to Kailua Development Plan.

Hawai‘i County Zoning

As shown on Figure AA, the project site is zoned “Open”. Under Section 25-5-160 of the Hawai‘i County Code, “The O (Open) district applies to areas that contribute to the general welfare, the full enjoyment, or the economic well-being of open land type use which has been established, or is proposed. The object of this district is to encourage development around it such as a golf course and park, and to protect investments which have been or shall be made in reliance upon the retention of such open type use, to buffer an otherwise incompatible land use or district, to preserve a valuable scenic vista or an area of special historical significance, or to protect and preserve submerged land, fishing ponds, and lakes (natural or artificial tide lands)”.

Some of the proposed uses at Kona Kai Ola are permitted uses in the Open zone such as:

- Heiau, historical areas, structures, and monuments;
- Natural features, phenomena, and vistas as tourist attractions;
- Private recreational uses involving no aboveground structure except dressing rooms and comfort stations;

- Public parks;
- Public uses and structures, as permitted under Section 25-4-11.

In addition to those uses permitted outright, the following uses are permitted after issuance of a use permit:

- Yacht harbors and boating facilities; provided that the use, in its entirety, is compatible with the stated purpose of the O district.
- Uses considered directly accessory to the uses permitted in this section shall also be permitted in the O district.

The proposed time-share and hotel units and commercial uses would not be consistent with the zoning designation of "Open". Project implementation therefore requires rezoning of portions of the project to the appropriate zoning category or use permits for certain uses.

Special Management Area

As shown in Figure AB, the entire project area up to the highway is within the coastal zone management zone known as the Special Management Area ("SMA"). At the County level, implementation of the CZM Program is through the review and administering of the SMA permit regulations. Kona Kai Ola complies with and implements the objectives and policies of the Coastal Zone Management (CZM) Program, and a full discussion is provided in Section 5.1.3. The development concepts in the proposed project and Alternatives 1 and 2 will be subject to applicable SMA rules and regulations.

Karlton Kau

From: Dayan Vithanage
Sent: Wednesday, February 07, 2007 8:25 AM
To: Berna Cabacungan; Karlton Kau; Robert Bourke
Subject: FW: Sierra Club Moku Loa Group DEIS comments
Importance: High

From: Janice Palma-Glennie [mailto:palmtree7@hawaiiantel.net]
Sent: Tuesday, February 06, 2007 4:24 PM
To: Dayan Vithanage
Subject: Sierra Club Moku Loa Group DEIS comments
Importance: High

Dept. of Hawaiian Homelands
1099 Alakea St, Suite 2000, Honolulu, HI 96813

Attn: Linda Chinn

Jacoby Development Inc
171 17th ST NW, Suite 1550
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Attn: Scott Condra,
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Oceanit
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828 Fort Street Mall, 6th Fl
Honolulu HI 96813
Attn:Dayan Vithanage

Office of Environmental Quality Control
235 S. Beretania St., Suite 702
Honolulu, Hawaii 96813

Re: Comments on Kona Kai Ola’s Draft Environmental Impact Statement

February 2, 2007

Aloha:

Overall, the Moku Loa Group of the Sierra Club feels that the Draft EIS for the Kona Kai Ola development proposal does not answer many of the questions which and others posed we posed in the ESIPN comment period. Comments by the National Park Service, for example, regarding potential development problems were also insufficiently answered.

Comments on the DEIS for Jacoby Development International’s proposed Kona Kai Ola project in West Hawai`i include, but are not limited to the following:

Please explain how the JDI plan fits with the Hawai`i County General Plan (GP)?

How does JDI plan to reconcile the wishes of residents who oppose new hotel development (particularly on coastal land) and support protection of this particular area as open space/conservation land? The EIS should specifically refer to the Hawaii Tourism Authority's polling data that shows that the vast majority of residents in the state and in Kona oppose new hotel development.

Many residents were invited to hear presentations about JDI’s proposal. Many who attended went to gather information regarding the proposal and/or were in disagreement with those plans from the beginning or by the end of those meetings. There were also many who turned down requests to meet due to unequivocal opposition to the project. The DEIS treats these interviews/presentations the same and does not fully address the depth of opposition to its project by many of those listed as attendees to its presentations and by others who did not participate in their presentations and meetings.

The DEIS admits that Jacoby's proposed connector road and other roadways will be extra-burdened during the construction phase of this development. This "phase", as stated in the DEIS, is estimated to last for 14 years. The EIS should specifically discuss how much worse traffic will be for those 14 years. How much longer will commuters be stuck in traffic for those 14 years?

An extraordinary amount of information came out in studies conducted for TSA's development at Kaloko Light Industrial Area in the contested case hearing before the LUC. Both the studies that the National Park completed as well as the LUC's findings of fact should be disclosed in the EIS.

The EIS should discuss how JDI's plan will fit into a scenario where resort/hotel developments -- especially those dependent upon overcapacity roadways and other infrastructural lag -- are deemed unacceptable by the Kona community, the County administration, and the County Council.

With a projected total population increase of 5,321 persons, what will the social affects be on the existing Kona community (i.e., crime, lack of open space, viewplane loss, decimation of water quality, increased population density, increase of tourist population, increased noise, natural resource depletion, etc). What negative affects will further "in-migration" (tipping the balance of residents born outside the state to nearly half of the population of Hawai`i by 2000) from this project have on the social balance of the Kona community -- particularly the native Hawaiian population?

JDI claims that it needs to expand the Honokohau Harbor to nearly five times its current size in order to make an "acceptable level of return in investment." By projecting the income to be garnered by JDI from this development, is there a line between an "acceptable return" versus "maximizing profits" that can be drawn; and to what detriment will a so-called "acceptable level" of profit have on the environment, society, and culture of the region in comparison to JDI merely "making a profit"?

In the DEIS, it is admitted, it is admitted that many adverse impacts will occur from this project. Water quality will diminish, anchialine ponds will be destroyed, endangered turtles and whales will be injured and/or killed (section 3.9.5), and air quality compromised, to name a few. Some are said to be mainly during construction (i.e., fugitive dust from bulldozing, vehicular traffic from construction, etc) and others long-term and/or permanent (vehicle emissions , ponds destroyed, loss of open space, urbanization, etc).

Please further clarify the following:

How many turtles will be killed during the 14-year construction period? How many will be killed after construction by those using the expanded marina, expanded facilities, increased visitor population and increased human access to the shoreline?

What affect will that number have on the overall population of turtles and other marine species? How will the increased population affect turtles other than by direct kill (runoff including non point source pollution, harassment both intentional and unintentional, etc.)?

What other solutions does JDI have than to leave the major part of this problem to local enforcement agencies?

How many whales will be killed and/or injured during the construction period? How many will be killed after construction by those using the expanded marina, expanded facilities, increased visitor population and increased human access to the shoreline and whale-watching tours and individual boats?

What affect will the number of possible deaths have on the overall population of whales? What other solutions does JDI have than to leave the major part of this problem to already over- burdened local enforcement agencies?

How much will the air quality degrade in Kona and surrounding areas due to the construction period even when "mitigation measures indentified in Section 3.5 of the DEIS" are used? How does leaving the enforcement to this rule to local agencies affect already over-burdened law enforcement?

"As fishing effort increasess, so does the fishing pressure on existing stocks." pg. 52. How much will this development -- adding at least as many as four times the amount of boat slips -- affect the size and number of fishing catch? How will that presumed decrease affect local fisheries, the local fishing industry (especially those already engaged in commercial and/or subsistence fishing and, in particular, those who were born and raised as fisherfolk, dependent upon a steady supply of fish?

Some fishing experts say that the only way to increase the size of the harbor is to have two entrances. Does JDI have any plans to do this? If so, what are the environmental and safety ramifications of such an expansion?

“Project-related motor vehicle traffic should be insignificant”, so says the DEIS, after the project is completed. How will vehicle emissions increase during the construction phase and what impact will that have on residents and the natural environment for those fourteen years? Once the project-related motor vehicle traffic has wound down, how much added vehicle emissions will come from this project (including boats and cars)? How will those emissions affect residents and the environment, especially in combination with VOG conditions (volcanic emissions)?

Water requirements for this project are deemed unable to be filled, according to the DEIS. From where will the water for this project come? How will the provision of 2.6 million gallons of water per day of water affect the natural environment and existing residential and business communities?

Employment is at an all-time high in Hawai`i with workers being imported to fill job vacancies (especially construction and service jobs). It seems that questions of affordable housing for those who will be employed at Kona Kai Ola are as yet unanswered. When hundreds of workers move to West Hawai`i for those jobs, what will be the increased affects of affordable housing deficit, lack of schools, and other infrastructure? Who will be responsible for and have to pay for the influx of hundreds or even thousands of workers from outside the Kona community?

The DEIS states taht loss of natural and open space will occur. How does this loss of natural and open space affect the social fabric of the community who currently enjoys the existence of those natural resources, whether it be recreational, subsistence, spiritual, cultural or merely the positive affects and feelings of well-being of merely seeing the currently natural, open viewplane of the area while driving? How will the loss of natural, open space affect those whose use this area depends upon an unpolluted, low-impact, natural environment (i.e., subsistence fishing, shoreline gathering, surfing, swimming, diving, etc).? To what areas will these displaced persons be able go to recreate, fish, gather, and enjoy the positive effects of being in a natural environment if JDI’s project is built?

From refrigerators to housing materials to construction workers, this project will require importation of products and services. When commercial ventures aren’t restricted to small, local ownership; when construction materials, food, and fuel are not restricted to being locally produced;when transport in and out of the area is dependent upon car and air; when workers must be moved in from other communities, states and even countries; etc., how will sustainability (claimed as one of the devleopment’s greatest aspects) in any meaningful sense of the word, be achieved within this development?

“Smart growth” is community-generated -- built on a model of balanced, predictable land use and mixed use concepts. How does JDI -- whose proposed project is resort-based, lacks affordable and/or residential housing, schools and other aspects of a “mixed use” community -- plan to fit into at model of growth which is favored by Kona residenst?

Endangered, native species are listed by the National Park Service as being threatened by this development. How does JDI propose to remove these cited threats?

The words “not likely” are used throughout the document. For instance, in Sec. 3.9.3.2, it’s stated that anchialine ponds that are located to the north of the harbor wil not likely be impacted by the increased salinity which will drastically alter others. What environmental, social, and cultural impacts will there be if those ponds are impacted similarly to the others whose salinity will no longer render them “anchialine”?

To conclude and summarize these comments, the MLG reiterates its statements and questions posed during the EISPN comment period and asked that they, once again, be answered. We believe that more studies are in order and that more of the questions posed whether they be from our group, the National Park Service or other groups and individuals, need to be more directly and fully answered.

We appreciate and reserve the right to send additional comments to you before the February 13th deadline.

Mahalo.

Sincerely,

Janice Palma-Glennie
for the Moku Loa Group of the Sierra Club

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Oceanit Center
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Attn:Dayan Vithanage

Office of Environmental Quality Control
235 S. Beretania St., Suite 702
Honolulu, Hawaii 96813

Re: Comments on Kona Kai Ola's Draft Environmental Impact Statement

February 2, 2007

Aloha:

Overall, the Moku Loa Group of the Sierra Club feels that the Draft EIS for the Kona Kai Ola development proposal does not answer many of the questions which and others posed we posed in the ESIPN comment period. Comments by the National Park Service, for example, regarding potential development problems were also insufficiently answered.

Comments on the DEIS for Jacoby Development International's proposed Kona Kai Ola project in West Hawai`i include, but are not limited to the following:

- Please explain how the JDI plan fits with the Hawai`i County General Plan (GP)?

- How does JDI plan to reconcile the wishes of residents who oppose new hotel development (particularly on coastal land) and support protection of this particular area as open space/conservation land? The EIS should specifically refer to the Hawaii Tourism Authority's polling data that shows that the vast majority of residents in the state and in Kona oppose new hotel development.

- Many residents were invited to hear presentations about JDI's proposal. Many who attended went to gather information regarding the proposal and/or were in disagreement with those plans from the beginning or by the end of those meetings. There were also many who turned down requests to meet due to unequivocal opposition to the project. The DEIS treats these interviews/presentations the same and does not fully address the depth of opposition to its project by many of those listed as attendees to its presentations and by others who did not participate in their presentations and meetings.

- The DEIS admits that Jacoby's proposed connector road and other roadways will be extra-burdened during the construction phase of this development. This "phase", as stated in the DEIS, is estimated to last for 14 years. The EIS should specifically discuss how much worse traffic will be for those 14 years. How much longer will commuters be stuck in traffic for those 14 years?

- An extraordinary amount of information came out in studies conducted for TSA's development at Kaloko Light Industrial Area in the contested case hearing before the LUC. Both the studies that the National Park completed as well as the LUC's findings of fact should be disclosed in the EIS.

- The EIS should discuss how JDI's plan will fit into a scenario where resort/hotel developments -- especially those dependent upon overcapacity roadways and other infrastructural lag -- are deemed unacceptable by the Kona community, the County administration, and the County Council.

- With a projected total population increase of 5,321 persons, what will the social affects be on the existing Kona community (i.e., crime, lack of open space, viewplane loss, decimation of water quality, increased population density, increase of tourist population, increased noise, natural resource depletion, etc). What negative affects will further "in-migration" (tipping the balance of residents born outside the state to nearly half of the population of Hawai`i by 2000) from this project have on the social balance of the Kona community -- particularly the native Hawaiian population?

- JDI claims that it needs to expand the Honokohau Harbor to nearly five times its current size in order to make an "acceptable level of return in investment." By projecting the income to be garnered by JDI from this development, is there a line between an "acceptable return" versus "maximizing profits" that can be drawn; and to what detriment will a so-called "acceptable level" of profit have on the environment, society, and culture of the region in comparison to JDI merely "making a profit"?

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- Endangered, native species are listed by the National Park Service as being threatened by this development. How does JDI propose to remove these cited threats?

- The words "not likely" are used throughout the document. For instance, in Sec. 3.9.3.2, it's stated that anchialine ponds that are located to the north of the harbor wil not likely be impacted by the increased salinity which will drastically alter others. What environmental, social, and cultural impacts will there be if those ponds are impacted similarly to the others whose salinity will no longer render them "anchialine"?

To conclude and summarize these comments, the MLG reiterates its statements and questions posed during the EISPN comment period and asked that they, once again, be answered. We believe that more

- "Project-related motor vehicle traffic should be insignificant", so says the DEIS, after the project is completed. How will vehicle emissions increase during the construction phase and what impact will that have on residents and the natural environment for those fourteen years? Once the project-related motor vehicle traffic has wound down, how much added vehicle emissions will come from this project (including boats and cars)? How will those emissions affect residents and the environment, especially in combination with VOG conditions (volcanic emissions)?

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We appreciate and reserve the right to send additional comments to you before the February 13th deadline.

Mahalo.

Sincerely,

Janice Palma-Glennie

Janice Palma-Glennie
for the Moku Loa Group of the Sierra Club

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RECEIVED
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innovation through engineering & scientific excellence

January 31, 2007

Ms. Janice Palma-Glennie
West Hawaii Conservation Chair
Moku Loa Group
Hawai'i Sierra Club
P. O. Box 1137
Hilo, HI 96721-1137

Dear Ms. Palma-Glennie:

Subject: Kona Kai Ola Draft Environmental Impact Statement (DEIS)

This letter responds to your verbal request to me on January 29, 2007 to extend the comment period for the Kona Kai Ola DEIS.

The DEIS was published in the Office of Environmental Quality Control Bulletin on December 23, 2006. The 45-day comment period ends on February 6, 2007. Our records show that we mailed a participant letter and a copy of the DEIS to you at the above address on December 20, 2006 via U.S. Postal Priority Mail.

Regarding your request, we will include your comments and our response in the Final EIS if your transmittal is postmarked by February 13, 2007. Please contact me if you would like additional copies or electronic files of the DEIS sent to you.

Thank you for your interest in the Kona Kai Ola project, and we look forward to receiving your comments.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Homelands
Jacoby Development, Inc.

oceanit®
innovation through engineering & scientific excellence

July 23, 2007

Janice Palma-Glennie
Moku Loa Group,
Sierra Club Hawai‘i Chapter
P.O. Box 1137
Hilo, Hawai‘i 96721

Dear Ms. Palma-Glennie :

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Dated February 2, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Each of your comments is italicized and is followed by our response.

Please explain how the JDI fits with the Hawai‘i County General Plan (GP)?

Response: In December 2005, the Hawai‘i County Planning Director proposed that the DLNR portion of the Kona Kai Ola project that was designated "Open" in the 2005 General Plan, be amended to "Urban Expansion Area." On November 29, 2006, the Hawai‘i County Council approved this amendment.

Kona Kai Ola is consistent with the Urban Expansion Area designation. The agreement between the developer and the State identifies hotel and time-share uses as possible development at Kona Kai Ola. The project is not a resort. A resort is a concept in which visitors are attracted to spend most, if not all, of their stay within the resort area through the design of amenities that fulfill the needs of a particular visitor market segment. This self-containment is achieved to varying degrees in resort development, depending on the natural, historic/cultural, and recreational resources within a resort site and the intended scale of the resort.

State and County laws recognize this distinction between a "resort" and a "hotel" or "time-share unit." Section 514E-5, Hawai‘i Revised Statutes, authorizes time-share units to be located in a resort area or any other area in which a county may by ordinance allow a hotel unit. The Hawai‘i County Code correspondingly permits hotels and time-share units in non-resort zoning districts. The proposed project may include up to 700 hotel units and 1,803 time-share units, and depending on the eventual location of these project components, rezoning may be required for implementation.

How does JDI plan to reconcile the wishes of residents who oppose new hotel development (particularly on coastal land) and support protection of this particular area as open space/conservation land? The EIS should specifically refer to the Hawaii Tourism Authority's polling data that shows that the vast majority of residents in the state and in Kona oppose new hotel development.

Response: The opposition to hotel development needs to be evaluated within the context of the respondents' overall lifestyle. The reasons behind this opposition need to be considered to understand the full context of the reaction to hotel development. For example, resident support for expanded tourism employment is cyclical. It decreases when tourism is strong, as at present, and expands when tourism declines.

In response to your comment, the EIS has been revised to include findings of the Hawai'i Tourism Authority (HTA) statewide "Survey of Resident Sentiments on Tourism in Hawai'i" that included small "West Hawai'i" samples in 2002 and 2005, in EIS Section 4.5.4.2, Issues Related to Project Scale and "Growth-Generating" Nature. The following is the added text:

> Issues related to population growth are not unique to Kona Kai Ola. In 2002 and 2005, the Hawai'i Tourism Authority (HTA) included small "West Hawai'i" samples in its statewide "Survey of Resident Sentiments on Tourism in Hawai'i." Critical issues included cost of housing and traffic, followed by population growing too fast. The survey also found that almost everything – with the exception of availability of jobs – was more likely to be considered a "big problem" in 2005 than in 2002. The West Hawai'i results were similar to those from most other parts of the state.
>
> The survey also found an erosion from 2002 to 2005 in West Hawai'i resident support for tourism growth and belief in the overall benefits of tourism, although a majority still did feel tourism had brought more benefits than problems, and particularly in the need for more tourism jobs. Based on even earlier statewide survey results, the 2005 HTA report noted that resident support for expanded tourism employment is cyclical – it shrinks when tourism is strong (as at present) and then expands again when tourism has down times.
>
> In addition to the results shown in these two exhibits, the 2005 survey included a number of other questions. Several dealing with local government performance indicated a frustration with infrastructure overload from recent growth:
>
> - 66% of West Hawai'i residents said government had done a "poor job" of building new infrastructure to keep up with growth in resident and visitor population.
> - 45% gave government "poor" marks (vs. just 32% "good," and the rest unsure) for planning and controlling tourism-related growth.
> - 40% said "poor" (vs. 20% "good") for balancing the economic benefits from tourism against the need to control problems caused by tourism.
>
> Thus, it appears that much of the negative sentiment toward tourism growth may be rooted in the current perception of infrastructure overload.

Many residents were invited to hear presentations about JDI's proposal. Many who attended went to gather information regarding the proposal and/or were in disagreement with those plans from the beginning or by the end of those meetings. There were also many who turned down requests to meet due to unequivocal opposition to the project. The DEIS treats these interviews/presentations the same and does not fully address the depth of opposition to its project by many of those listed as attendees to its presentations and by others who did not participate in their presentations and meetings.

Response: The EIS fully addresses the diversity and breadth of community input from over 920 Big Island residents who have participated in Kona Kai Ola presentations from November 2005 through June 2007. A summary of concerns is listed in Section 1.8, Proactive Communication Outreach. These concerns covered a range of topics that include sustainability, the project's relationship to the ahupua'a, traffic and roadway improvements, other infrastructure, marina-related safety issues and market feasibility, shoreline access, shoreline parks, and various community-oriented uses.

Additional analysis of community reaction to Kona Kai Ola was conducted in the Social Impact Study. The study included interviews that allowed for in-depth discussions and focused on specifically affected groups, such as marine and shoreline users. Issues analyzed in this study included project-specific issues and concerns related to marine / shoreline use and project-specific issues of broad community concerns. These findings are summarized in EIS Section 4.5.4, Community Issues and Perceived Impacts, and presented in Appendix O.

The DEIS admits that Jacoby's proposed connector road and other roadways will be extra-burdened during the construction phase of this development. This "phase", as stated in the DEIS, is estimated to last for 14 years. The EIS should specifically discuss how much worse traffic will be for those 14 years. How much longer will commuters be stuck in traffic for those 14 years?

The traffic analyses conducted for the proposed Kona Kai Ola development evaluated the traffic impact at full build-out of the development at the Year 2020 time horizon. Within this time horizon, major upgrades to the roadway system are expected, based on current planning efforts by the State of Hawai'i Department of Transportation (HDOT) and Hawai'i County. Although all of these upgrades will not be available when Kona Kai Ola begins its development, it is expected that both phases of the widening project on Queen Ka'ahumanu Highway will be complete, mitigating much of the current traffic congestion in the project study area.

The County of Hawai'i is also moving ahead with its project to extend Keohokalole Highway from the vicinity of Kealakehe High School to Palani Street, providing additional roadway capacity parallel to Queen Ka'ahumanu Highway. Additionally, Kona Kai Ola is proposing to construct an extension of Kealakehe Parkway that would connect it with Kuakini Highway in the vicinity of Makala Boulevard. This roadway will also provide an alternative parallel path to Queen Ka'ahumanu Highway, thereby providing more capacity in the Queen Ka'ahumanu Highway corridor between Kealakehe Parkway and Makala Boulevard.

In view of these proposed improvements, construction-related traffic would be accommodated. The phasing of construction over 15 years also reduces the intensity of construction impacts by spreading the construction into smaller increments, rather than concentrating these activities in a shorter period of time. This further assists the roadway system in accommodating the construction-related traffic.

An extraordinary amount of information came out in studies conducted for TSA's development at Kaloko Light Industrial Area in the contested case hearing before the LUC. Both the studies that the National Park completed as well as the LUC's findings of fact should be disclosed in the EIS.

Response: We acknowledge your reference to the Land Use Commission record regarding "TSA." We believe that you are referring to TSA Corporation's petition for a boundary amendment to the State Land Use Commission (Docket A00-732), which was approved by the Commission effective February 14, 2001. The Commission reclassified to the Urban

District approximately 102 acres for Phases III and IV of the Kaloko Industrial Park, located mauka of the Kaloko-Honokūhau National Historical Park, hereafter referred to as Park, subject to numerous conditions of approval that were imposed in the interest of mitigating potential impacts upon the Park, particularly the water quality of anchialine ponds and nearshore waters.

We agree that the record contains numerous reports that were submitted by the National Park Service who was an intervenor in the Commission's proceedings. TSA also provided numerous reports relating to potential impacts of its proposed industrial/ commercial development upon neighboring properties, including the Park.

We do not believe that the information in such studies is directly related to the impact analysis that is required in this EIS. Although there are data relating to Park's resources in 1999 or 2000, we do not know whether such data are reasonably reliable at the present time. We believe that more current data will be used to study and monitor potential impacts on the Park's resources as further project design enables more detailed mitigation measures to be developed. In addition, the location of the TSA property (up-gradient from the Park) appears to be significantly different from Kona Kai Ola in terms of the potential relationship to groundwater dynamics relating to the Park. It is also notable that the TSA record and findings of the Commission reflect the limitations and parameters of information on that contested case record. Such information may not be meaningfully applied to a case in which more current and expansive data are available.

Still, your reference to the TSA record and this response serve to inform the interested public and governmental agencies of the substantive record in that case that can be reviewed in relation to the Park's resources and their position in protecting those resources. Please also note that our response to the National Park Service comments indicates JDI's interest in considering the mitigative conditions for application in the Kona Kai Ola project.

The EIS should discuss how JDI's plan will fit into a scenario where resort/hotel developments -- especially those dependent upon overcapacity roadways and other infrastructural lag -- are deemed unacceptable by the Kona community, the County administration, and the County Council.

Response: We respond to this comment in three parts. First, Kona Kai Ola is not a resort. Although commonly used interchangeably, "resort" and "hotel" are distinct land use concepts. Transient accommodations, including time share units, are inherent in both terms. However, a resort is a concept in which visitors are attracted to spend most, if not all, of their stay within the resort area through the design of amenities that fulfill the needs of a particular visitor market segment. This self-containment is achieved to varying degrees in resort development, depending on the natural, historic/cultural, and recreational resources within a resort site and the intended scale of the resort. State and County laws recognize this distinction between a "resort" and a "hotel" or "time-share unit." Section 514E-5, Hawai'i Revised Statutes, authorizes time share units to be located in a resort area or any other area in which a county may by ordinance allow a hotel unit. The Hawai'i County Code correspondingly permits hotels and time share units in non-resort zoning districts.

Second, regarding "overcapacity roadways and other infrastructure lag," Kona Kai Ola will mitigate project-related impacts on infrastructure systems, and, in some cases, such as the roadway system and the wastewater system, project improvements will benefit the larger community. Further, the project includes crucial privately-funded improvements, such as the marina, as well as privately-funded community-oriented facilities such as parks, other recreational facilities and public access.

Third, you refer to unacceptability by the Kona community, the County administration, and the County Council. This statement is inaccurate. In terms of the "Kona community," we do not believe that there has been only "unacceptability" from the Kona community. From November 2005 through June 2007, over 920 Big Island community members have participated in Kona Kai Ola presentations. Community input has varied and Section 1.8 lists the various concerns expressed in these presentations.

Further, regarding the County administration and County Council, development approval applications have not previously been submitted to the County of Hawaiʻi. Hence, there have been no formal or final decisions made by the County of Hawaiʻi. The developer has received concerns from the Planning Director and other County officials and is responding to these concerns.

With a projected total population increase of 5,321 persons, what will the social affects be on the existing Kona community (i.e., crime, lack of open space, viewplane loss, decimation of water quality, increased population density, increase of tourist population, increased noise, natural resource depletion, etc). What negative affects will further "in-migration" (tipping the balance of residents born outside the state to nearly half of the population of Hawaiʻi by 2000) from this project have on the social balance of the Kona community -- particularly the native Hawaiian population?

<u>Response</u>: The estimated population of 5,321 persons is an increase in the de facto population, not resident population. As explained in Section 4.5.1.1, this estimate is estimated for Year 15, which is full build-out and stabilization. This onsite population would account for four percent of forecast 2020 de facto population for West Hawaiʻi.

The types of impacts you identify are discussed in Section 4.5, Social Impacts, and analyzed in detail in Appendix O, Social Impacts.

Regarding impacts on the native Hawaiian population, these are discussed as part of the Cultural Impact Study, which is summarized in Section 4.1, Cultural Resources, and discussed in detail in Appendices L-1 and L-2, Cultural Impact Assessment.

JDI claims that it needs to expand the Honokōhau Harbor to nearly five times its current size in order to make an "acceptable level of return in investment." By projecting the income to be garnered by JDI from this development, is there a line between an "acceptable return" versus "maximizing profits" that can be drawn; and to what detriment will a so-called "acceptable level" of profit have on the environment, society, and culture of the region in comparison to JDI merely "making a profit"?

<u>Response</u>: The number of boat slips will increase from the existing 272 slips to a total of 1,072 slips with the addition of the proposed 800 slips; this represents an increase of 300 percent.

Regarding the relationship between developer profit and "detriment" on the region's environment, society and culture, we note that Kona Kai Ola is proposed as a mutually-beneficial project intended to meet several community needs while generating a reasonable rate of return for the developer.

The project is funded by private investment. These private funds will enable crucial privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant. Private funds will also be used in the development of community-oriented facilities such as parks, other recreational facilities and public access.

Further several project features will enhance the public experience on these lands. These community-oriented features include various water features such as seawater lagoons with a marine wildlife park and a marine science center, a yacht club, fishing club, a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. The coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, cultural sites and ‘Alula for community use.

Additional project community areas would include facilities and space for community use, including programs of the Kona Kai Ola Community Foundation, which supports community programs in health care, culture, education, and employment training for the local community, especially to native Hawaiians.

Further, DLNR and DHHL both independently requested a private developer to develop these public lands in order to generate revenues to support the public programs of these agencies, and JDI was selected. Hence, public interest will be served through the development of the Kona Kai Ola project.

In the DEIS, it is admitted that many adverse impacts will occur from this project. Water quality will diminish, anchialine ponds will be destroyed, endangered turtles and whales will be injured and/or killed (section 3.9.5), and air quality compromised, to name a few. Some are said to be mainly during construction (i.e., fugitive dust from bulldozing, vehicular traffic from construction, etc) and others long-term and/or permanent (vehicle emissions, ponds destroyed, loss of open space, urbanization, etc).

Response: You raise several concerns in this comment, and follow this comment with comments and questions on specific topics. We address water quality and anchialine pools in this response, and are addressing comments related to turtles, whales and air quality in subsequent responses.

Water quality: As explained in the DEIS, the agreement between JDI and the State of Hawai‘i established a required scope and scale of the project for which the impact analysis was provided. Kona Kai Ola is of the position that alternative actions other than a No Project alternative are not currently feasible without an amendment to the agreement with the State. Agency and public comments in response to the DEIS, as well as additional information generated as a result of inquiry into issues raised by the comments, have been helpful in identifying alternative actions that will serve the State’s goal of providing additional marina slips for the Kona area. These alternative actions also serve to reduce or mitigate anticipated effects of the proposed development.

Thus, agencies such as the Land Division of the Department of Land and Natural Resources, the U.S. Department of the Interior Fish and Wildlife Service, and the Planning Department of the County of Hawai‘i, and the Office of Environmental Quality Control (OEQC), as well as community organizations, have commented that a reduced scale marina and related facilities should be considered. The OEQC has also asked that the alternative of a reduced scale project be evaluated under the assumption that DHHL may determine that a downsized project would be preferred.

In response to these comments on the DEIS and in consideration of measures to mitigate anticipated impacts, the EIS Section 2, Alternatives Analysis, has been revised to describe the following alternatives, which are discussed in more detail in the EIS:

- Alternative 1 is a project involving a 400-slip marina, 400 hotel units, 1,100 time-share units, and commercial and support facilities. This alternative would enhance water quality and avoid the need to widen the existing harbor entrance channel, as well as reduce traffic and socioeconomic impacts.
- Alternative 2 is an alternative that had been previously discussed, but not included in the proposed project that includes an 800-slip harbor and a golf course.
- Alternative 3 is the no-action alternative.

A comparison between impacts related to the proposed project concept and impacts related to Alternative 1 indicates that a reduction in the acreage and number of slips in the marina, as well as the reduction in hotel and time-share units, would generate less environmental, traffic, social and economic impacts. Although positive economic impacts would be reduced, Alternative 1 can be considered as a preferable alternative because of reduced environmental impacts. However, while it can be concluded that the 25-acre marina in Alternative 1 would be the preferred size, the DLNR agreement establishes the size of the marina at 45 acres and 800 slips. An amendment to the DLNR agreement is required in order to allow Alternative 1 to proceed. Hence, selection of Alternative 1 is an unresolved issue at this time. Attachment 1 contains the full text of the revised Section 2, Alternatives Analysis.

Water quality is one of the areas that led to the study of additional alternatives. In response to DEIS comments, a three dimensional hydrodynamic and water quality model of Honokōhau Harbor and its surrounding waters was developed using the Delft3D modeling suite. The model was driven at its offshore boundaries by tidal predictions, and calibrated to reproduce available measurements of water levels, currents, salinity and temperature.

Alternative 1 would reduce the marina basin by 45 percent; this reduction significantly improved the flushing and water quality. Section 3.9.1.5 has been revised to discuss the water quality modeling study, and expand the discussion on water quality. Attachment 2 contains the full text of Section 3.9.1.5, Harbor Water Quality.

Anchialine pools: The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 parts per thousand (ppt) and that the anchialine biology would then perish.

In response to DEIS comments and to further study the pools south of the entrance channel of Honokōhau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2 of the EIS and is summarized in EIS Sections 3.9.2.1 and 3.9.2.2. In addition, further comment on the groundwater hydrology effects on anchialine pools was prepared by Waimea Water Services and is contained in Appendix G-3 of the EIS.

The DEIS identified 22 anchialine pools. Further studies determined that three of these pools are actually part of an estuary complex with direct connection to the ocean. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction.

The additional studies indicate that the remaining pools may not increase in salinity to levels unhealthy for *H. rubra* and *M. lohena* and other anchialine pool fauna. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is extremely difficult. The shallow lavas are of the pāhoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pāhoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Hence, the additional studies found that changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, the developer is committed to practicing good stewardship over the pools to be preserved and eliminating or reducing alien species to the extent practicable. The developer recognizes it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Mitigation measures to facilitate the long term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. The framework for the mitigation plan will include three measures including bioretention, salinity adjustment and possible new pools. Attachment 3 contains the revised EIS Sections 3.9.2.1 and 3.9.2.2 on anchialine pools.

How many turtles will be killed during the 14-year construction period? How many will be killed after construction by those using the expanded marina, expanded facilities, increased visitor population and increased human access to the shoreline? What affect will that number have on the overall population of turtles and other marine species? How will the increased population affect turtles other than by direct kill (runoff including nonpoint source pollution, harassment both intentional and unintentional, etc.)? What other solutions does JDI have than to leave the major part of this problem to local enforcement agencies?

While it is not possible to estimate “how many turtles will be killed” during construction and operations, full understanding of turtles and existing conditions help to understand project impacts. In response to DEIS, additional studies were conducted by Marine Acoustics, Inc., to expand the EIS discussion regarding the affected environment and project impact on turtles. The following text is added to Section 3.9.4.1. Underlined text indicates additional text and deletions are indicated with strike-through text.

> **Sea Turtles:** Five species of sea turtles are known to frequent Hawaiian waters, with Hawaiian green sea turtles (*Chelonia mydas*) by far the most abundant at 97% of the total numbers, hawksbill turtles (*Eretmochelys imbricata*, 1.7% of total), olive ridley turtles (*Lepidochelys olivacea*, 0.8%), and occasional sightings of leatherback

(*Dermochelys coriacea*) and loggerhead sea turtles (*Caretta caretta*, Chaloupka, et al, 2006, from stranding reports). Green sea turtles are the most plentiful large marine herbivore in the world and have experienced a very successful population recovery in Hawaiian waters since 1974 when harvest was outlawed in Hawai‘i, and 1978 when they became protected under the Endangered Species Act (Balazs, et al. 2004). Both green sea turtles and hawksbills are known to breed and nest on beaches within the main Hawaiian Islands, and have a 25-30 year generation time with a life span of 60-70 years (Balazs et al 2004). Total population numbers of green sea turtles in the Hawaiian archipelago have not been estimated, but the population has at least tripled since the 1970s and may now be approaching the carrying capacity of the islands (Chaloupka, et al. 2006).

Bartol et al. (1999) measured the hearing of juvenile loggerhead sea turtles using auditory evoked potentials to low-frequency tone bursts found the range of hearing to be from at least 250 to 750 Hz. The frequency range that was presented to the turtles was from 250 Hz to 1000 Hz (Bartol et al. 1999).

Most recently, Bartol and Ketten (2006) used auditory evoked potentials to determine the hearing capabilities of subadult green sea turtles and juvenile Kemp’s ridleys. Subadult Hawaiian green sea turtles detected frequencies between 100 and 500 Hz, with their most sensitive hearing between 200 and 400 Hz. However, two juvenile green turtles tested in Maryland had a slightly expanded range of hearing when compared to the subadult greens tested in Hawai‘i. These juveniles responded to sounds ranging from 100 to 800 Hz, with their most sensitive hearing range from 600 to 700 Hz. The two juvenile Kemp’s ridleys had a more restricted range (100 to 500 Hz) with their most sensitive hearing falling between 100 and 200 Hz (Bartol and Ketten 2006).

Adult green turtles are primarily herbivorous often seen on reefs as deep as 100+ feet but much more common in shallower waters. Foraging behavior of green turtles is well documented and in Hawai‘i is typically characterized by numerous short dives (4 to 8 min) in shallow water (typically less than 3 m) with short surface intervals (less than 5 sec) (Rice et al. 1999).Resting periods are characterized by longer dives (over 20 min) in deeper water (4 to 40 m) with surface intervals averaging 2.8 min (Rice et al. 1999). The amount of time that turtles spend foraging versus resting is still largely unknown. Green turtles in Hawai‘i frequently use small caves and crevices in the sides of reefs as resting areas, and spend significant amounts of time on the tops of reefs (Balazs et al. 1987). Green turtles are known to be resident in Kiholo Bay, Hawai‘i (Balazs et al. 2000), and presumably other areas as well, potentially increasing their susceptibility to vessel collision and/or repeated disturbance. Two turtle “cleaning stations” have been reported near the mouth of Honokōhau Harbor. Vessel collisions and potential noise impacts are a concern with regard to turtles. In a study of 3,861 turtle strandings in the main Hawaiian Islands from 1982 – 2003 (Chaloupka, et al. 2006), boat strikes accounted for only about 2.7 percent of the cases and were almost always fatal (95 percent). Entanglement in gill nets accounted for about six percent of strandings and also had a high rate of mortality (75 percednt). Hook and line entanglement (seven percent of strandings) was much less likely to result in the death of the turtle (52 percent mortality). At least 20 green sea turtles have stranded in Honokōhau Harbor or along the boundaries of Kaloko-Honokōhau National Historical Park.

Recent increases in longline fisheries may be a serious source of mortality. Greens comprised 14% of the annual observed take of all species of turtles by the Hawai‘i-based longline fishery between 1990 to 1994 (NMFS 1998a). Over the period of 1994 to 1999, it was estimated that an annual average of 40 green sea turtles were caught by the Hawai‘i-based longline fishery (McCracken 2000).

Recent proliferation of a tumorous disease known as fibropapillomatosis (Herbst 1994) may reverse improvements in the status of the Hawaiian stock (NMFS 1998a), although recent modeling suggests that population levels continue to increase despite the disease (Chaloupka and Balazs 2005). The disease is characterized by grayish tumors of various sizes, particularly in the axial regions of the flippers and around the eyes. This debilitating condition can be fatal and neither a cause nor a cure has been identified.

Hawksbill turtles (Eretmochelys imbricate) are observed less often than green sea turtles near Honokōhau. About 20-30 female hawksbills nest annually in the Main Hawaiian Islands (NMFS 1998b). In 20 years of netting and hand-capturing turtles at numerous nearshore sites in Hawai‘i, only eight hawksbills (all immatures) have been encountered at capture sites including Kiholo Bay and Ka‘u (Hawai‘i), Palo‘ou (Moloka‘i) and Makaha (O‘ahu) (NMFS 1998b). It was only recently discovered that hawksbills appear to be specialist sponge carnivores (Meylan 1988). Previously they had been classified as opportunistic feeders on a wide variety of marine invertebrates and algae.

Increasing human populations and the concurrent destruction of habitat are also a major concern for the Pacific hawksbill populations (NMFS 1998b). Hawksbill turtles appear to be rarely caught in pelagic fisheries (McCracken, 2000). However, incidental catches of hawksbill turtles in Hawai‘i do occur, primarily in nearshore gillnets (NMFS 1998b). The primary threats to hawksbills in Hawai‘i are increased human presence, beach erosion and nest predation (*e.g.,* by mongooses) (NMFS 1998b).

The discussion on project impacts on turtles has been expanded as follows:

An increased level of impacts to turtles from increased boating and fishing activities may occur. ~~The level of impact documented by National Marine Fisheries Service is limited to only three turtle mortalities confirmed, since 1982, from a total of 3,861 strandings throughout the Main Hawaiian Islands~~. Of the 3,861 turtle strandings recorded from the Main Hawaiian Islands since 1982, 75% were mortalities, and of these about 4% (~est. 116, from Figure 3 of Chaloupka, et.al.) were from boat strikes and 3 of these occurred within 10 miles of Honokōhau Harbor. Data from NPS staff at the adjacent Kaloko-Honokōhau National Historic Park show a total of 20 strandings within the parking (19) and harbor (1) between 2000 and 2006 with one attributed to boat strike and 6 to fishing gear entanglement. Eleven additional gear entanglements and one additional boat strike were also recorded but not listed as strandings. Human caused impacts from fishing and boat strikes are anticipated to increase as turtle populations continue to increase and boating /fishing activities increase with the expanding harbor.

~~It would appear that anthropomorphic impact to turtles from boat strikes and fishing activities is very low along the Kona Coast adjacent to the existing harbor. It is likely that this is due in part to the relatively steep ocean bottom that limits the habitat of the turtles to the very nearshore areas away from the areas of heavy boat traffic~~. Recognition by the general public that sea turtles are protected ~~also~~ puts a heavy social pressure on fishermen who may inadvertently catch a sea turtle, and is likely a factor in the recovery of this species. Although no adverse impacts to turtles have been documented within the existing harbor, the close proximity of boats and turtles in this environment is cause for concern.

Once the land bridge is open, it is highly likely that turtles will be attracted into the new harbor and be subject to potential harm from in-water construction of piers or other facilities. During this period of time and until the harbor is operational, mesh barrier will be erected across the new harbor channel to exclude turtles from the inner basin. The mesh size needs to be selected in consultation with NMFS ~~agencies~~ to make sure it does not entangle turtles.

Marine Acoustics, Inc., further analyzed the acoustical impacts on marine mammals and sea turtles due to construction and operation of the project, and the following text, which describes their analysis and identifies possible impacts and mitigation measures, is contained in Section 3.9.4.2:

A complete analysis of the in-air and in-water potential acoustic impacts from the construction of the Kona Kai Ola small boat harbor was completed by Marine Acoustics, Inc.(MAI) and is included in this document as Appendix T-3. In conducting this analysis, the best available scientific, environmental, geologic, and meteorological data were obtained and used to calculate the acoustic transmission loss (TL) and subsequently to predict the received levels (RLs) at the five receiver sites. State of the art acoustic propagation models were employed in this analysis to determine in-air and in-water TL. MAI used the Acoustic Integration Model© (AIM) to assess the impact of the predicted acoustic sound field on the species of marine mammals that could conceivably occur near the Kona Kai Ola project site.

The conclusion of that report determined that the criteria for Level A impacts to marine mammals for either in-air or in-water conditions at the receiver sites were never exceeded for the model source and receiver locations for non-blasting activities. However, these thresholds could be exceeded by the explosive blasting used to create the new harbor. For both in-air or in-water acoustic propagation, this only occurred when an animal was within about 200 meters (656 ft) of the explosion, This condition could only occur when the explosive source was at locations farthest north in the new harbor and closest to the existing harbor. This condition mandates that a safety range out to at least 200 meters (656 ft) of the source be shown to be clear of all marine mammals and sea turtle prior to each blast to preclude potential Level A takes.

The MAI report indicated that the in-air RLs for the explosive sources would exceed the assumed 100 dBA threshold for Level B harassment of pinnipeds (seals) for ranges out to about 0.4 nm (i.e., 800 yds [731 m]). This threshold is nominally for pinnipeds, but it should be extended to surface resting marine mammals and basking or beached sea turtles. Therefore, an in-air safety buffer of at least 731m from any explosive source is proposed, that should be maintained and found clear of marine mammals and basking or beached sea turtles prior to any blasts. It should be noted that although a receiver site was not modeled specifically in the existing harbor, that area is often within the range of this safety buffer and that extra care should be taken to ensure that no marine mammals or sea turtle are in the existing harbor prior to any blast. Analysis of the most restrictive Level B in-water explosive threshold shows that it is only exceeded when an animal is closer than 300 m (984 ft) from the explosive source.

Although the possibility exists for Level B impacts to marine mammals, based purely on the sound fields produced by the explosive blasts, analysis is the marine mammal distribution and movement as predicted by the AIM model, indicates that this is very unlikely situation. Therefore, it is expected that there will be much less than 0.5 Level B takes, with or without mitigation.

It should be recognized that several mitigation measures are already built into the proposed project. For example, the proposed practice to maintain a rock “dam” separating the construction site from the existing harbor reduces acoustic energy propagating to area potentially containing marine mammals or sea turtles. Also, this dam precludes animals from entering the construction area. This dam or land-bridge will be in place for all drilling and dredging activities, except for the removal of the land bridge itself.

Several other possible methods of mitigation are available to the Kona Kai Ola project, and feasibility, practicality, and benefit will be discussed with the National Marine Fisheries Service (NMFS) during consultation, and may be implemented subsequent to that consultation. The first possible mitigation technique is to acoustically monitor the potentially impacted areas during construction to: a) assess the accuracy of the modeling and b) to interact proactively with construction personnel to ensure that the identified threshold levels are not exceeded. Although the best available science and data was used to model the acoustics of the area, numerous conservative assumptions needed to be built into the modeling. By monitoring the actual levels received, in-situ corrections/updates to modeled parameters could potentially reduce the built-in conservativeness and reduce the potentially impacted areas. For example, the modeling assumes that all of the small voids in the bedrock are water-filled and therefore impart minimum attenuation on the acoustic signal as it propagates through. If even a small percentage of the voids are gas-filled, this attenuation would increase greatly and the impacted area would be reduced.

Another possible mitigation technique would be to augment the land-based visual observer, who it is assumed would verify that the area was clear the animals, with boat-based observers. This would increase the effectiveness of recognizing the presence of marine mammals and sea turtles in the potentially affected areas.

Additionally, interactions with the construction teams to alter the blasting methods modeled could potentially mitigate and reduce acoustic impacts to marine animals. A blasting expert will be consulted to develop a discontinuous non-linear blasting plan that will optimize cancellation of the explosion pressure wave into the marine environment. Examples of possible changes include: reducing charge size, reducing the depth drilled and blasted during any blast, reducing the number of blast holes or the volume of each blast, etc. The combination of these techniques with acoustic monitoring could potentially allow a large portion of the northern third of the harbor to be excavated with little or no potential impact to marine animals.

Interactions with NMFS during the consultation period will be used to examine these or any other techniques which may be identified. Also, the project is requesting help in identifying any possible method known to NMFS to establish and maintain turtle exclusion areas, especially in the existing harbor, without harassing the turtles. It may become apparent during those consultations that even with the identified buffer zones and mitigation techniques that an Incidental Harassment Authorization (IHA) is required, especially for the northern third of the proposed harbor.

> Marine Acoustics, Inc. also completed a study of the expected ambient noise levels in Honokōhau Bay as a result of the increased vessel traffic from the expanded harbor. This report is included in this document as Appendix T-2. That report concluded that the average maximum daytime ambient noise levels would be expected to increase about 9.7 dB across the frequency spectrum from 100 Hz – 2 kHz, with the quadrupling of the vessels using the expanded harbor (i.e., the proposed action). Although significant, this increase would occur primarily during daylight hours, and the predicted median ambient noise would still be below 100 dB for all frequencies. The other significant factor is that there will be a quadrupling of the number of localized (i.e., small) individual sound fields in the area. These sound fields surround the individual boat that are contributing to the overall ambient noise. Noise levels in excess of 120 dB extend out to about 550 m (1804 ft) from these boats, with even high levels at closer ranges. Short of actual collisions with animals, Level A impacts are unlikely for noise levels typically generated by small boats. The Level B threshold nominally extends to approximately ten meters around each boat (depending on equipment such as size of motor, conditions of propeller and other equipment). Therefore potential Level B impacts to marine mammals and sea turtles would only occur within this range. Therefore, the chance for potential Level B impacts is small.

How many whales will be killed and/or injured during the construction period? How many will be killed after construction by those using the expanded marina, expanded facilities, increased visitor population and increased human access to the shoreline and whale-watching tours and individual boats? What affect will the number of possible deaths have the overall population of whales? What other solutions does JDI have than to leave the major part of this problem to already over- burdened local enforcement agencies?

As with your comments and questions regarding turtles, it is not possible to estimate "how many whales will be killed" during construction and operations. The additional studies by Marine Acoustics included whales and the following text is added to Section 3.9.4.1 regarding whales as part of the affected environment:

> **Humpback Whales:** The population of humpback whales (*Megaptera novaeangliae*) around Hawai'i was estimated to be between 4,500-6,500 in 2000 (Mobley et al 2001). The population growth rate between 1993 and 2000 is estimated to be seven percent indicating that the population is recovering from its dramatic reduction due to commercial whaling. It is worth noting that this is considered a high rate of increase for a mammalian species.
>
> The highest densities of animals are found within the 100 fathom isobath. Most humpbacks off Hawai'i are found north of Honokōhau in the waters of the Hawaiian Islands Humpback Whale National Marine Sanctuary. Nevertheless, they are commonly seen off Honokōhau in winter months. Humpbacks are not deep diving animals. Whales in Hawai'i typically dive to less than 100 feet, although occasional deeper dives are possible (Hamilton et al. 1997)The whales breed and give birth while in Hawai'i during the winter months, and migrate north to feed each spring.
>
> Congress designated the Hawaiian Islands Humpback Whale National Marine Sanctuary (HINMS) on November 4, 1992, and was followed by the Governor of Hawai'i's formal approval in 1997. The Sanctuary's purpose includes protecting humpback whales and their habitat within the Sanctuary, educating the public about the relationship of humpback whales to the Hawaiian Islands marine environment, managing the human uses of the Sanctuary, and providing for the identification of marine resources and ecosystems of national significance for possible inclusion in

the Sanctuary. The sanctuary is approximately four nautical miles north of Honokōhau Harbor.

Whales have very sensitive hearing, so any loud underwater sound has the potential to disturb these animals. ~~Vessel collisions are also a concern with whales.~~ Playback experiments have estimated that humpback whales will respond to biologically meaningful sound at levels as low as 102 dB re 1 μPa, a level that is similar to background ambient noise (Frankel et al. 1995). Increases in vessel numbers will lead to an increase in noise from operating boats. However, even at its greatest predicted increase, the median sound level from active boats is not expected to raise sound levels to an intensity that would be considered an impact (Level B take) to marine mammal population (See Appendices T-2 and T-3). Humpback whale song ranges from 20 Hz to over 10,000 Hz, with most acoustic energy typically concentrated in the 100-1000 Hz range. This vocal production and the anatomy of their inner ear indicate that these animals are most sensitive to low-frequency sound (Ketten 1992).

Numerous studies have shown that human activity can affect humpback whale behavior, including vessel activity (Bauer 1986; Norris 1994; Corkeron 1995; McCauley et al. 1996; Scheidat et al. 2004), oceanographic research (Frankel and Clark 2000; Frankel and Clark 2002), and sonar (Miller et al. 2000; Fristrup et al. 2003). If the humpback whale population continues to expand at its present rate (8%/year) it can be expected that greater numbers of whales will extend into waters off the Kona Coast. This is likely to increase the demand for whale watching vessels from the new harbor and this increase will have a negative impact on the whale population expansion. The increase in both the number of vessels and number of whales increases the chance for collisions.

Vessel collisions are also a major concern. The majority of whale strikes occur where whales and boats are most common, such as in shallow waters between Lāna'i and Maui. In a recent study, three of 22 recorded whale-vessel collisions in the main Hawaiian Islands occurred off the Kona coast. (Lammers et al. 2003). That study also found that 14 of the 22 collisions were reported between 1995 and 2003. This observed increase may result from more awareness of the issue, or from the greater number of both whales and vessels in Hawaiian waters. In Hawai'i, data from 1972 to 1996 reveal at least six entanglements of humpback whales in commercial fishing equipment (Mazzuca et al. 1998). These data also indicate an increasing trend of entanglement since 1992 and a three-fold increase in death and entanglement occurrences related to human activity in 1996.

It is highly unlikely that humpback whales will approach to within the Level A or Level B impact “take” zones created by the explosive blasts of harbor construction. However, the sounds generated by these explosions will be within the frequency hearing range of humpback whales and could potentially be heard by whales between Kona and Maui. Modeling predicts that the maximum sound level two miles offshore the site is less than 150 dB re1 μPa, which is less than the threshold for Level B impacts. As the explosions are planned to occur daily for up to 9 months, the cumulative impact of this noise must be considered if construction is anticipated when whales are expected in the area (December 15 – March 30).

Possible impacts due to acoustic impacts generated by construction activities and operations, as well as project mitigation measures, were previously discussed in our response to your comments on turtles. Regarding other possible impacts, the following discussion is contained in Section 3.9.4.2:

> Completion of the harbor expansion project will increase the vessel traffic crossing the Hawaiian Islands Humpback Whale National Marine Sanctuary, the southern boundary of which is approximately four nautical miles north of Honokōhau Harbor. At a time when the whale population is growing, an increase of vessel traffic may increase the likelihood of vessel-whale collisions. Related to vessel traffic, an increase in whale watching activities is also likely. Vessels participating in these activities directly seek out higher whale population densities, increasing the likelihood of collisions, but also having the potential for disrupting whale behaviors such as resting, courting, mating or birthing.
>
> As noted earlier, however, of the 22 recorded whale strikes in the main Hawaiian Islands, only three were recorded off the Kona coast. Sanctuary managers may need to implement additional regulations for private and/or commercial activities directly involving whale encounters. Mariner education programs, already in place as part of Sanctuary operations, will help to mitigate possible impacts due to increased boaters, and the proposed marine science center will complement Sanctuary educational programs.

How much will the air quality degrade in Kona and surrounding areas due to the construction period even when "mitigation measures identified in Section 3.5 of the DEIS" are used? How does leaving the enforcement to this rule to local agencies affect already over-burdened law enforcement?

<u>Response</u>: Project mitigation related to air quality impacts is not "leaving the enforcement to this rule to local agencies affect already over-burdened law enforcement." Mitigation will be accomplished through developer compliance with rules and regulations regarding air quality. This means that the initiative to make sure that air quality remains within acceptable levels is that of the developer, not enforcement agencies.

As fishing effort increases, so does the fishing pressure on existing stocks." pg. 52. How much will this development -- adding at least as many as four times the amount of boat slips -- affect the size and number of fishing catch? How will that presumed decrease affect local fisheries, the local fishing industry (especially those already engaged in commercial and/or subsistence fishing and, in particular, those who were born and raised as fisherfolk, dependent upon a steady supply of fish?

<u>Response:</u> In response to DEIS comments, the EIS expanded discussion on fishery impacts in Section 3.9.2. The additional information responds to your questions and is presented, as follows:

> **Impacts on Marlin and Tuna / Pelagic Fishery**
>
> The impact on the marlin and tuna fisheries from increased harbor capacity will be a function of the number of new boats in the harbor targeting these fisheries and the ability of these new boats to attract paying customers. Both marlin and large tuna fisheries have been shown to be in general decline according to private, state, and national fisheries statistics. There are several hypothesized causes for these declines relating primarily to international fisheries. The ability of the State to manage these pelagic marine fish stocks is limited by the national and international fishing policies.

Fisheries management typically attempts to reduce fishing pressure by limiting access to the fishery either through licensing, gear (boat) restrictions, catch limits, season or area limits. Limiting the number of boat slips available would not by itself provide effective control over fisheries pressure because these pressures are market driven, as well as for recreational and subsistence purposes, and there are other methods, such as boat launch ramps, to access the fishery.

Impacts on Coral Reef From Extractive Fisheries

It is possible that a large number of boat slips in the expanded harbor will be occupied by resident-owned motor boats for personal use. Private boats in Hawai‘i are used for a variety of activities that have historically proven difficult to regulate. These may include extractive activities such as bottom fishing, trolling, spear fishing, tropical fish and invertebrate collecting, as well as non-extractive activities including sport diving, skiing, paragliding, racing, or shoreline transportation. Each of these activities has individual existing impacts upon marine resources and these impacts are expected to increase with the new harbor unless appropriate management is initiated.

There is a general perception that the increased access to nearshore resources will result in a decline in these fish stocks similar to that seen historically on O‘ahu. This perception is not without merit and deserves serious attention from resource managers. However, the increased access to the shoreline has already occurred, and will continue as the coastline is developed regardless of harbor development. As most fisheries are market driven, as well as for recreational and subsistence purposes, there will be increased pressure on these resources in the future regardless of harbor development. Fisheries managers need to take a serious look at management strategies for the future. Attempting to preserve fisheries resources only by limiting the size of the harbor is not likely to have any positive long term effect on the nearshore living marine resources because there are increasingly other avenues to access the shorelines.

SCUBA

An increase in the number of boat slips is likely to cause an increase in both the number and size of commercial moored vessels offering dive tours as well as private boats used for diving. Although all of the dive sites in Kona are relatively near shore, the lack of shoreline access and ease of entry by boat makes boat diving the preferred option. As more of the Kona coast becomes developed however, this shoreline limitation to dive sites is likely to decrease. Attempting to limit dive pressure on the reef by limiting the number of available slips is not by itself an effective long-range management tool. As the number of divers on the reef increases, the pressure on the reef from anchor damage, extractive fisheries, and unintentional diver induced coral damage will likely increase. The increased pressure on dive sites from SCUBA divers must be met with commensurate changes in management to limit adverse impacts.

The EIS also contains additional discussion on mitigation measures, as follows:

An increase in the harbor size offers the opportunity to consolidate, focus, and fund management and enforcement activities at one centralized location. The pressure on fish and invertebrate stocks, as well as upon populations of marine mammals and turtles can be expected to increase as the Kona population increases, regardless of whether the harbor is improved. The following changes could be made by DLNR, paid for at least in part by the additional revenues to DLNR from the Kona Kai Ola project. These changes are in the management authority of the DLNR Division of Aquatic Resources and the DLNR Division of Boating and Ocean Recreation.

- Increase in the number of fisheries enforcement and management personnel in Kona at one centralized harbor location
- Allocation of slip and office space for fisheries personnel and equipment
- Increased numbers of submerged mooring buoys (presently approaching 100) at all dive sites,
- Increased education materials for recreational divers and fishermen
- Initiate restrictions on the quantity and size of boats in each commercial sector
- For inshore species, initiate catch restrictions in line with Division of Aquatic Resources guidelines that prioritize recreational fishing above commercial fishing, and subsistence fishing above recreational fishing.

Some fishing experts say that the only way to increase the size of the harbor is to have two entrances. Does JDI have any plans to do this? If so, what are the environmental and safety ramifications of such an expansion?

Response: JDI has no plans to add another entrance.

"Project-related motor vehicle traffic should be insignificant", so says the DEIS, after the project is completed. How will vehicle emissions increase during the construction phase and what impact will that have on residents and the natural environment for those fourteen years? Once the project-related motor vehicle traffic has wound down, how much added vehicle emissions will come from this project (including boats and cars)? How will those emissions affect residents and the environment, especially in combination with VOG conditions (volcanic emissions)?

Response: The air quality impact estimates are based on standard criteria, which do not attempt to estimate the specific emissions, as this would require several assumptions and limit the usefulness of findings. Further, it is not possible to estimate boat emissions.

The Air Quality Study shows that carbon monoxide emissions from automobile traffic will comply with air quality standards. It is unknown what, if any, effect, vog might have in combination with air pollution from motor vehicles.

Water requirements for this project are deemed unable to be filled, according to the DEIS. From where will the water for this project come? How will the provision of 2.6 million gallons of water per day of water affect the natural environment and existing residential and business communities?

Response: As stated in the DEIS, DWS sources are inadequate to support the project. Initial coordination with DLNR has identified two possible sources that may possibly be used for the project. DLNR anticipates a sustainable yield of each well to be approximately 1.5 million gallons per day.

- Keōpū Well #2 (State Well No. 3957-02)
- Keōpū Well #4 (State Well No. 3857-02)

The proposed water system will also include transmission and storage facilities. Initial communications with Queen Lili‘uokalani Trust indicates an interest in partnering with Kona Kai Ola and allowing the needed transmission main corridor/easement through their property. However, the Queen Lili‘uokalani Trust has not yet identified a development proposal on their property to the south. Water transmission corridors may alternately be coordinated with the State Department of Transportation as part of their highway improvements. While discussions continue with the Queen Lili‘uokalani Trust, the storage tank that will serve the project will be located either on TMK 7-4-08:56 or 7-4-20:22. The proposed water system improvements and proposed operation criteria are based on Chapter 5, Hawai‘i County Department of Water Supply Potable Water System Design Standards.

Environmental impacts resulting from the development of new water sources will be addressed in applications for a Well Construction Permit and Pump Installation Permit submitted to the State Commission on Water Resource Management. The development of new water sources will benefit the existing community by providing additional sources to meet existing and non-project future needs.

Employment is at an all-time high in Hawai‘i with workers being imported to fill job vacancies (especially construction and service jobs). It seems that questions of affordable housing for those who will be employed at Kona Kai Ola are as yet unanswered. When hundreds of workers move to West Hawai‘i for those jobs, what will be the increased affects of affordable housing deficit, lack of schools, and other infrastructure? Who will be responsible for and have to pay for the influx of hundreds or even thousands of workers from outside the Kona community?

In response to DEIS comments, a study of workforce housing requirements was prepared to evaluate secondary impacts. Findings are summarized in EIS Section 4.6.5, Workforce Housing Impacts, which is as follows:

> **Workforce Housing Impacts**
>
> In response to DEIS comments, a study of possible workforce requirements and related secondary impacts was conducted by The Hallstrom Group; this study is presented in Appendix C-2. This study was based on a four-step study process that included 1) quantification of population and employment projections, 2) .analysis of West Hawai‘i employment demand and supply, 3) characterization of the subject workforce, and 4) quantification of subject workforce housing impacts.
>
> The population and job count on the Hawai‘i Island are forecast to increase by approximately 70 percent during the 24 year projection period that ends in 2030. On average, at least 60 percent of the population growth will be a result of net in-migration to the County.
>
> Although trends will be slowing relative to recent decades, a significant portion of the population and business expansion will be directed towards West Hawai‘i. In the next two decades, the population and job count in West Hawai‘i will increase by about 80 percent, reaching 128,200 residents and 87,400 employment positions by 2030. The available approved or entitled, proposed and announced new projects and their associated forecast job creation supply will not be sufficient to meet estimated employment demand over time. Further, with the approaching build-out of the major West Hawai‘i resorts and residential-orientation of the newer resort

communities, few opportunities will exist for expansion in the historically-vital tourism economic sector.

As discussed in Section 4.6.3.2, implementation of the Kona Kai Ola master plan will create a total of 3,842 on-site full time equivalent employment positions in the operating businesses of the development. The project is estimated to be operational around 2012, following completion of infrastructure and Phase I construction, and will continue until the community reaches build-out and stabilization in 2026.

Approximately 45 percent of the jobs will be entry level positions with an average annual wage of $20,000 in current dollars. Another 40 percent will be mid-level jobs with average yearly pay of $32,000, and, 15 percent will be management/high-skill positions with wages averaging $50,000.

Approximately 2,147 of the jobs in the subject project will be filled by persons who have in-migrated to the Big Island. However, only a nominal portion would be specifically relocated to West Hawaii as a result of the development.

The total net housing load created by Kona Kai Ola in-migrant workers will be 1,074 units. This in-migration will generate a need for a range of 625 to 859 affordable housing units, as follows:

- As discussed in Section 4.5.2.2, under Hawaiʻi County Ordinance Chapter 11, Section 4 Affordable Housing Requirements, hotel uses generating more than 100 employees on a full-time equivalent basis must earn one affordable housing credit for every four full-time equivalent jobs created. Application of the "1 to 4" ratio to all of the transient units proposed for Kona Kai Ola (hotel and timeshare) results in a workforce housing requirement of 625 units.
- Another method of calculating the need for affordable worker housing units is to estimate that approximately 80 percent of the total in-migrant worker need housing that meet affordable housing pricing guidelines. This results in a high end range of 859 units.

Based on affordable housing pricing guidelines, affordable housing units will have an estimated sales price of $216,000 to $292,000.

As agreements between the State and JDI prohibit residential development at Kona Kai Ola, workforce housing would need to be located off-site. Probable and desirable locations for workforce housings were based on availability, efficiencies and surveys conducted of area workers. Possible locations in support of Kona Kai Ola included the mid-elevation lands of the Keahole to Kailua-Kona Corridor, between the Queen Kaʻahumanu fronting commercial/industrial developments and Mamalahoa Highway; and in the Waikoloa Village expansion areas.

The most suitable location for workforce housing units is the Villages at Laʻiʻōpua community, a DHHL project, or within the Hawaiʻi Housing Finance and Development Corporation affordable housing development planned for Keahuolū. These are two State-owned undertakings directly across the highway in the same ahupuaʻa . Locating workforce affordable housing units in these communities would substantially lessen the traffic impacts associated with a community subject workforce. Alternatively, the State lands adjacent to Waikoloa Village would be appropriate.

JDI will comply with all affordable housing requirements of applicable Hawai‘i County ordinances.

The DEIS states that loss of natural and open space will occur. How does this loss of natural and open space affect the social fabric of the community who currently enjoys the existence of those natural resources, whether it be recreational, subsistence, spiritual, cultural or merely the positive affects and feelings of well-being of merely seeing the currently natural, open viewplane of the area while driving? How will the loss of natural, open space affect those whose use this area depends upon an unpolluted, low-impact, natural environment (i.e., subsistence fishing, shoreline gathering, surfing, swimming, diving, etc)? To what areas will these displaced persons be able go to recreate, fish, gather, and enjoy the positive effects of being in a natural environment if JDI's project is built?

Response: While the project will result in the transformation of open space into a planned development, Kona Kai Ola will meet a sustainability design-related goal of maintaining 40 percent of the site area as open space.

The following is revised text from the Executive Summary that summarizes how the project will mitigate view impacts:

> To protect view planes to and along the shoreline area, the proposed project includes a 400-foot buffer zone along the shoreline that will be preserved as open space. Improvements within this buffer zone will be limited to lateral shoreline public trails, mauka-makai access trails from the project site, and cultural or environmental-related improvements related to existing features within the buffer zone. No buildings or structures shall be built within the 400-foot shoreline setback area, with the possible exception of structures that are directly related to native Hawaiian cultural resources in the buffer zone and that are requested by JDI's cultural advisors.
>
> To control building mass near the shoreline, development sites directly adjacent to the shoreline setback area will be limited by design covenants to a lower unit density. Buildings immediately adjacent to the 400-foot shoreline setback are proposed at one and two stories high to minimize building mass against the shoreline setback area. Major roadways, parking areas, and areas surrounding all major structures will be landscaped in accordance with a landscape master plan. In Alternative 1, the shoreline setback in the shoreline park would be increased to 600 feet in the southern area of the project site, and remain at 400 feet at the northern area of the project site.

Regarding your comment that Kona Kai Ola will displace persons who recreate, fish, gather, and enjoy the positive effects of being in a natural environment, the project will enhance the public experience on these lands. These community-oriented features include various water features such as seawater lagoons with a marine wildlife park and a marine science center, a yacht club, fishing club, a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. The coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and ‘Alula for community use. Additional project community areas would include facilities and space for community use, including programs of the Kona Kai Ola Community Foundation, which supports community programs in health care, culture, education, and employment training for the local community, especially to native Hawaiians.

From refrigerators to housing materials to construction workers, this project will require importation of products and services. When commercial ventures aren't restricted to small, *local ownership; when construction materials, food, and fuel are not restricted to being locally produced; when transport in and out of the area is dependent upon car and air; when workers must be moved in from other communities, states and even countries; etc., how will sustainability (claimed as one of the development's greatest aspects) in any meaningful sense of the word, be achieved within this development?*

Response: JDI has made a corporate commitment to environmental sustainability in all its work. In Kona Kai Ola, JDI intends to incorporate the latest environmental design and technology to create an energy efficient, low environmental impact, sustainable development at Kona Kai Ola. The vision for the project is to develop a project that has minimal impact on the environment by striving to significantly reduce water consumption, waste disposal, energy use and carbon dioxide emissions. Section 1.5.2, Project Sustainable Design, has been expanded to include specific project sustainability goals, and is contained in Attachment 4 of this letter.

Further, it is not the intent of JDI to import project materials, workers, services and so on. Every effort will be made to integrate the local community in project planning and operations as the project progresses, and, during operations, use the services of the local entrepreneurs, employees and marina workers, feature locally-grown produce and local cuisine in eating establishments, highlight local talent in all venues and rely on local cultural experts in perpetuating the Hawaiian culture and preserving cultural resources.

"Smart growth" is community-generated -- built on a model of balanced, predictable land use and mixed use concepts. How does JDI -- whose proposed project is resort-based, lacks affordable and/or residential housing, schools and other aspects of a "mixed use" community -- plan to fit into at model of growth which is favored by Kona residents?

Response: The Kona Kai Ola project is based on generally accepted smart growth principles, which are outlined by the Smart Growth Network (http://www.smartgrowth.org/). Smart growth recognizes connections between development and quality of life. It leverages new growth to improve the community. Smart growth principles that are applicable to Kona Kai Ola are as follows:

- Create walkable neighborhoods: Kona Kai Ola will be a walkable development. The development will be easily navigable on-foot or on a bike, and will include numerous walking and biking trails linking site features.
- Encourage community and stakeholder collaboration: From November 2005 through June 2007, over 920 Big Island community members have participated in Kona Kai Ola presentations. Community input gathered from these presentations and facilitated by JDI's smart growth expertise, has shaped the vision for Kona Kai Ola.
- Make development decisions predictable, fair and cost effective: The EIS documents provide full disclosure of project impacts and mitigation, as well as phasing and implementation time frame. This information provides a predictable scenario for what will happen at Kona Kai Ola in the future. Further, the project represents a fair and cost effective use of public lands that will infuse private investment into the community while meeting public needs.
- Mix land uses: The vision for Kona Kai Ola is an environmentally sustainable marina-focused development featuring a mix of uses including visitor and resident-serving commercial enterprises, hotels and time-share units, marina services, open space and community-benefiting facilities including public infrastructure improvements in a pedestrian friendly setting surrounding the marina and seawater lagoons.
- Preserve open space, farmland, natural beauty and critical environmental areas: Kona Kai Ola will be designed to protect and preserve the area's scenic and open

space resources. Consistent with the project's sustainability goals, 40 percent of the project site will be retained in open space. Further, Kona Kai Ola includes a 400-foot buffer zone along the shoreline that will be preserved as open space. Improvements within this buffer zone will be limited to lateral shoreline public trails, mauka-makai access trails from the project site, and cultural or environmental-related improvements related to existing features within the buffer zone. No buildings or structures shall be built within the 400-foot shoreline setback area, with the possible exception of structures that are directly related to native Hawaiian cultural resources in the buffer zone and that are requested by JDI's cultural advisors.

- Provide a variety of transportation choices: Kona Kai Ola will reduce transportation related impacts through provision of mass transit options. The project will provide public transit service linking the airport and the new harbor village and Kailua Village. The development will also establish a transit system to transport people around the project site. Further, Kona Kai Ola will be a walkable development. The development will be easily navigable on-foot or on a bike. The plan will include numerous walking and biking trails linking site features. Additionally, reducing site temperatures will enhance the walkability of the site.

Endangered, native species are listed by the National Park Service as being threatened by this development. How does JDI propose to remove these cited threats?

Response: The flora survey, which is presented in Appendix E, was conducted, in part, to determine the presence of any native flora, particularly any that are federally listed as threatened or endangered. No federally-listed endangered plants were found on the property, nor were there any candidates for such status identified. Identification was based on "Endangered and threatened wildlife and plants," prepared by the U.S. Fish and Wildlife Service (1999).

The fauna survey, which is presented in Appendix F, was conducted, in part, to determine if any avian or mammalian species currently listed as endangered, threatened or proposed for listing under either the federal or State endangered species program. The diversity and density of avian species were extremely low, as expected given the dry and harsh conditions of the project site. The findings were consistent to earlier surveys conducted on the property in 2001, as well as other surveys conducted within the lowland, fountain grass dominated areas in North Kona. Due to the conditions of the project site, it is unable to sustain the nesting of native avian species.

The Kealakehe Waste Water Treatment Plant, however, has been a viable nesting area for waterbirds along the Kona coast. Although not detected during this survey, it is possible that small numbers of the endangered endemic Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened Newell's Shearwater (*Puffinus auricularis newelli*) fly over the project area between the months of May and November.

It was noted that development typically does have a potential impact on Hawaiian Petrels and Newell's Shearwaters as they could be disoriented and downed because of exterior lighting associated with the various businesses and marina operations. To mitigate project-related impacts, Kona Kai Ola will incorporate shielded external lighting to minimize the disorientation of flying nocturnal Hawaiian Petrels and Newell's Shearwaters. Also shielding would be needed to comply with Hawai'i County Code § 14-50 et seq. which requires the shielding of exterior lights so as to lower the ambient glare caused by unshielded lighting to the astronomical observatories located on Mauna Kea.

The words "not likely" are used throughout the document. For instance, in Sec. 3.9.3.2, it's stated that anchialine ponds that are located to the north of the harbor will not likely be *impacted by the increased salinity which will drastically alter others. What environmental, social, and cultural impacts will there be if those ponds are impacted similarly to the others whose salinity will no longer render them "anchialine"?*

Response: Terms such as "likely." "highly likely," and "not likely" are used to measure the level of possibility of project impact, and this likelihood was based on extensive and numerous studies contained in the EIS.

Regarding your question on anchialine pools, please refer to pages 7 to 10 of this letter.

To conclude and summarize these comments, the MLG reiterates its statements and questions posed during the EISPN comment period and asked that they, once again, be answered. We believe that more studies are in order and that more of the questions posed whether they be from our group, the National Park Service or other groups and individuals, need to be more directly and fully answered.

Response: Our response to your EISPN comment letter dated August 1, 2006, is dated October 20, 2006. Our response letter provided information available at the time, and identified EIS studies that would further address your comments. All of the studies were conducted, and are included in the EIS. Further, in response to DEIS comments, several additional studies were conducted. The collective information presented in this EIS process responds to the comments in your EISPN comment letter.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

2 Alternatives Analysis

~~In typical land development projects, the initial planning process includes the exploration of alternatives to development objectives. In the EIS process, these alternatives are presented with a disclosure of reasons for the dismissal of non-preferred alternatives.~~

~~Kona Kai Ola does not follow this same pattern of alternatives evaluation.~~ As discussed in Section 1.4, the proposed Kona Kai Ola project is the result of agreements between JDI and the State DLNR and DHHL. The agreements and leases between the State and JDI stipulate the parameters of development for this site in terms of uses, quantities and size of many features, resulting in a limited range of land uses. Unlike a private property project, JDI is required to meet the criteria outlined in the agreements, thereby affording less flexibility in options and uses. From the developer's perspective, the agreements must also provide sufficient flexibility to allow for a development product that responds to market needs and provides a reasonable rate of return on the private investment.

The agreements between JDI and DLNR specify that the proposed harbor basin is to be 45 acres and accommodate 800 slips. This development proposal is the subject of this EIS. In response to DEIS comments, additional water quality studies and modeling were conducted. These studies determined that the water circulation in a 45-acre 800-slip marina would be insufficient to maintain the required standard of water quality. The models of water circulation suggest that a new 25-acre harbor basin could successfully maintain required water quality in the new harbor. Comments on the DEIS from DLNR, from other government agencies, the neighbors and the general community also called for the consideration of alternatives in the EIS, including a project with a smaller harbor basin and less density of hotel and time-share units.

In response to these comments on the DEIS, three alternatives are evaluated in this Final EIS and include Alternative 1, which is a plan with a 25-acre 400-slip harbor basin including a decrease in hotel and time-share units; Alternative 2, which is an alternative that had been previously discussed but not included in the proposed project, that includes an 800-slip harbor and a golf course; and Alternative 3, the no-project alternative. Each alternative is included in the EIS with an evaluation of their potential impacts. These project alternatives are presented to compare the levels of impacts and mitigation measures of the proposed project and alternative development schemes pursuant to requirements set forth in Chapter 343, HRS.

~~JDI is required to provide a new marina basin not less than 45 acres and a minimum of 800 new boat slips. Further, the agreements provide the following options for land uses at the project site:~~

- ~~Golf Course~~
- ~~Retail Commercial Facilities~~
- ~~Hotel Development Parcels~~
- ~~Marina Development Parcels~~
- ~~Community Benefit Development Parcels~~

~~JDI is not pursuing the golf course option and is proposing instead to create various water features throughout the project site. All other optional uses have been incorporated in Kona Kai Ola.~~

2.1 Project Alternatives

2.1.1 Alternative 1: 400-Slip Marina

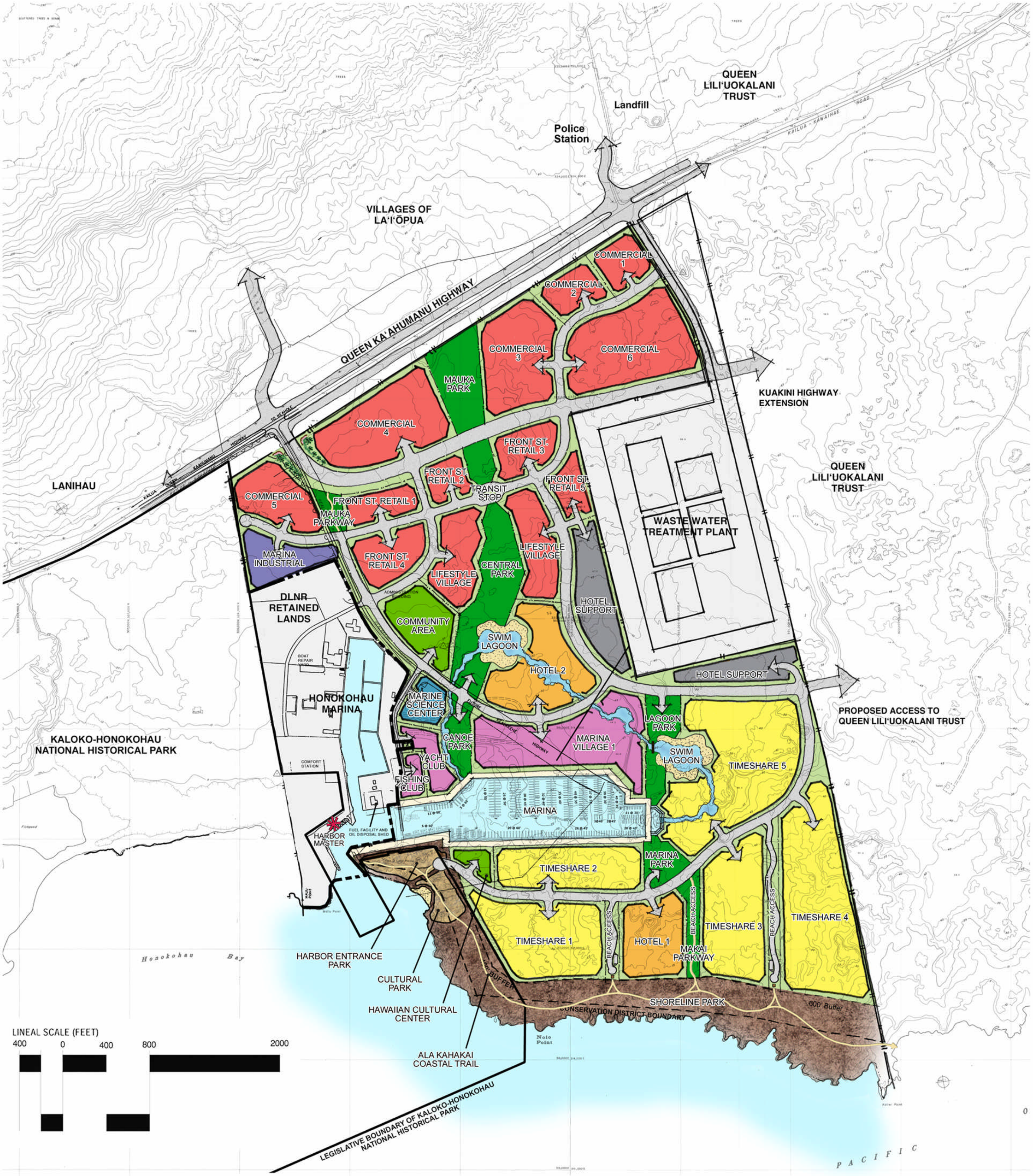
Studies conducted in response to DEIS comments found the construction and operation of an 800-slip marina may significantly impact the water quality within the marina and along the shoreline. Specifically, the Harbor Water Quality Modeling Study, as contained in Appendix U, found that the water circulation in a 45-acre 800-slip harbor was insufficient to maintain an acceptable level of water quality. Further, the existing harbor channel, which would serve both the existing and new harbors, could not adequately serve the increased boat traffic generated by an 800-slip marina during peak traffic. Mitigation measures to accommodate peak boat traffic included the widening of the existing channel, an action that would entail a complex process of Federal and State approvals and encounter significant environmental concern.

Concerns related to the proposed density of hotel and time-share units were also expressed in comments to the DEIS from members of the public, neighbors to the project site, especially the Kaniohale Community Association, and government agencies. Common themes in DEIS comments were related to impacts regarding traffic, project requirements of potable water and infrastructure systems, including sewer, drainage, utility and solid waste systems, and socioeconomic impacts.

In response to the water quality study results, and to the DEIS comments, an alternative plan was developed with a smaller marina with less boat slips, and a related decrease in hotel and time share units. Illustrated in Figure G, Alternative 1 reflects this lesser density project, and features a 400-slip marina encompassing 25 acres. For the purposes of the Alternative 1 analysis, JDI assumed 1,100 time-share units and 400 hotel rooms. Project components include:

- 400 hotel units on 34 acres
- 1,100 time-share units on 106 acres
- 143 acres of commercial uses
- 11 acres of marina support facilities
- 214 acres of parks, roads, open spaces, swim lagoons and community use areas

In addition, Alternative 1 would include the construction of a new intersection of Kealakehe Parkway with Queen Ka'ahumanu Highway, and the extension of Kealakehe Parkway to join Kuakini Highway to cross the lands of Queen Lili'uokalani Trust, and connecting with Kuakini Highway in Kailua-Kona. This is a significant off-site infrastructure improvement and is included in the agreements between the State and JDI.



Source: PBR HAWAII

Plan is conceptual only and subject to change

Figure G: Alternative 1: 400-Slip Marina

LEGEND

- TIME SHARE
- HOTEL
- RETAIL / COMMERCIAL
- MARINA RETAIL
- MARINA SUPPORT / COMMERCIAL
- MARINE SCIENCE CENTER
- COMMUNITY AREA / CULTURAL CENTER
- SWIM LAGOON
- MARINA
- UTILITIES
- PARKS & GREEN SPACE
- SHORELINE
- HARBOR ENTRANCE PARK / CULTURAL PARK

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JDI
JACOBY DEVELOPMENT, INC.

Like the proposed project, Alternative 1 would have a strong ocean orientation, and project components that support this theme would include various water features including seawater lagoons and a marine science center. The new Alternative 1 harbor would include a yacht club, fishing club, a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. The coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use. Additional Alternative 1 community areas would include facilities and space for community use, including programs of the Kona Kai Ola Community Foundation, which supports community programs in health care, culture, education, and employment training for the local community, especially to native Hawaiians. Like the original proposed plan, Alternative 1 includes 40 percent of the land in parks, roads, open spaces, swim lagoons and community use areas.

2.1.2 Alternative 2: Golf Course Feature

Alternative 2 was among the alternatives discussed at a community charrette in September 2003. It includes a golf course, which is a permitted use in the DLNR agreement and DHHL lease. As Figure H illustrates, an 18-hole championship golf course would occupy 222 acres on the southern portion of the project site. As with the proposed project, Alternative 2 includes an 800-slip marina on a minimum of 45 acres.

To support the economic viability of the project, other Alternative 2 uses include:

- Golf course clubhouse on three acres
- 1,570 visitor units on 88 acres fronting the marina
- 118 acres of commercial uses
- 23 acres of community uses

Community uses in Alternative 2 include an amphitheater, a canoe facilities park, a community health center, a Hawaiian cultural center and fishing village, a marine science center and employment training center. The sea water lagoon features contained in the proposed project and Alternative 1 are not included in this alternative.

2.1.3 Alternative 3: No Action

In Alternative 3, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.

~~The economic viability and sustainability of the project is determined by the density and uses proposed. Because JDI is obligated to develop an 800-slip marina for the State, complete road improvements, and provide various public enhancement features at its own expense, the density proposed for the income generating features of the development must be sufficient to provide an acceptable level of economic return for JDI. The market study, which is discussed in Section 4.6, reviewed various development schemes and determined that the currently proposed density and mix is the optimum to meet the anticipated financing and development cost obligations for the public features associated with the development.~~

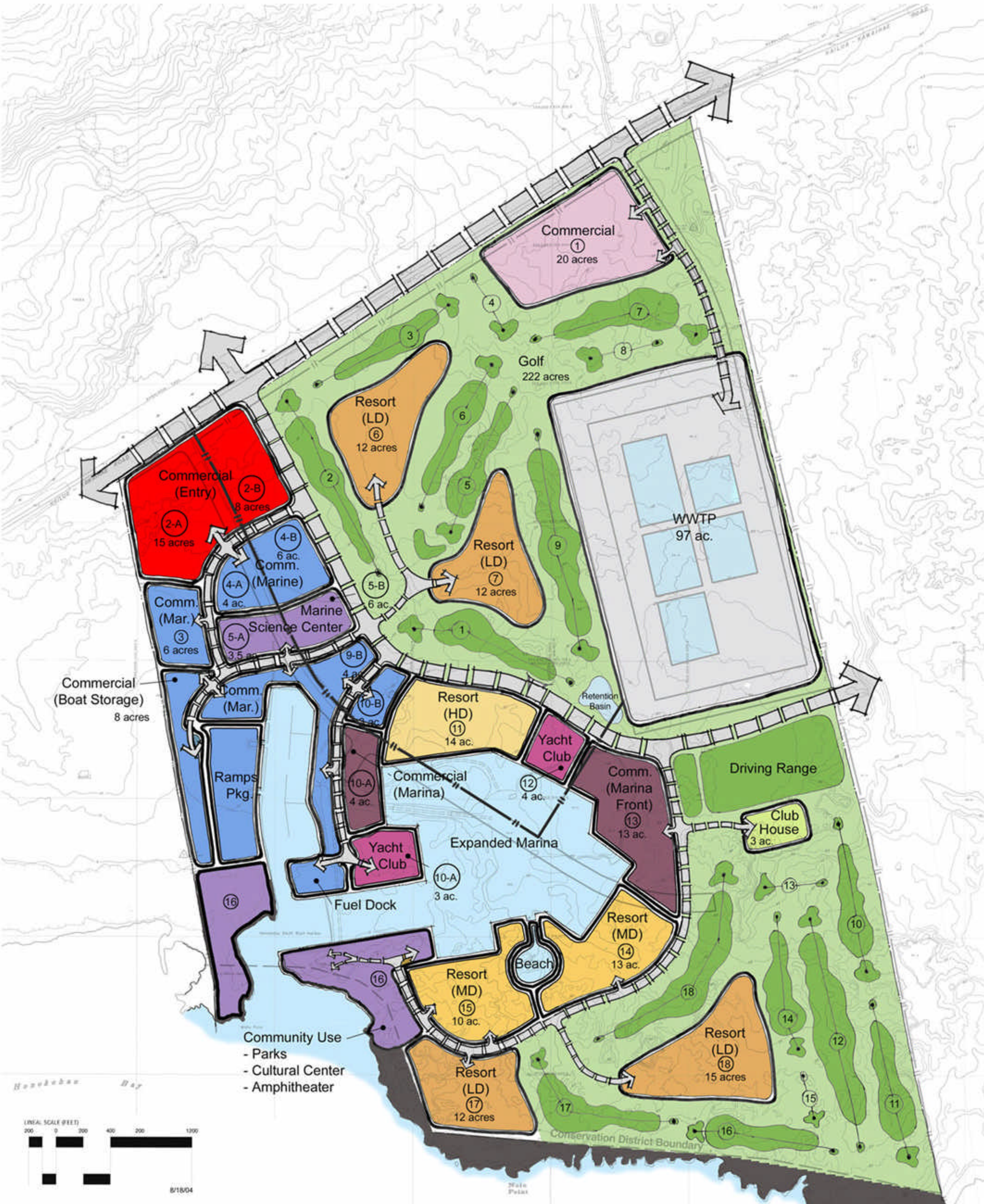

Figure H. Alternative 2: Golf Course Alternative

Legend

oceanit

JDI

Jacoby Development, Inc.

2.2 Alternatives Analysis

As discussed in Section 2.1, the proposed Kona Kai Ola project (also referred to as "proposed project") is defined by development requirements related for a marina and the related uses that would be needed to generate a reasonable rate of return that covers development costs.

Beginning with Section 2.2.1, the alternative development concepts are comparatively assessed for potential impacts that may reasonably be expected to result from each alternative. Following is an overview of the primary observations of such assessment.

Alternative 1 includes half of the State-required boat slips and 60 percent of the proposed hotel and time-share units and, due to the decreased density, this alternative would generate significantly less environmental and socio-economic impacts. A harbor water quality model found the reduction of the volume of the new marina basin by about half (approximately 25 acres) significantly improved the water circulation and quality. Further, the reduced number of boat slips would generate less boat traffic, thereby reducing congestion and the need to mitigate impacts further by the widening of the existing harbor channel.

A project with fewer hotel and time-share units and increased commercial space with a longer (14 years) absorption period would change the mix of employment offered by the project, and slightly increase the overall employment count. The public costs/benefits associated with Alternative 1 would change, compared to the proposed project, with a general increase in tax collections, and a general decrease in per capita costs. Detailed discussion of Alternative 1 potential economic impacts are provided in Section 4.6.6. Comparisons of levels of impact are presented throughout this FEIS.

While this analysis might indicate that the 25-acre marina in Alternative 1 would be the more prudent choice, the DLNR agreement establishes the minimum size and slip capacity of the marina at 45 acres and 800 slips, respectively. Amendments to the DLNR agreement would be required in order to allow Alternative 1 to proceed as the preferred alternative. Hence, selection of the preferred alternative is an unresolved issue at the writing of this FEIS.

Alternative 2, the golf course alternative, was not previously considered to be the preferred alternative primarily because market conditions at the time of project development might not likely support another golf course. Further, DHHL has a strategy goal to have more revenue-generating activities on the commercial lease lands within the project area. In addition, concerns have been expressed as to environmental impacts of coastal golf courses, including the potential adverse impact on Kona's water supply if potable water is used for golf course irrigation.

While Alternative 3, the no-project alternative, would not generate adverse impacts related to development of these lands associated with the construction and long-term operations, it would also not allow for an expanded public marina that would meet public need and generate income for the public sector. Further, the no-project alternative would foreclose the opportunity to create a master-planned State-initiated development that would result in increased tax revenue, recreation options and community facilities. Crucial privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities, and public access would not be contributed.

~~Hence, the only valid alternative to the proposed project is the no-action alternative. In this alternative, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.~~

~~The no-project alternative would therefore not generate adverse impacts associated with the construction and long-term operations would not occur.~~

~~Likewise, the creation of a master-planned state-initiated development, resulting in increased employment, tax revenue, recreation options and community facilities, would not be created. Privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities and public access would not be contributed.~~

Further, the creation of revenue-producing businesses on the DHHL property to fund homestead programs would not occur, resulting in fewer potential benefits for Hawaiians.

Hence, the agreements and leases between the State and JDI indicate that the no-action alternative is not in the public interest~~has been rejected at this time~~.

2.2.1 Impact Comparison

Grading and Excavation

The proposed project requires grading and excavation. Both actions may impact groundwater due to rainfall runoff during construction. Alternative 1 would require a significantly smaller excavation for the marina basin and would therefore carry a lesser risk of potential adverse effects on water quality. Alternative 2 would require the same basin excavation as the proposed project, and would also include extensive grading and filling to build the golf course, the latter of which would generate additional impacts. Alternative 3 would result in no change to the geography, topography and geology.

Further discussion on grading and excavation is contained in Section 3.3.

Natural Drainage

Most precipitation infiltrates into the porous ground at the site, and no significant sheet flow is likely. Alternative 1 would generate similar levels of impacts on natural drainage as those of the proposed project and thus require similar mitigation measures. The golf course in Alternative 2 would not be as porous since the site would be graded, soil would be placed, and grass and other landscaping would be grown. Sheet flow and runoff can occur on a golf course, and drainage patterns might change. Alternative 3 would result in no change to the existing natural drainage pattern. Further discussion on natural drainage is contained in Section 3.4.

Air Quality

Air quality will be affected by construction activities, as well as pollutants from vehicular, industrial, natural, and agricultural sources. Alternative 1 would generate less construction air quality impacts than the proposed project due to the reduced amount of intensive groundwork associated with the smaller marina basin and fewer long-term impacts by reducing traffic 35 and 40 percent during, respectively, AM and PM peak traffic times. Construction of Alternative 2 would result in fugitive dust and exhaust from equipment and is expected to generate the same level of air quality impact as the proposed project. Alternative 3 would result in no change to existing air quality. Further discussion on air quality is contained in Section 3.5.

Terrestrial Environment

To provide additional habitat for shorebirds and some visiting seabirds, the project proposes to construct a brackishwater pond area suitable for avian fauna, including stilts, coots and ducks. While habitat expansion is beneficial, there is also a possibility that these species may be exposed to activity that may harm them. Alternative 1 would not include a brackish water pond, but will include 5 acres of seawater features, which is 74 percent less than the 19 acres of seawater features in the proposed project. While this would reduce beneficial impacts, it would also decrease exposure to potentially harmful activity. Alternative 2 does not include the brackish water pond features, but would include drainage retention basins that would attract avian fauna and expose them to chemicals used to maintain golf course landscaping. While Alternative 3 would result in no increase in potentially harmful activity, it would also not provide additional habitat for avian fauna. Further discussion on the terrestrial environment is contained in Section 3.7.

Groundwater

Groundwater at the project site occurs as a thin basal brackish water lens. It is influenced by tides and varies in flow direction and salt content. The existing Honokōhau Harbor acts as a drainage point for local groundwater. Any impact to groundwater flow from the proposed harbor is likely to be localized. The proposed marina basin will not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance.

There will be differences in the flow to the marina entrance between the proposed project and Alternative 1. Alternative 1, being smaller in size, will have less impact on groundwater flow than the proposed marina. Alternative 2 will have a similar impact to groundwater quality as the proposed project. Alternative 2 may also impact water quality by contributing nutrients and biocides to the groundwater from the golf course. Alternative 3 would result in no change in existing groundwater conditions. Further discussion on groundwater is contained in Section 3.8.1.

Surface Water

There are no significant natural freshwater streams or ponds at the site, but there are brackish anchialine pools. Surface water at the project site will be influenced by rainfall. Runoff typically percolates rapidly through the permeable ground. The proposed project will include some impermeable surfaces, which together with building roofs, will change runoff and seepage patterns.

Alternative 1 is a lower density project that is expected to have proportionally less impact on surface water and runoff patterns and less potential impact on water quality than the proposed project. Alternative 2 would have more impact on surface water quality than the proposed project due to fertilizers and biocides carried by runoff from the golf course. Alternative 3 would result in no change to surface water conditions. Further discussion on surface water is contained in Section 3.8.2.

Nearshore Environment and Coastal Waters

The potential adverse impacts to the marine environment from the proposed project are due to the construction of an 800-slip marina and the resulting inflow of higher salinity seawater and inadequate water circulation, both of which are anticipated to impair water quality to the extent of falling below applicable standards. One possible mitigation measure is to significantly reduce the size of the marina expansion.

The reduced marina size (from 45 to 25 acres) and reduced lagoon acreage in Alternative 1 are expected to result in a proportionate reduction in seawater discharging into the new harbor and increased water circulation. Alternative 2 includes the same marina basin size and is therefore subject to the same factors that are expected to adversely affect water quality.

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water quality in the proposed harbor depends on several components. These include salinity, nutrients, and sediments that come from the ocean, rainfall runoff, water features with marine animals, and dust. The smaller project offered as Alternative 1 is expected to produce a reduced amount of pollutants and reduce the risk of adverse impact upon water quality.

It is notable that the 45-acre marina basin planned in the proposed project and Alternative 2 only becomes viable from a water quality impact standpoint if the additional brackish groundwater inflow into the new marina exceeds 60 mgd. The resulting flushing from such inflow would be expected to better maintain water quality. However, it is unclear whether 60 mgd of brackish groundwater would be available. As proposed in Alternative 1, reduction of the volume of the new marina basin by 45 percent will significantly improve the flushing and water quality because the lower volume can be flushed by the available groundwater flow.

In addition, there could be higher rainfall runoff from the Alternative 2 golf course into the harbor, because the grassed golf course will be less porous than the natural surface. The golf course will also require relatively high levels of fertilizer, biocides, and irrigation, all of which could contribute to adverse water quality impacts.

Further discussion on nearshore environment and coastal waters is contained in Section 3.9.1.

Anchialine Pools

Anchialine pools are located north of Honokōhau Harbor, and south of the harbor on the project site. The marine life in these pools is sensitive to groundwater quality, and changes due to construction and operation of the project could degrade the viability of the pool ecosystem. In the southern complex, 3 anchialine pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction in the proposed project and Alternatives 1 and 2.

Predicting the extent of change in groundwater flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is therefore extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Due to the uncertainty of changes in groundwater flow and quality due to marina construction, the variability in impacts between the proposed project and Alternatives 1 and 2 is unknown at this time. Alternative 3 would result in no change in groundwater flow. While this would eliminate the potential for adverse impacts, Alternative 3 would also continue the pattern of existing degradation related to human activity and the introduction of alien species. Further discussion on anchialine pools is contained in Section 3.9.2.

Marine Fishing Impacts

The proposed marina will increase the number of boats in the area and it is reasonable to assume that a portion of these new boats will engage in fishing activities. The increase in boats in the area would be primarily related to the marlin and tuna / pelagic fishery, coral reefs due to extractive fisheries, and SCUBA activities. The pressure on fish and invertebrate stocks is expected to increase with or without the marina. Harbor expansion provides the opportunity to address existing conditions to consolidate, focus, and fund management and enforcement activities at one location.

Compared to the proposed project, Alternative 1 would result in a 21 percent decrease in boat traffic, thereby lessening the potential for marine fishing impacts. The level of impacts in Alternative 2 would be similar to that of the proposed project. Alternative 3 would result in no change in existing marine fishing conditions, and no opportunity to address already existing pressure on fish and invertebrate stocks. Further discussion on marine fishing impacts is contained in Section 3.9.3.

Cultural and Archaeological Resources

The proposed project will integrate cultural and archaeological resources in the overall development. Archaeological sites recommended for preservation will be preserved, and cultural practices will be encouraged. Kona Kai Ola includes a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. Proposed is a 400-foot shoreline setback that would serve as a buffer between the ocean and developed areas. This coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use.

Alternative 1 would contain all of the cultural archaeological features and the shoreline setback area would be 400 feet in the northern portion of the site and increase to 600 feet in the southern portion. Alternative 2 would preserve cultural and archaeological resources, but does not include a 400-foot shoreline setback. Alternative 3 would result in no change to existing cultural and archaeological resources and no addition of cultural and community facilities and activities. Further discussion on cultural and archaeological resources is contained in, respectively, Sections 4.1 and 4.2.

Noise

Project-generated noise is due to construction equipment and blasting, boats, marina activities, vehicle traffic, and the Kealakehe Wastewater Treatment Plant operations. Alternative 1 would generate less noise impacts due to reduced construction activities, fewer boats, less traffic and less on-site activity. Alternative 2 would also generate less noise due to reduced traffic and less on-site activity, but noise related to the excavation of the marina basin and an increase in the number of boats would be similar to that of the proposed project. Further discussion on noise impacts is presented in Section 4.4.

Socioeconomic Impacts

The proposed project will generate an increase in de facto population of an estimated 5,321 persons due to the increase in hotel and time-share units. The estimated de facto population increase in Alternative 1 is 37 percent less, at 3,363 persons, than the proposed project. The de facto population increase in Alternative 2 is similar to Alternative 1.

Employment in the commercial components will nearly double in Alternative 1, from a stabilized level of 1,429 full-time equivalent (FTE) positions in the proposed project to 2,740 in the Alternative 1.

Under Alternative 1, the total operating economic activity at Kona Kai Ola will increase due to the added commercial space more than off-setting the fewer visitor units, moving upward from $557.6 million per year to circa $814.3 million annually. The total base economic impact resulting from development and operation of Alternative 1 will similarly be higher by between 35 and 45 percent than that of the proposed project.

Alternative 1, which has a reduced marina size of 25 acres, and fewer hotel and time-share units, would have a meaningful market standing, create significant economic opportunities, and provide a net benefit to State and County revenues. From a market perspective, a smaller Kona Kai Ola would still be the only mixed use community in the Keahole to Kailua-Kona Corridor offering competitive hotel and time-share product.

The estimated absorption periods for marketable components of Alternative 1 are generally shorter than those for the same components in the proposed project. Marina slips under Alternative 1 are estimated to be absorbed within 2 years after groundbreaking, as compared with 9 years for absorption of slips in the proposed project. Hotel rooms under Alternative 1 are estimated to be absorbed within 4 years after groundbreaking, as compared with 7 years under the proposed project. Time-share units would be absorbed within 10 years under Alternative 1, while 15 years are projected under the proposed project. Due to the planned increase in commercial facilities under Alternative 1, the absorption period of commercial space is estimated at 14 years, as compared with 8 years for absorption of such facilities under the proposed project.

The State and County will still both receive a net benefit (tax receipts relative to public expenditures) annually on a stabilized basis under the Alternative 1. The County net benefits will be some $12.2 million per year under the Alternative 1 versus $14.9 million under the proposed project. The State net benefits will increase under the Alternative 1 to about $37.5 million annually, up substantially from the $11.4 million in the proposed project.

Due to the lower de facto population at build-out, the effective stabilized public costs for both the State and County will decline meaningfully under the Alternative 1, dropping from $7.7 million annually for the County and $36.5 million for the State, to $4.9 million and $23 million per year, respectively.

Alternative 3 would result in no increase in de facto population and improvement to economic conditions. Further discussion on social and economic impacts are contained in, respectively, Sections 4.5 and 4.6.

Vehicular Traffic

The proposed project will impact the nearby road network that currently is congested during peak traffic times. The proposed project includes roadway improvements that would reduce the impact and improve roadway conditions for the regional community.

Alternative 1 includes the same roadway system improvements as the proposed project, yet would reduce vehicular traffic by 35 percent when compared to the proposed project. Alternative 2 would have similar traffic conditions and roadway improvements as Alternative 1. Alternative 3 would result in no increase in traffic and no roadway improvements.

Marina Traffic Study

The increase in boat traffic due to the proposed 800-slip marina would cause entrance channel congestion during varying combinations of existing and new marina peak traffic flow. Worst case conditions of active sport fishing weekend and summer holiday recreational traffic result in traffic volumes exceeding capacity over a short afternoon period. Mitigation to address boat traffic in the proposed project include widening the entrance channel, traffic control, implementation of a permanent traffic control tower, or limiting vessel size.

Alternative 1 would result in a 21 percent reduction in boat traffic congestion under average existing conditions and ten percent reduction during peak existing conditions. The reduction to 400 slips also reduces the impacts of congestion at the entrance channel, thereby reducing the need for any modifications to the entrance channel.

Alternative 2 would have the same level of boat traffic as the proposed project. Alternative 3 would not meet the demand for additional boat slips and would not generate additional boat traffic. Further discussion on marina traffic is contained in Section 4.8.

Police, Fire and Medical Services

The proposed project will impact police, fire and medical services due to an increase in de facto population and increased on-site activity. Alternatives 1 and 2 would have similar levels of impact as the proposed project due to increased on-site activity. Further discussion on police, fire and medical services are contained, respectively, in Sections 4.10.1, 4.10.2 and 4.10.3.

Drainage and Storm Water Facilities

The proposed project will increase drainage flows, quantities, velocities, erosion, and sediment runoff.

Alternative 1 involves a reduction of the project density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces associated with hotel and time-share development and to the creation of more open space. However, roadway areas will increase by about 30 percent in Alternative 1. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings. The golf course in Alternative 2 may also change drainage characteristics from those of the proposed project and may not reduce impacts. Alternative 3 would result in no change in existing conditions and no improvements to drainage infrastructure. Further discussion on drainage and storm water facilities is contained in Section 4.10.5

Wastewater Facilities

The proposed development is located within the service area of the Kealakehe WWTP and a sewer system will be installed that connects to the WWTP. The sewer system will be comprised of a network of gravity sewers, force mains, and pumping stations which collect and convey wastewater to the existing Kealakehe WWTP. Project improvements will incorporate the usage of recycled / R1 water. Improvements implemented by the proposed project will also accommodate the needs of the regional service population.

Alternative 1 would generate approximately 10 percent less wastewater flow than the proposed project. Wastewater flow in Alternative 2 is undetermined. Alternative 3 would result in no additional flow, as well as no improvements that will benefit the regional community. Further discussion on wastewater facilities is contained in Section 4.10.6.

Potable Water Facilities

The proposed project average daily water demand is estimated at 1.76 million gallons per day. Existing County sources are not adequate to meet this demand and source development is required. The developer is working with DLNR and two wells have been identified that will produce a sustainable yield that will serve the project. These wells will also serve water needs beyond the project.

Alternative 1 would result in net decrease of about five percent of potable water demand. Alternative 2 may have a lower water demand than the proposed project as long as potable water is not used for irrigation. Alternative 3 would result in no additional flow, as well as no source development that will benefit the regional community. Further discussion on potable water facilities is contained in Section 4.10.8.

Energy and Communications

Regarding Alternative 1, preliminary estimates for electrical, telecommunications, and cable resulted in a net demand load that remains similar to the proposed project. Further discussion on energy and communications is contained in Section 4.10.9.1.

The proposed project will increase the demand for electrical energy and telecommunications. The demand would be reduced in Alternative 1 because the number of boat slips and units would decrease. Similarly, Alternative 2 would have fewer units than the proposed project and therefore reduce energy demands. Further reduction in energy demand for either alternative could be achieved by using seawater air conditioning (SWAC) and other energy reduction measures, as planned by the developer. Further discussion on energy and telecommunications is contained in Section 4.10.9.2.

Water Features and Lagoons

The proposed project includes a brackishwater pond, lagoons, and marine life exhibits supplied by clean seawater. The water features in Alternative 1 would significantly decrease by 74 percent from 19 acres in the proposed project to five acres in Alternative 1. This decrease in water features would result in a corresponding decrease in water source requirements and seawater discharge. Alternative 2 does not include the seawater features. Alternative 3 would result in no additional demand for water source requirements and seawater discharge.

2.2.2 Conformance with Public Plans and Policies

State of Hawai‘i

Chapter 343, Hawai‘i Revised Statutes

Compliance with this chapter is effected, as described in Section 5.1.1 in regard to the proposed project and the alternatives discussed.

- State Land Use Law, Chapter 205, Hawai‘i Revised Statutes

  The discussion in Section 5.1.2 is directly applicable to Alternative 1, the proposed project. Alternative 1 will involve a setback of 400 feet that increases to 600 feet along the southern portion of the project site’s shoreline area. Alternative 2 does not provide for such a setback, but may still require approvals from DLNR for cultural, recreational, and community uses and structures within the Conservation district.

- Coastal Zone Management Program, Chapter 205A, Hawai‘i Revised Statutes

  Recreational Resources:

  In addition to the discussion of consistency with the associated objective and policies, as described in Section 5.1.3, the reduction from the proposed project’s 800-slip marina to a 400-slip marina under Alternative 1 will still expand the region’s boating opportunities and support facilities. The existing harbor entrance will still be utilized under this alternative; however, potential risks relating to boat traffic and congestion in the marina entrance area will be reduced significantly. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities, and marine science center remain important recreational components under Alternative 1.

Alternative 2 includes a golf course component, which would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Alternative 2, like the proposed project, will expand the region's boating opportunities and support facilities through its 800-slip marina. However, the potential adverse impacts of increased boat traffic from the size of the marina are significant enough to offset the benefits of increased boating opportunities.

Coastal Ecosystems:

The discussion in Section 5.1.3 is directly applicable to Alternative 1.

Alternative 1 not only reduces the number of slips proposed by 50 percent, but it also reduces the size of the marina from 45 acres to 25 acres. The 25-acre marina will increase the body of water within the existing harbor, but to a significantly lesser extent than the proposed project's estimated increase, which is also applicable to the 45-acre size that is proposed for the marina under Alternative 2.

The findings of the Harbor Water Quality Modeling Study conclude that a reduction in the size of the harbor expansion is an alternative that will mitigate the risk of significant impacts upon water quality within the marina and existing harbor. Accordingly, the reduction in both the number of slips and the size of the marina basin under Alternative 1, in combination with proper facilities design, public education, and enforcement of harbor rules and regulations, would result in fewer long-term impacts to water quality and coastal ecosystems. Short-term (construction-related) impacts would likely remain the same although the reduction in the total acreage of excavation is expected to result in a shorter duration of such impacts.

In addition to its 800-slip marina and potential adverse impacts upon water quality and the marine environment, Alternative 2 includes a golf course component, which has the potential to impact coastal ecosystems by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Economic Uses

Although reduced in the number of slips, the smaller marina under Alternative 1 will nevertheless serve public demand for more boating facilities in West Hawai‘i and is consistent with the objective and policies and discussion set forth in Section 5.1.3. The economic impacts of Alternative 2, while comparable to those of the proposed project's marina development, are notably marginal as to the golf course component, based on the marketability analysis that indicates a condition of saturation within the region.

Coastal Hazards

The discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Tsunami risks mainly affect the large shoreline setback area that is proposed for the project and Alternative 1. Alternative 2 projects a transient accommodation site that is partially within the tsunami hazard zone and thus carries a higher hazard risk. However, the essential requirement for these alternatives, as well as the proposed project, is a well-prepared and properly implemented evacuation plan.

Beach Protection

Discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Alternative 1 and, to a lesser extent, Alternative 2, will retain the shoreline area in its natural condition.

Similar to the proposed project, Alternative 1 provides for a shoreline setback of considerable width within which no structure, except for possible culturally-related structures, would be allowed. Alternatives 1 and 2 will thus be designed to avoid erosion of structures and minimize interference with natural shoreline processes.

Marine Resources

The discussion in Section 5.1.3 is also applicable to Alternative 1 which is described to be an alternative that is specifically projected to mitigate anticipated adverse impacts on water quality and the marine environment that might otherwise result from the original harbor design and scale, which is also incorporated in Alternative 2 . The reduced marina size under Alternative 1 is projected to meet water quality standards and enable greater compliance with the objective and policies addressed in this section.

Alternative 2 includes a golf course component and thus the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Hawai'i State Plans, Chapter 226, Hawai'i Revised Statutes

Section 226-4 (State goals), 5 (Objectives and policies for population, and 6 (Objective and policies for economy in general):

The discussion in Section 5.1.4 is applicable to Alternatives 1 and 2, in addition to the proposed project. These development concepts generally conform to the goals, objectives, and policies set forth in these sections because they will provide some degree of economic viability, stability, and sustainability for future generations. Kona Kai Ola will convert essentially vacant land into a mixed-use development with a distinctive marina and boating element, providing a wide range of recreational, business, and employment opportunities to the community.

Section 226-8 Objective and policies for the economy – the visitor industry:

Alternatives 1 and 2 will be consistent with the State's economic objective and policies relating to the tourism industry for the same reasons that are discussed in regard to the proposed project in Section 5.1.4. They will incorporate JDI's commitment to sustainability principles in the planning and design of the development concepts in Alternatives 1 and 2. Although the total hotel and time-share unit count is reduced to approximately 1,500 in Alternatives 1 and 2, the transient accommodations component of these alternatives will still further the State's objective and policies for increased visitor industry employment opportunities and training, foster better visitor understanding of Hawai'i's cultural values, and contribute to the synergism of this mixed-use project concept that addresses the needs of the neighboring community, as well as the visitor industry.

Section 226-11 Objectives and policies for the physical environment: land-based, shoreline and marine resources:

Alternative 1 is expected to involve less potential adverse impacts upon these environmental resources than the proposed project. Likewise, and Alternative 2 would have less adverse impact because of its reduction in the size of the marina and in the total hotel and time-share unit count. Alternative 1 carries less potential risk to water quality and related impacts upon the marine environment and anchialine pool ecosystems. Although approximately three anchialine pools are expected to be destroyed, the great majority of pools will be preserved within and outside of the proposed 400-foot shoreline setback.

The golf course component in Alternative 2 has the potential to impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the marina basin and nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools by introducing the chemicals into the pond systems.

Section 226-12 Objective and policies for the physical environment: scenic, natural beauty, and historic resources:

The discussion in Section 5.1.4 is directly applicable to Alternative 1 and describes the compliance with the objective and policies addressed.

The golf course component of Alternative 2 would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area.

Just as with the proposed project, Alternatives 1 and 2 would also be designed to blend with the natural terrain and to honor and protect the cultural history, resources, and practices of these lands.

Section 226-13 Objectives and policies for the physical environment: land, air and water quality:

As stated above, because of the reduction in both the number of slips and the size of the marina basin, with proper facilities design, public education and enforcement of harbor rules and regulations, Alternative 1 is anticipated to cause fewer long-term impacts to water quality than either the proposed project or Alternative 2. Based on the findings of the Harbor Water Quality Modeling Study, water quality resulting from a reduced marina basin size as proposed under Alternative 1 is expected to be similar to existing conditions.

As previously noted, Alternative 2 has the potential to adversely impact water quality by increasing the nutrient loading in surface runoff and groundwater by introducing pesticides, herbicides and other chemicals common in golf course development and maintenance into the marina basin and nearshore waters surrounding the project site.

Section 226-14 Objectives and policies for facility systems - general:

Alternatives 1 and 2 will conform to the objective and policies of this section on the grounds that are discussed in regard to the proposed project in Section 5.1.4. The master-planning and phasing of the project concepts under these alternatives will be coordinated with associated public and private infrastructural planning and related private and public infrastructural financing. The cost of the marina construction and project-related infrastructure is to be borne by the developer, resulting in considerable savings for the public. In addition, the projected lease revenue from these public lands will provide additional public benefits by establishing a revenue stream for capital improvements and maintenance of a range of State facilities.

Section 226-15 Objectives and policies for facility systems - solid and liquid wastes:

In addition to the developer's commitment to sustainable development design, the project will involve upgrades to the County of Hawaiʻi's Kealakehe Wastewater Treatment Plant to meet current needs, as well as the project's future needs. This commitment is applicable to Alternatives 1 and 2, as well as the proposed project that is discussed in Section 5.1.4.

Section 226-16 Objectives and policies for facility systems – water:

The discussion of water conservation methods and the need to secure additional potable water sources in Section 5.1.4 is also applicable to Alternative 1 and demonstrates conformity to the objective and policies for water facilities. Alternative 2 involves greater irrigation demands in regard to its golf course component and greater potable water demands for human consumption than those for Alternative 1. Alternative 2 is expected to face more serious challenges in securing adequate and reliable sources of water.

Section 229-17 Objectives and policies for facility systems – transportation:

Alternatives 1 and 2 will conform to this objective and policies because they will present water transportation opportunities, including the possible use of transit water shuttles to Kailua-Kona, as described in regard to the proposed project in Section 5.1.4.

Section 226-18 Objectives and policies for facility systems – energy:

Alternatives 1 and 2 conform to these objective and policies through the use of energy efficient design and technology and commitment to the use and production of renewable energy to serve the project’s needs. Solar energy production, solar hot water heating, and the use of deep cold seawater for cooling systems are currently identified as means of saving substantial electrical energy costs for the community and the developer.

Section 226-23 Objectives and policies for socio-cultural advancement – leisure:

Alternative 1 conforms to this objective and related policies for the reasons offered in Section 5.1.4 in regard to the proposed project. Alternative 1 will be of greater conformity with the policy regarding access to significant natural and cultural resources in light of the 400-600 foot shoreline setback that has been designed for this alternative.

Although it does not propose the considerable shoreline setback that is planned for Alternative 1, Alternative 2 is consistent with this objective and related policies in incorporating opportunities for shoreline-oriented activities, such as the walking trails. In addition, the golf course component adds a more passive recreation alternative to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Section 226-25 Objectives and policies for socio-cultural advancement-culture:

The discussion in Section 5.1.4 is relevant to Alternatives 1 and 2 and demonstrate their conformity the objective and policies of this section.

Both alternatives involve the preservation and protection of cultural features that have been identified by the Cultural Impact Assessment and archaeological studies for the project area. Both provide for public shoreline access, and both will continue the policy of close consultation with the local Hawaiian community and cultural and lineal descendants in the planning of cultural resource preservation and protection.

Section 226-103 Economic priority guidelines:

Alternatives 1 and 2 conform to these guidelines for the same reasons that are set forth in Section 5.1.4. They involve private investment in a public project that will create economic diversification through a mix of marina, industrial, commercial, visitor, and cultural facilities. This presents a wide range of entrepreneurial opportunities, long-term employment opportunities, and job training opportunities.

Section 226-104 Population growth and land resources priority guidelines:

As described in Section 5.1.4, the policy support for the proposed project also extends to the similar development concepts considered in Alternatives 1 and 2. Those alternatives conform to the guidelines of this section because they involve an urban development under parameters and within geographical bounds that are supported by the County's General Plan, a preliminary form of the Kona Community Development Plan, the County's Keahole to Kailua Regional Development Plan, and the reality of being located along the primary commercial/industrial corridor between Keahole Airport and Kailua-Kona. As with the proposed project, the development concepts of Alternatives 1 and 2 are essentially alternatives for the implementation and "in-filling" of the urban expansion area in North Kona.

DHHL Hawai‘i Island Plan

This 2002 plan projects DHHL's Honokōhau makai lands for commercial use. As compared to the proposed project and Alternative 2, Alternative 1 presents an expanded commercial component that provides greater compliance with the plan, while addressing certain beneficiaries' concerns about the scale of the marina originally required in the Project. Alternative 2 also conforms to the recommended commercial uses in the makai lands but to a lesser degree than Alternative 1 because of its more limited commercial component. Like the proposed project, its marina size and number of slips raise environmental issues, as more specifically discussed in Part 3, and community concerns.

County of Hawai‘i General Plan

HCGP Section 4 – Environmental Quality Goals, Policies and Courses of Action:

Alternative 1 is consistent with this section. It presents a reduction in both the number of slips and the size of the marina basin that, in combination with proper facilities design, public education and enforcement of harbor rules and regulations, would result in very few long term impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions.

Alternative 2 is the least consistent with this section. In addition to the potential significant impacts of its 800 slip marina basin, its golf course component has the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides and other chemicals common in golf course use and management into the nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools beyond their current conditions by introducing such substances into the pool systems.

HCGP Section 7 – Natural Beauty Goals and Policies:

Alternative 2 conforms to some degree with this section. Its golf course component would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area, as demonstrated in other makai golf courses within the region.

HCGP Section 8 – Natural Resources and Shoreline:

Alternative 1 is most consistent with the goals and policies of this section. It would require considerably less marina excavation than the proposed project and Alternative 2 and would reduce the potential risk of long-term adverse impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions with the degree of reduction in marina basin size that is proposed under Alternative 1. This reduction is also expected to reduce potential impacts upon anchialine pools and their ecosytems, as well as shoreline and marine resources that are affected by water quality. Alternative 1 also retains the shoreline preservation and protection concepts that are proposed in and described for the Project.

HCGP Section 10 – Public Facilities Goals and Policies:

The discussion in Section 5.2.1. in relation to the proposed project is applicable to Alternatives 1 and 2. Improvements to public facilities are are integral to the Kona Kai Ola development. The provision of additional boat slips and numerous road improvements, including a makai extension of Kuakini Highway south to Kailua-Kona are incorporated into plans for the project's development. In light of these elements, Alternatives 1 and 2 are consistent with the goals and policies of this section.

HCGP Section 11 – Public Utility Goals, Policies:

As with the proposed project, Alternatives 1 and 2 are consistent with the goals and policies of this section, based on the relevant grounds set forth in Section 5.2.1. The developer is committed to design, fund, and develop environmentally sensitive and energy efficient utility systems to the extent possible, as described previously in Part 5. Its master planning provides for the coordinated development of such systems with the objective of achieving significant savings for the public. As previously-mentioned example, the project development involves the upgrading of the Kealakehe Wastewater Treatment Plant.

HCGP Section 12 – Recreation:

Alternative 1 is consistent with the goals, policies, and courses of action for North Kona in this section.

Although the number of slips is reduced under Alternative 1, the region's boating opportunities and support facilities will still be expanded. The existing marina entrance would still be utilized under this alternative. However, concerns relating to increased activity leading to increased congestion in the marina entrance area would be mitigated to a certain extent. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities and marine science center remain important components of Alternative 1.

The golf course component of Alternative 2 would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola. Alternative 2 is also considered to be consistent with this section.

HCGP Section 13 and 13.2 – Transportation:

The reduced marina component under Alternative 1 will still provide transportation opportunities and provide for possible use of transit water shuttles to Kailua-Kona, although to a lesser degree than under the proposed project and Alternative 2 . However, in each scenario, internal people-movers are planned, and numerous roadway improvements are planned for coordination with public agencies, including but not limited to the construction of the Kuakini Highway extension between Honokōhau and Kailua-Kona. Accordingly, both Alternatives 1 and 2 are consistent with the goals, policies, and courses of action for North Kona under these sections of the General Plan.

HCGP Section 14.3 – Commercial Development:

For the reasons presented in the discussion under Section 226-104 of the State Plan, the planned commercial component under Alternatives 1 and 2 are consistent with this section.

HCGP Section 14.8 – Open Space:

Alternatives 1 and 2 are consistent with the goals and policies of this section. Alternative 1 provides a considerable (400-600 foot) shoreline setback along the entire ocean frontage of the project site as a means of protecting the area's scenic and open space resources, as well as natural and cultural resources. Although it does not incorporate the shoreline setback planned in Alternative 1, Alternative 2 provides a golf course component would contribute to the amount of open space that is currently proposed and allow additional view corridors to be created.

Community Development Plans

Community development plans are being formulated for different regions in the County in order to supplement the County's General Plan. The Kona Kai Ola project is located in the Kona Community Development Plan (CDP) area. Maps associated with the preliminary work phases

of the Kona CDP include the Kona Kai Ola project site within the “Preferred Urban Growth” boundary of the North Kona district. The Kona CDP process is guided by a Steering Committee composed of a broad cross-section of the community. The Steering Committee will eventually complete its work and recommend the CDP’s adoption.

After the DEIS was published, the Kona CDP has progressed to the development of plans for the major urban growth corridor north of Kailua-Kona. The Kona CDP has produced a draft plan showing a transit oriented development that includes a midlevel public transit corridor along the mauka residential elevation, and a makai transit corridor that runs along a proposed new frontage road just makai and parallel to Queen Kaahumanu Highway. The development plan for Alternative 1 includes the Kuakini Highway as part of this proposed frontage road and transit line from Kailua Kona to the Kealakehe area, along with a transit stop at Kona Kai Ola. The Alternative 1 plan also includes a road that could be extended to be part of the proposed frontage road should it be approved and implemented. In addition, the Kona CDP has continued to emphasize the principles of smart growth planning with mixed use urban areas where people can live, work, play and learn in the same region. Kona Kai Ola has been specifically designed to be consistent with this policy in order to provide a stable employment base close to where people live in the mauka residential areas already planned for DHHL and HHFDC lands.

It should be noted that currently and over the years, the 1990 Keāhole to Kailua Development Plan (K-to-K Plan) guides land use actions by the public and private sectors. It is intended to carry out the General Plan goals and policies related to the development of the portion of North Kona area, including the Kona Kai Ola site. The “Preferred Growth Plan” of the Keāhole to Kailua Development Plan identifies the project site as a new regional urban center to include commercial, civic, and financial business related uses, an expanded “Harbor Complex,” a shoreline road, and a shoreline park. The proposed project and the development concepts in Alternatives 1 and 2 are therefore consistent with the recommendations in the Keāhole to Kailua Development Plan.

Hawai‘i County Zoning

As shown on Figure AA, the project site is zoned “Open”. Under Section 25-5-160 of the Hawai‘i County Code, “The O (Open) district applies to areas that contribute to the general welfare, the full enjoyment, or the economic well-being of open land type use which has been established, or is proposed. The object of this district is to encourage development around it such as a golf course and park, and to protect investments which have been or shall be made in reliance upon the retention of such open type use, to buffer an otherwise incompatible land use or district, to preserve a valuable scenic vista or an area of special historical significance, or to protect and preserve submerged land, fishing ponds, and lakes (natural or artificial tide lands)”.

Some of the proposed uses at Kona Kai Ola are permitted uses in the Open zone such as:

- Heiau, historical areas, structures, and monuments;
- Natural features, phenomena, and vistas as tourist attractions;
- Private recreational uses involving no aboveground structure except dressing rooms and comfort stations;

- Public parks;
- Public uses and structures, as permitted under Section 25-4-11.

In addition to those uses permitted outright, the following uses are permitted after issuance of a use permit:

- Yacht harbors and boating facilities; provided that the use, in its entirety, is compatible with the stated purpose of the O district.
- Uses considered directly accessory to the uses permitted in this section shall also be permitted in the O district.

The proposed time-share and hotel units and commercial uses would not be consistent with the zoning designation of "Open". Project implementation therefore requires rezoning of portions of the project to the appropriate zoning category or use permits for certain uses.

Special Management Area

As shown in Figure AB, the entire project area up to the highway is within the coastal zone management zone known as the Special Management Area ("SMA"). At the County level, implementation of the CZM Program is through the review and administering of the SMA permit regulations. Kona Kai Ola complies with and implements the objectives and policies of the Coastal Zone Management (CZM) Program, and a full discussion is provided in Section 5.1.3. The development concepts in the proposed project and Alternatives 1 and 2 will be subject to applicable SMA rules and regulations.

Attachment 2

- Enforcement of harbor rules and regulations

3.9.1.4 Wave Impacts to the Existing Honokōhau Harbor

The wave climate within the existing Honokōhau Harbor and the proposed marina was analyzed using a numerical model that is further discussed in Appendix J~~I~~. A wave measurement study was conducted to determine the wave response of the existing harbor to outside wave climate. A directional wave gage at a depth of sixty feet directly in front of the existing harbor entrance and a non directional wave gage inside the existing harbor basin were installed to measure wave climates simultaneously. The results of the wave measurements were provided for wave transformation model calibration.

Results of the wave climate analysis with and without the expansion were used to predict wave agitation impacts to the existing harbor. The model was operated for waves with a 9-second period and swells of 13-second period as the dominating waves for the offshore area.

Anticipated Impacts and Proposed Mitigation

Wave climate in the existing harbor from the proposed marina construction depended on the period of the incoming waves. There was a slight decrease in the wave height in the existing basin for outside waves of a 9-second period. For longer period swells, there was no significant change in the wave height in the basin.

For waves with a 9-second period, the wave height at the inner end of the outer basin attenuated to 40 percent of the incident wave. There was no additional wave attenuation due to the presence of the proposed marina. Within the existing harbor inner basin, the wave height attenuated to about 20 percent of the incident wave. The wave height in the inner harbor decreased by about 10 percent with the construction of the proposed marina.

For longer period swells, the wave height in the outer basin remained at 50 percent attenuation. In the inner basin, the wave height reduced to about 20 to 30 percent of the incident wave. There was no significant change in the wave height in the inner basin from marina construction.

The analysis shows that under short storm wave conditions, the proposed marina construction causes a positive impact by reducing the wave height by 10 percent in the existing marina. However, under swell conditions there is no change in wave agitation in the mooring area of the existing harbor with the proposed marina. Overall, the impact of construction of the proposed marina basin is positive since the existing harbor will experience less wave agitation. This may be due to the fact that the amount of wave energy entering through the harbor entrance remains the same, while additional water area and frictional surfaces (both sides and bottom) provide for greater wave dissipation after the expansion. No mitigation is ~~recommended~~ proposed due to the project's positive effect.

3.9.1.5 Harbor Water Quality

A three dimensional hydrodynamic and water quality model of Honokōhau Harbor and its surrounding waters was developed using the Delft3D modeling suite and is described in detail in Appendix U. The model was driven at its offshore boundaries by tidal predictions, and calibrated to reproduce available measurements of water levels, currents, salinity and temperature.

Model results suggested that the brackish groundwater inflow to Honokōhau Harbor was approximately 30 million gallons per day (mgd), with an average salinity of 22 parts per thousand (ppt), in order to reproduce the salinity profiles observed from a number of available data sets. In addition, this flow rate is in very good agreement to the published values of brackish groundwater inflow to Honokōhau Harbor. The model also showed that under these conditions, Honokōhau Harbor maintained a flushing time of approximately 12 hours, which is consistent with available studies and data. The flushing within the harbor was found to be primarily due to the density currents that result from the salinity gradient within the Harbor created by the brackish groundwater inflow. This finding also corroborated with study findings that this flushing mechanism results in water exchange in the harbor on the order of seven times faster than if it were flushed via tidal action alone.

A water quality model was developed to replicate typical conditions experienced in Honokōhau Harbor and its environs. Water quality parameters were calibrated and validated using two available datasets. It was found that the water quality within Honokōhau Harbor is primarily maintained due to the high rate of circulation. The nutrient loads entering the harbor through the brackish groundwater inflow are high, and without high flushing, water quality within the Harbor would not be able to be maintained.

Anticipated Impacts and Mitigation Measures

The water quality model was applied to predict the post-project conditions after the addition of the Kona Kai Ola Marina. Per the Conceptual Master Plan, the marina consists of a 45 acre marina basin with 800 boat slips. Brackish groundwater inflows into the new marina basin were bracketed between 0 mgd and 60 mgd. The two simulated extremes represent scenarios where no additional brackish groundwater will be intercepted by the new marina, which is not consistent with the observed conditions, and when brackish groundwater inflow into the new marina is twice the amount that will be still flowing into the existing marina, respectively.

The model results demonstrated, relative to the increased area, that water quality within the proposed 45-acre marina basin system could not be maintained. Inflow of brackish groundwater to the new marina was found to be fundamental to the flushing and water quality of the proposed system. However, even for the largest simulated inflow of 60 additional mgd entering the new marina, water quality was still degraded post-expansion. This is primarily due to the fact that the proposed marina basin has five times the volume of the existing harbor. In addition, the geometry of the system led to internal circulation between the existing harbor and new marina basin. The 45-acre new marina basin only becomes viable from a water quality impact standpoint if the additional brackish groundwater inflow into the new marina exceeds 60 mgd.

Alternatives to the aforementioned system that could maintain the flushing and water quality, as observed under existing conditions, were investigated. It was found that the reduction of the volume of the new marina basin by 45 percent significantly improved the flushing and water quality. Broad range sensitivity tests were also performed to determine the effect that various parameters had on the proposed system. For example, addition of nitrogen and phosphorous loads were tested to determine the limitation of the system.

The conditions with the project constructed were found to be phosphorous limited. Several simulations were performed including and excluding the inflow from the marine exhibits which provides an additional nitrogen load and also varying the location of this inflow. It was found that the inflow from the marine exhibits can have a beneficial effect on flushing, especially when positioned within the existing harbor basin. However, its effect is significantly less than the effect due to the brackish groundwater inflow. When the exhibit inflow is excluded or positioned at the east end of the new marina, its effect is small in terms of flushing due to its high salinity. From a water quality perspective, since the loads from the exhibit inflow consist primarily of nitrogen, it does not cause increased algae growth. However, this exhibit inflow does raise the concentrations of ammonia and nitrate in the system.

Simulation results indicate that under the conditions when the post-expansion system receives an additional brackish inflow into the new 25-acre marina on the order of 30 mgd or more, water quality within the harbor system and in the surrounding waters remained similar to existing conditions. These conditions are expected to occur based on the findings reported by Waimea Water Services (2007), which states that the proposed marina would exhibit the same or similar flushing action as the existing marina.

An additional mitigation measure proposed by Waimea Water Services (2007), if sufficient inflow is not intercepted, consists of drilling holes in the bottom of the new marina to enhance this inflow and facilitate flushing within the proposed system.

~~3.9.3~~3.9.2 Anchialine ~~Ponds~~ Pools

Two studies on anchialine pools were conducted in this EIS process. The anchialine ~~ponds~~ pools water quality studies and ~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute and is~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute in October 2006 and are included as Appendix ~~G~~H-1. That survey included pools located both north and south of Honokōhau Harbor. In response to DEIS comments and to further study the pools south of entrance channel of Honokōhau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2.

~~3.9.3.1~~3.9.2.1 Existing Conditions

Anchialine ~~ponds~~ pools exist in inland lava depressions near the ocean. Two anchialine ~~pond~~ pool complexes are located immediately to the north and south of the Honokōhau Harbor entrance channel. The complex to the north is located wholly within the designated boundaries of the Kaloko-Honokōhau National Historical Park as shown in Figure Q~~O~~. Many of the ~~ponds~~ pools in the southern complex are within the park administrative boundary as well. ~~Ponds~~ Pools in the northern complex show little evidence of anthropogenic impacts. Many contain typical vegetation and crustacean species in high abundance.

Figure R locates anchialine pools near the harbor entrance and pools~~Ponds~~ in the southern complex are depicted in Figure S.

Attachment 3

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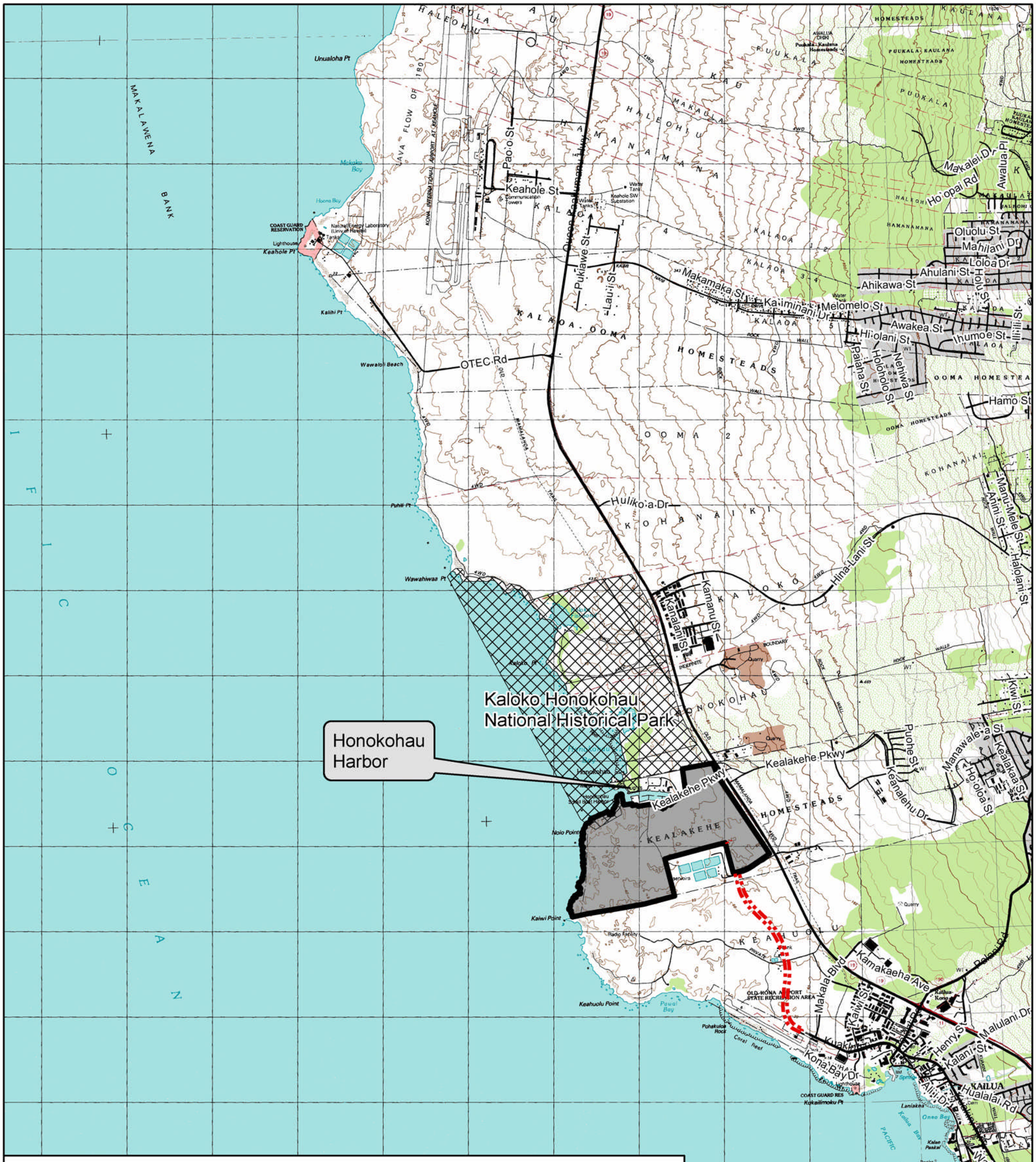
Figure R locates anchialine pools near the harbor entrance and pools~~Ponds~~ in the southern complex are depicted in Figure S.



Source: http://nrdata.nps.gov/kaho/kahodata/kaho_parkbndry_ply.zip

Figure Q: National Historical Park Service Legislative Boundary Map

Legend

- Project Site
- Proposed Parkway
- National Park Boundary

N W E S

0 2,500 5,000 Feet

oceanit
innovation through engineering & scientific excellence

JDI
JACOBY DEVELOPMENT, INC.

Source: Oceanic Institute

Figure R: Anchialine Pool Locations

N
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S

0 2,000 4,000 Feet

oceanit

JDI
JACOBY DEVELOPMENT, INC.

Source: Aquatic Resources Management And Design

Figure S: Anchialine Pool Locations in Southern Complex

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JDI
JACOBY DEVELOPMENT, INC.

The 2006 study identified 22 pools in the southern complex. The 2007 study found that three of the 22 pools are part of an estuary complex with direct connection to the ocean. While there were several signs of direct human use and disturbance, such as trash receptacles and toilet facilities, the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickleweed and mangrove. ~~are moderately to heavily impacted, with many containing exotic fish that exclude the anchialine crustaceans. The ponds also show evidence of human impact, including discarded bottles, cans, wrappers, diapers, toilet paper, etc. Water quality conditions within the ponds generally reflect the conditions of the underlying groundwater.~~

~~Figure P locates anchialine ponds near the harbor entrance. The study conducted as a part of this EIS show that the anchialine ponds south of the harbor entrance are moderately to heavily impacted by human activities and introduced fish populations. The study found that the nitrogen phosphorus concentrations in these ponds are significantly higher compared to the ponds north of the harbor entrance. The sources of these additional nutrients are not known. Continuous influx of nutrients will eventually degrade the water quality to levels that could alter the pond ecology.~~

Biota surveys in the two pond systems clearly indicate that counts of typical pond denizens show a remarkable difference between the northern and southern ~~ponds~~ pools. In the northern ~~ponds~~ pools the number of *Halocaridina rubra* ranged from a low of 20–25 to too numerous to count. The biota rich pond bottoms appeared red due to the *Halocaridina rubra* numbers. The only other species visible was the predatory shrimp *Metabetaeus lohena*. In contrast, only four out of the 22 ~~ponds~~ pools examined in the southern pond complex showed a decreased presence of *Halocaridina rubra* (6 to 200) individuals in the pond, and three ~~ponds~~ pools contained *Metabetaeus lohena*. Eight of the ~~ponds~~ pools contained numbers of introduced minnows which is an apparent predator of *Halocaridina rubra* and *Metabetaeus lohena*.

The 2007 study found three of the pools identified in the 2006 study were part of an estuary complex with direct connection to the ocean, and that the southern complex contained 19 anchialine pools. The study further found that a majority of the southern pools are degraded biologically and physically, primarily due to the effects of introduced fish and plant species. Six pools are currently devoid of alien fish, but they face a high level of threat due to the proximity of pools that have these species. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction.

The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 ppt. and that the anchialine biology would then perish. There is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and final determination of anchialine salinity following the harbor construction. The assessment that all anchialine pools will be barren with the construction of the harbor may be premature. *Halocaridina rubra* (opae ula) are routinely drawn from high salinity wells at 30-32 ppt.

Within the 19 pools, native and non-native fauna included 14 species comprised of 5 fish, 2 mollusca, and 6 crustacea. Algae within the pools primarily consisted of a mixed assemblage of diatoms and cyanobacteria, with several pools dominated by matted filamentous *Cladophora*, sp. The darker cave/overhang pools and high tide pools had epilithic *Hildenbrandia* sp. covering the rock substrate. Riparian vegetation was dominated by introduced species consisting of Pickleweed (*Batis maritima*), Mangrove (*Rhyzophora mangle*), and Christmasberry (*Shinus terebenthifolius*). Only two species of native plants Akulikuli (*Sesuvium portulacastrum*) and Makaloa (*Cyperus laevigatus*) existed near the pools and comprised only few small patches and a single tuft (respectively).

Most of the hypogeal anchialine shrimp have adapted to the presence of minnows by foraging in the pools at night. During daylight hours, only the adult shrimp appear to coexist at low population levels with the smaller *P. reticulata*, but the larger *G. affinis* and *Oreochromis* prevent the daytime appearance of hypogeal shrimp due to predation.

The average salinity in Kealakehe pools is relatively high at 13.5 ppt compared to most other pools along the West Hawai'i coastline, having an average of approximately 7 ppt. This high salinity appears to be characteristic of this region, and is similar to the average of most pools within the adjacent ahupua'a of Honokōhau and Kaloko. The levels of nitrate-nitrogen levels are relatively high compared to other undeveloped areas, but fall in the range of some developed landscapes. Other water quality parameters, including pH and temperature, fall into normal ranges for anchialine pools.

This relatively high salinity is the likely reason aquatic insects were not found in any pools at Kealakehe. Though the rare damselfly *Megalagrion xanthomelas* has been observed and collected from Kaloko, a statewide assessment of its range has not found it to occur in water with salinity greater than 3ppt. However, there has been an unsubstantiated occurrence of the nymph in a pool of up to 8ppt (Polhemus, 1995).

Another species of concern is the hypogeal decapod shrimp *Metabetaeus lohena.* These shrimp are sometimes predatory on *H. rubra* but are more often opportunistic omnivores similar to *H. rubra.* Predusk and nocturnal sampling at high tide is clearly the optimal method to determine habitat range and population densities for this species. These shrimp were found in 13 of the 19 pools, 7 of which had *M. lohena* only at night. The occurrences of *H. rubra* were found in 16 of 19 sampled pools, 8 of which had 'Ōpae'ula observed only at night. Consequently, despite having numerous degraded anchialine resources at Kealakehe, there are opportunities for many of the pools to be restored and enhanced to a level where large populations of anchialine shrimp and other native species may return to inhabit the pools as they likely have in the past.

~~As mentioned earlier, the southern ponds also had elevated concentrations of nutrients indicating water quality degradation. These factors indicate that if no restoration or maintenance activities are instituted to reserve these ponds, these ecosystems will degrade beyond recovery.~~

~~3.9.3.2~~3.9.2.2 Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

The anchialine ~~ponds~~ pools that are located north of the existing harbor are not likely to be impacted because no development activities are proposed north of the existing harbor. It is highly unlikely that existing groundwater flows to the Kaloko-Honokōhau pond system to the north of the existing harbor will be impacted by the proposed marina to the south.

Of the 19 pools in the southern complex, three would be eliminated due to harbor construction. Regarding the remaining pools, the DEIS noted that t~~T~~he change in the local groundwater flow pattern in the vicinity of the proposed marina ~~will~~ would impact the anchialine ~~ponds~~ pools that are located between the proposed marina and the shoreline south of the harbor entrance. The 2006 study (Appendix H-1) noted that t~~T~~he salinity of the anchialine ~~ponds~~ pools ~~will~~ would increase due to reduction of brackish groundwater, and that ~~. Some ponds will be excavated to make the new harbor basin. T~~those ~~ponds~~ pools that are not excavated will revert to full salinity, causing the loss of their habitat. ~~and associated aquatic flora and fauna. However, current investigations indicate that these ponds are already enriched by nutrients and the density of associated aquatic fauna is very low. In addition, trash from visitors, and introduction of minnows has already degraded the pond ecology.~~ Even without the potential impacts from the proposed marina construction, the pond ecology might change irreversibly from the nutrient input, human indifference and expansion of non native fauna species.

Further studies conducted in response to DEIS comments (Appendix H-2, and Appendix G-3) indicate that the remaining pools may not increase in salinity to levels unhealthy for *H. rubra* and *M. lohena* and other anchialine pool fauna. In addition, these studies determined that there are realistic mechanisms employed elsewhere that would mitigate changes due to groundwater changes. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore.

Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented. The mitigation plan will be based on the following objectives:

Objective 1 To preserve, maintain, and foster the long-term health and native ecological integrity of anchialine pools at Kealakehe.

Objective 2 To protect and promote cultural practices and traditions surrounding anchialine resources at Kealakehe.

Objective 3 To provide education, interpretation, and interactive opportunities for the community to learn about and appreciate the anchialine resources.

Objective 4 To acquire a pond manager to implement the program, conduct monitoring, research, and reporting, and provide education to the community about anchialine and estuarine resources.

Mitigation measures to facilitate the long-term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on the environment can be measured. The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment and possible new pools.

As a mitigation measure, bioretention, which is a Best Management Practice (BMP) is a feasible application for the proposed development. There is a probability that nutrients and other potential pollutants will runoff landscaping and impermeable surfaces such as roadways and parking lots during medium or high rainfall events. Some of these pollutants could enter the groundwater table and into anchialine pools and ultimately the ocean. As an alternative to directing runoff into the ground through drywells, storm water should be directed into bioretention areas such as constructed surface or subsurface wetlands, vegetated filter strips, grass swales, and planted buffer areas. Storm water held and moved through these living filter systems are essentially stripped of most potential pollutants, and allowed to slowly infiltrate back to the groundwater table.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Another mitigation measure that may be included in the management plan is salinity adjustment. In the 2006 assessment regarding the impact to the southern pools from the proposed construction of the harbor, it was stated that this construction would cause the salinity in the anchialine pools to become equivalent to the ocean at 35ppt. It was then concluded that the anchialine biology would perish.

However, there is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and a final determination of anchialine salinity following the harbor construction. The dynamics of groundwater movement through a porous lava medium both seaward and laterally along the coastline is an inexact science. This is compounded by the variations in water density, including stratification of salinity within the proposed harbor and capillary movement of low-density surface water through the substrata.

The assessment that all anchialine pools will be barren with the construction of the harbor may therefore be premature. *H. rubra* are routinely drawn from high salinity wells at 30 – 32 ppt and survive in this salinity for years. Further, high populations *H. rubra* and *M. lohena* have thrived and reproduced in pool salinities of 27ppt. If the pools do become full strength seawater at 35ppt, there exists uncertainty on the long-term effects to anchialine organisms, since there are no long-term studies or examples of native anchialine ecosystems at 35ppt. Native anchialine pool vegetation also has relatively high salinity tolerance.

If the salinity were expected to rise to 35 ppt, possible mitigation in the management plan will include methods to surcharge man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water. If sufficient volume is used, it is theoretically possible to lower salinity in adjacent natural anchialine pools. This surcharge method has been successfully used to raise salinity in anchialine pools and cause the salinity rise in adjacent pools of at least up to 10 meters away. Surcharging with low salinity should work as well or better since the lower density water will essentially float atop the higher salinity water at the surface layer, and move throughout the complex of natural pools. Surcharging may also be a viable mitigation to dilute and more rapidly disperse any pollutants that may be detected in the pools.

Another mitigation measure includes the creation of new anchialine pools. There is significant opportunity to create new anchialine pools and greatly expand the native habitat and resource. It has been demonstrated at several projects in West Hawai'i that anchialine pools can be created and will be colonized with a full compliment of anchialine species endemic to the area. Anchialine pools are considered focal points of higher productivity relative to the subterranean groundwater habitat around them. Their productivity promotes an increase in population levels of anchialine species within the pools themselves and throughout the subterranean habitat surrounding them.

~~No realistic mechanisms are envisioned for re-injecting fresh water into these systems to maintain their ecological balance as an anchialine system. These ponds will be changed from a brackish water system to a marine system. But, those ponds in the area of the shoreline park and cultural park will be cleaned of vegetation and protected from other physical alteration. A buffer zone around these newly established marine ponds will be protected as well.~~

~~The anchialine pond shrimp (*Metabetaeus lohena)* and the orangeback damsel fly (*Megalagrion xanthomelas)* are listed as candidate endangered species in the Federal Register and were both recorded in surveys of these anchialine ponds done in 2004 by US Geological Survey Biological Resources Division and the NPS Inventory and Monitoring Program. Low numbers of *Metabetaeus lohena* were encountered in three of the 22 ponds surveyed in the southern pond complex. *Megalagrion xanthomelas* was not encountered in any of the southern pond complex ponds during the recent study. The low density of *Metabetaeus lohena* and the observed absence of *Megalagrion xanthomelas* may be due to the impacts from high nutrient input and general degradation of the ponds.~~

~~An attempt should be made to move as much of the existing population of *Metabetaeus lohena* from these anchialine ponds before they become too saline, to possible newly excavated ponds that may be developed off-site. These shrimp should not be introduced into existing populated ponds to avoid any potential pathogenic impacts to the healthy ponds.~~

~~Public education on the unique ecology of the anchialine ponds and the need for preserving their ecology will reduce future human impacts in other healthy ponds.~~

~~Further recommended mitigation includes restoration to degraded anchialine ponds off the project site, preferably those located at the adjacent Kaloko-Honokōhau National Historical Park.~~

Attachment 4

1.5.2 Project Sustainable Design

The U.S. General Services Administration defines sustainable design as a process that "seeks to reduce negative impacts on the environment, human health and comfort of building occupants, thereby improving building performance" (GSA 2006). Sustainable design is a process that requires integration and communication between all parties involved in the design and construction of a development. In a typical development, an owner works with an architect and site planner to design the development. Following a site's design, engineers are hired to design the structure and systems of a building. Eventually a contractor is brought in to construct the development. In this version of development, the designers and contractors work in isolation. In contrast, sustainable design requires that team members work together to understand how all pieces to a development fit within the whole. This integration allows project members to offer unique solutions to common design and construction problems while also integrating environmental concerns into a project.

JDI has made a corporate commitment to environmental sustainability in all its work. In Kona Kai Ola, JDI intends to incorporate the latest environmental design and technology to create an energy efficient, low environmental impact, sustainable development at Kona Kai Ola. The vision for the project is to develop a project that has minimal impact on the environment by striving to significantly reduce water consumption, waste disposal, energy use and carbon dioxide emissions.

One key to measuring the sustainability of the project's design and operation is to use the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. The LEED Green Building Rating System is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings. LEED gives building developers and operators the tools they need to have an immediate and measurable impact on their buildings' performance (LEED 2006). JDI has experience with the LEED certification process from its other projects both for individual buildings, and for large campus infrastructure as well. JDI intends to pursue, at a minimum, Silver LEED certification for its development of the Kona Kai Ola project.

At the project's onset, JDI developed goals related to design, energy, water, waste and transportation, and the following sections present goals in each of those areas.

~~Sustainable design principles include the ability to:~~

- ~~minimize non-renewable energy consumption~~
- ~~optimize site potential~~
- ~~use environmentally preferable products~~
- ~~protect and conserve water~~
- ~~enhance indoor environmental quality~~
- ~~optimize operational and maintenance practices~~

Na Kokua Kaloko Honokohau

February 6, 2007

Dayan Vithanage Oceanit
Oceanit Center
828 Fort Street mall, Suite 600
Honolulu, Hawaii 96813

Aloha Kakou,

Na Kokua Kaloko Honokohau is a grass roots / non-profit organization whose goal includes the preservation of the integrity of Kaloko-Honokohau. We have met continuously for the past 3 decades in an effort to guard and protect sacred sites in this very special area known as Kaloko-Honokau.
Since 1978, we have monitored the increasing commercial and industrial development in the vicinity of the Park and have consistently advised the developers to take careful precautions to avoid and mitigate any potential adverse impact on the very significant and fragile culture and natural resources of the Park.
The magnitude of the Kona Kai Ola "KKO" project and harbor expansion exceeds all other developments in scale, volume, costs, and potential adverse impact on the few remaining ancient Hawaiian settlements along this pristine coastline.
Fortunately, in 1978 congress agreed with the recommendations of 13 native Hawaiians to protect and preserve the ancient Kaloko-Honokohau coastal settlement…and to encourage and assist native Hawaiians to recreate and rejuvenate…practice and perpetuate their ancestral attitudes and values which contributed so much to their thriving and robust island culture.
We sincerely believe that the KKO project may not be a positive, contributing factor to our vision for restoring and perpetuating our eroding Hawaiian values and practices along this pristine coastline. Here are some of our reasons.

1) **There are 15.5 acres of land that congress authorized as part of the Park, to the south of Honokohau Harbor which has yet to be acquired by the Park. The KKO proposes to develop this area as a cultural park. However, we sincerely believe that the best protection and preservation for the unique cultural features in this area lies in allowing the site to become part of the National Park System, rather than a privately controlled isolated cultural artifact…developed independently and completely unassociated with other similar and directly related cultural features in the adjacent Park.**
2) **We do not believe that the anchialine pools confirmed that the opae'ula are thriving in the ponds. These tiny red shrimps are critical ingredients in our preservation plans to rejuvenate ancient fishing techniques and all the**

associated aspects of Kona's "Opelu Culture" that once thrived in this coastal region. We must not allow their limited habitat to be destroyed.

3) **The cumulative impact of 15 years of anticipated heavy constructed in the proposed project, in conjunction with highway expansion and multiple industrial park construction must be more carefully examined for its negative physical effects, such as noise, air quality, drainage and runoff, … and its negative spiritual effects, such as jarring the current undisturbed sweeping mauka-makai, coastline viewscape, disturbing frequent cultural ceremonies at the Park, and the irreparable distruction/degradation of sacred sites and cultural – maintaining resources.**

A hui hou,

Fred Cachola

Fred Cachola,
Na Kokua Kaloko Honokohau

J. Cachale
P.O. Box 596
KK 96745

RECEIVED
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2007
USPS

July 23, 2007

Fred Cachola
Na Kokua Kaloko Honokohau
P.O. Box 596
Kailua-Kona, Hawai‘i 96745

Dear Mr. Cachola:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Dated February 6, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement.

We acknowledge your concerns regarding the increasing commercial and industrial development in proximity to Kaloko-Honokohau National Historical Park. In EIS Section 8, Cumulative Impacts, several projects are proposed within a few miles of the Kaloko-Honokohau National Historical Park, including several residential communities, business and industrial parks, and government facilities. Kona Kai Ola is being proposed in this environment of change and growth, and we respectfully disagree that this project exceeds all other developments in scale, volume, costs and potential adverse impacts. Plans for Villages of La‘i‘Opua, for example, include 4,000 residential units and recreational facilities on 980 acres.

The developer is sensitive to the beauty, cultural value and environmental importance of the Kaloko-Honokohau National Historical Park and your stewardship of these lands is appreciated. We offer the following responses to your specific comments:

1. We acknowledge that you believe that the best protection and preservation of the 15.5 acres of land that the U.S. Congress authorized as part of Kaloko-Honokohau National Historical Park should be to allow it to become part of the National Historic Park system, rather than become a privately controlled isolated cultural artifact.

   While the developer has no control over the ownership of this land, protection of these cultural and natural resources is a high priority for Kona Kai Ola. Initial steps taken by Jacoby Development, Inc. (JDI) were to modify the initial conceptual master development plan which had a 40 foot setback from the shoreline, and move the developed area back over 400 feet from the shoreline to protect the 15 acres of National Historical Park designated lands.

   This area is not intended to be a cultural artifact, but rather a place to practice a rich, living culture. For example, JDI has commissioned additional studies on the anchialine pools to ensure that a brackishwater anchialine ecosystem thrives that is healthy to the ‘opae ‘ula and other flora.

This is further discussed in response to your second comment. JDI also intends to encourage the cultural practice in the community of cultivating ‘opae ‘ula, gathering it, and feeding the fishing ko‘a located in the nearshore waters. In addition, JDI has also included mitigation plans to expand ‘opae ‘ula habitat through the creation of new anchialine pools on the project site.

Further, any work that would be done in the area within the National Historic Park's legislative boundaries would be done in close consultation with all the necessary regulatory bodies, and include the Kaloko-Honokohau National Historical Park.

2. We note your concerns regarding the anchialine pools and impacts on ‘opae ‘ula. In response to DEIS comments and to further study the pools south of the entrance channel of Honokohau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2 of the EIS and is summarized in EIS Sections 3.9.2.1 and 3.9.2.2. In addition, further comment on the groundwater hydrology effects on anchialine pools was prepared by Waimea Water Services and is contained in Appendix G-3 of the EIS.

   The DEIS identified 22 anchialine pools. Further studies determined that three of these pools are actually part of an estuary complex with direct connection to the ocean. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction.

   While the second survey confirmed the presence of direct human use and disturbance, such as trash receptacles and toilet facilities, it found that the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickelweed and mangrove.

   The additional studies indicate that the remaining pools may not increase in salinity to levels unhealthy for anchialine pool fauna. Waimea Water Services found that harbor construction would cut off some of the fresh groundwater flow. However, predicting the extent of change in flow is difficult, if not impossible, even with numerous boreholes and intense sampling. The tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time. Hence, the additional studies found that changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment.

In either case, the developer is committed to practicing good stewardship over the pools to be preserved and eliminating or reducing alien species to the extent practical. The developer recognizes it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline, especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Mitigation measures to facilitate the long term health of the remaining anchialine pools will be based on environmental monitoring. Mitigation would include measures to adjust salinity of the pools if they experience salinity levels unhealthy to ‘opae ‘ula and other fauna. These measures are described in detail in EIS Section 3.9.2, Anchialine Pools. The additional EIS text that includes the added EIS Section 3.9.2, Anchialine Pools, is contained in Attachment 1 of this letter.

3. We acknowledge your concerns regarding various impacts that may occur during the 15-year construction period and that may be generated by marina industrial activities. The developer will work closely with the Kaloko-Honokohau National Historical Park to ensure that construction activities and marina industrial activities do not disrupt the Park, its resources, and its visitors.

   In addition, in response to a recommendation from the project’s cultural consultant, the developer will retain a cultural practitioner proficient in mitigating the concerns related to the life-systems in the area.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

The conditions with the project constructed were found to be phosphorous limited. Several simulations were performed including and excluding the inflow from the marine exhibits which provides an additional nitrogen load and also varying the location of this inflow. It was found that the inflow from the marine exhibits can have a beneficial effect on flushing, especially when positioned within the existing harbor basin. However, its effect is significantly less than the effect due to the brackish groundwater inflow. When the exhibit inflow is excluded or positioned at the east end of the new marina, its effect is small in terms of flushing due to its high salinity. From a water quality perspective, since the loads from the exhibit inflow consist primarily of nitrogen, it does not cause increased algae growth. However, this exhibit inflow does raise the concentrations of ammonia and nitrate in the system.

Simulation results indicate that under the conditions when the post-expansion system receives an additional brackish inflow into the new 25-acre marina on the order of 30 mgd or more, water quality within the harbor system and in the surrounding waters remained similar to existing conditions. These conditions are expected to occur based on the findings reported by Waimea Water Services (2007), which states that the proposed marina would exhibit the same or similar flushing action as the existing marina.

An additional mitigation measure proposed by Waimea Water Services (2007), if sufficient inflow is not intercepted, consists of drilling holes in the bottom of the new marina to enhance this inflow and facilitate flushing within the proposed system.

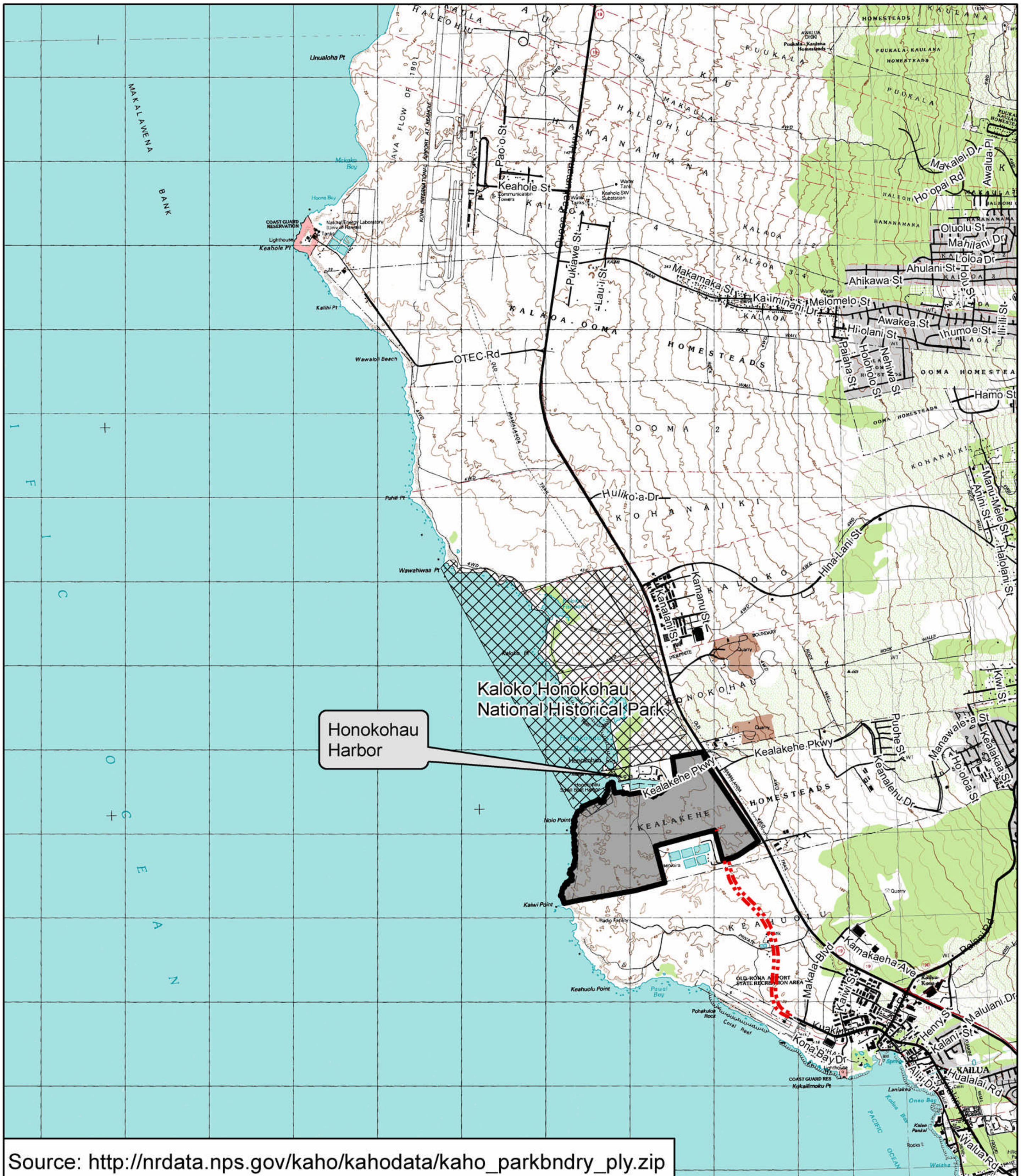
~~3.9.3~~3.9.2 Anchialine ~~Ponds~~ Pools

Two studies on anchialine pools were conducted in this EIS process. The anchialine ~~ponds~~ pools water quality studies and ~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute and is~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute in October 2006 and are included as Appendix ~~G~~H-1. That survey included pools located both north and south of Honokōhau Harbor. In response to DEIS comments and to further study the pools south of entrance channel of Honokōhau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2.

~~3.9.3.1~~3.9.2.1 Existing Conditions

Anchialine ~~ponds~~ pools exist in inland lava depressions near the ocean. Two anchialine ~~pond~~ pool complexes are located immediately to the north and south of the Honokōhau Harbor entrance channel. The complex to the north is located wholly within the designated boundaries of the Kaloko-Honokōhau National Historical Park as shown in Figure Q~~O~~. Many of the ~~ponds~~ pools in the southern complex are within the park administrative boundary as well. ~~Ponds~~ Pools in the northern complex show little evidence of anthropogenic impacts. Many contain typical vegetation and crustacean species in high abundance.

Figure R locates anchialine pools near the harbor entrance and pools~~Ponds~~ in the southern complex are depicted in Figure S.



Source: http://nrdata.nps.gov/kaho/kahodata/kaho_parkbndry_ply.zip

Figure Q: National Historical Park Service Legislative Boundary Map

Legend

- Project Site
- Proposed Parkway
- National Park Boundary

N
W E
S

0 2,500 5,000 Feet

oceanit
innovation through engineering & scientific excellence

JDI
JACOBY DEVELOPMENT, INC.

Source: Oceanic Institute

Figure R: Anchialine Pool Locations

0 2,000 4,000 Feet

JDI

Jacoby Development, Inc.

Source: Aquatic Resources Management And Design

Figure S: Anchialine Pool Locations in Southern Complex

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W
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oceanit

JDI

JACOBY DEVELOPMENT, INC.

The 2006 study identified 22 pools in the southern complex. The 2007 study found that three of the 22 pools are part of an estuary complex with direct connection to the ocean. While there were several signs of direct human use and disturbance, such as trash receptacles and toilet facilities, the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickleweed and mangrove. ~~are moderately to heavily impacted, with many containing exotic fish that exclude the anchialine crustaceans. The ponds also show evidence of human impact, including discarded bottles, cans, wrappers, diapers, toilet paper, etc. Water quality conditions within the ponds generally reflect the conditions of the underlying groundwater.~~

~~Figure P locates anchialine ponds near the harbor entrance. The study conducted as a part of this EIS show that the anchialine ponds south of the harbor entrance are moderately to heavily impacted by human activities and introduced fish populations. The study found that the nitrogen phosphorus concentrations in these ponds are significantly higher compared to the ponds north of the harbor entrance. The sources of these additional nutrients are not known. Continuous influx of nutrients will eventually degrade the water quality to levels that could alter the pond ecology.~~

Biota surveys in the two pond systems clearly indicate that counts of typical pond denizens show a remarkable difference between the northern and southern ~~ponds~~ pools. In the northern ~~ponds~~ pools the number of *Halocaridina rubra* ranged from a low of 20–25 to too numerous to count. The biota rich pond bottoms appeared red due to the *Halocaridina rubra* numbers. The only other species visible was the predatory shrimp *Metabetaeus lohena*. In contrast, only four out of the 22 ~~ponds~~ pools examined in the southern pond complex showed a decreased presence of *Halocaridina rubra* (6 to 200) individuals in the pond, and three ~~ponds~~ pools contained *Metabetaeus lohena*. Eight of the ~~ponds~~ pools contained numbers of introduced minnows which is an apparent predator of *Halocaridina rubra* and *Metabetaeus lohena*.

The 2007 study found three of the pools identified in the 2006 study were part of an estuary complex with direct connection to the ocean, and that the southern complex contained 19 anchialine pools. The study further found that a majority of the southern pools are degraded biologically and physically, primarily due to the effects of introduced fish and plant species. Six pools are currently devoid of alien fish, but they face a high level of threat due to the proximity of pools that have these species. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction.

The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 ppt. and that the anchialine biology would then perish. There is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and final determination of anchialine salinity following the harbor construction. The assessment that all anchialine pools will be barren with the construction of the harbor may be premature. *Halocaridina rubra* (opae ula) are routinely drawn from high salinity wells at 30-32 ppt.

Within the 19 pools, native and non-native fauna included 14 species comprised of 5 fish, 2 mollusca, and 6 crustacea. Algae within the pools primarily consisted of a mixed assemblage of diatoms and cyanobacteria, with several pools dominated by matted filamentous *Cladophora*, sp. The darker cave/overhang pools and high tide pools had epilithic *Hildenbrandia* sp. covering the rock substrate. Riparian vegetation was dominated by introduced species consisting of Pickleweed (*Batis maritima*), Mangrove (*Rhyzophora mangle*), and Christmasberry (*Shinus terebenthifolius*). Only two species of native plants Akulikuli (*Sesuvium portulacastrum*) and Makaloa (*Cyperus laevigatus*) existed near the pools and comprised only few small patches and a single tuft (respectively).

Most of the hypogeal anchialine shrimp have adapted to the presence of minnows by foraging in the pools at night. During daylight hours, only the adult shrimp appear to coexist at low population levels with the smaller *P. reticulata*, but the larger *G. affinis* and *Oreochromis* prevent the daytime appearance of hypogeal shrimp due to predation.

The average salinity in Kealakehe pools is relatively high at 13.5 ppt compared to most other pools along the West Hawai'i coastline, having an average of approximately 7 ppt. This high salinity appears to be characteristic of this region, and is similar to the average of most pools within the adjacent ahupua'a of Honokōhau and Kaloko. The levels of nitrate-nitrogen levels are relatively high compared to other undeveloped areas, but fall in the range of some developed landscapes. Other water quality parameters, including pH and temperature, fall into normal ranges for anchialine pools.

This relatively high salinity is the likely reason aquatic insects were not found in any pools at Kealakehe. Though the rare damselfly *Megalagrion xanthomelas* has been observed and collected from Kaloko, a statewide assessment of its range has not found it to occur in water with salinity greater than 3ppt. However, there has been an unsubstantiated occurrence of the nymph in a pool of up to 8ppt (Polhemus, 1995).

Another species of concern is the hypogeal decapod shrimp *Metabetaeus lohena.* These shrimp are sometimes predatory on *H. rubra* but are more often opportunistic omnivores similar to *H. rubra.* Predusk and nocturnal sampling at high tide is clearly the optimal method to determine habitat range and population densities for this species. These shrimp were found in 13 of the 19 pools, 7 of which had *M. lohena* only at night. The occurrences of *H. rubra* were found in 16 of 19 sampled pools, 8 of which had 'Ōpae'ula observed only at night. Consequently, despite having numerous degraded anchialine resources at Kealakehe, there are opportunities for many of the pools to be restored and enhanced to a level where large populations of anchialine shrimp and other native species may return to inhabit the pools as they likely have in the past.

~~As mentioned earlier, the southern ponds also had elevated concentrations of nutrients indicating water quality degradation. These factors indicate that if no restoration or maintenance activities are instituted to reserve these ponds, these ecosystems will degrade beyond recovery.~~

~~3.9.3.2~~3.9.2.2 Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

The anchialine ~~ponds~~ pools that are located north of the existing harbor are not likely to be impacted because no development activities are proposed north of the existing harbor. It is highly unlikely that existing groundwater flows to the Kaloko-Honokōhau pond system to the north of the existing harbor will be impacted by the proposed marina to the south.

Of the 19 pools in the southern complex, three would be eliminated due to harbor construction. Regarding the remaining pools, the DEIS noted that t~~T~~he change in the local groundwater flow pattern in the vicinity of the proposed marina ~~will~~ would impact the anchialine ~~ponds~~ pools that are located between the proposed marina and the shoreline south of the harbor entrance. The 2006 study (Appendix H-1) noted that t~~T~~he salinity of the anchialine ~~ponds~~ pools ~~will~~ would increase due to reduction of brackish groundwater, and that ~~. Some ponds will be excavated to make the new harbor basin. T~~those ~~ponds~~ pools that are not excavated will revert to full salinity, causing the loss of their habitat. ~~and associated aquatic flora and fauna. However, current investigations indicate that these ponds are already enriched by nutrients and the density of associated aquatic fauna is very low. In addition, trash from visitors, and introduction of minnows has already degraded the pond ecology.~~ Even without the potential impacts from the proposed marina construction, the pond ecology might change irreversibly from the nutrient input, human indifference and expansion of non native fauna species.

Further studies conducted in response to DEIS comments (Appendix H-2, and Appendix G-3) indicate that the remaining pools may not increase in salinity to levels unhealthy for *H. rubra* and *M. lohena* and other anchialine pool fauna. In addition, these studies determined that there are realistic mechanisms employed elsewhere that would mitigate changes due to groundwater changes. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore.

Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented. The mitigation plan will be based on the following objectives:

Objective 1 To preserve, maintain, and foster the long-term health and native ecological integrity of anchialine pools at Kealakehe.

Objective 2 To protect and promote cultural practices and traditions surrounding anchialine resources at Kealakehe.

Objective 3 To provide education, interpretation, and interactive opportunities for the community to learn about and appreciate the anchialine resources.

Objective 4 To acquire a pond manager to implement the program, conduct monitoring, research, and reporting, and provide education to the community about anchialine and estuarine resources.

Mitigation measures to facilitate the long-term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on the environment can be measured. The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment and possible new pools.

As a mitigation measure, bioretention, which is a Best Management Practice (BMP) is a feasible application for the proposed development. There is a probability that nutrients and other potential pollutants will runoff landscaping and impermeable surfaces such as roadways and parking lots during medium or high rainfall events. Some of these pollutants could enter the groundwater table and into anchialine pools and ultimately the ocean. As an alternative to directing runoff into the ground through drywells, storm water should be directed into bioretention areas such as constructed surface or subsurface wetlands, vegetated filter strips, grass swales, and planted buffer areas. Storm water held and moved through these living filter systems are essentially stripped of most potential pollutants, and allowed to slowly infiltrate back to the groundwater table.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Another mitigation measure that may be included in the management plan is salinity adjustment. In the 2006 assessment regarding the impact to the southern pools from the proposed construction of the harbor, it was stated that this construction would cause the salinity in the anchialine pools to become equivalent to the ocean at 35ppt. It was then concluded that the anchialine biology would perish.

However, there is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and a final determination of anchialine salinity following the harbor construction. The dynamics of groundwater movement through a porous lava medium both seaward and laterally along the coastline is an inexact science. This is compounded by the variations in water density, including stratification of salinity within the proposed harbor and capillary movement of low-density surface water through the substrata.

The assessment that all anchialine pools will be barren with the construction of the harbor may therefore be premature. *H. rubra* are routinely drawn from high salinity wells at 30 – 32 ppt and survive in this salinity for years. Further, high populations *H. rubra* and *M. lohena* have thrived and reproduced in pool salinities of 27ppt. If the pools do become full strength seawater at 35ppt, there exists uncertainty on the long-term effects to anchialine organisms, since there are no long-term studies or examples of native anchialine ecosystems at 35ppt. Native anchialine pool vegetation also has relatively high salinity tolerance.

If the salinity were expected to rise to 35 ppt, possible mitigation in the management plan will include methods to surcharge man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water. If sufficient volume is used, it is theoretically possible to lower salinity in adjacent natural anchialine pools. This surcharge method has been successfully used to raise salinity in anchialine pools and cause the salinity rise in adjacent pools of at least up to 10 meters away. Surcharging with low salinity should work as well or better since the lower density water will essentially float atop the higher salinity water at the surface layer, and move throughout the complex of natural pools. Surcharging may also be a viable mitigation to dilute and more rapidly disperse any pollutants that may be detected in the pools.

Another mitigation measure includes the creation of new anchialine pools. There is significant opportunity to create new anchialine pools and greatly expand the native habitat and resource. It has been demonstrated at several projects in West Hawai'i that anchialine pools can be created and will be colonized with a full compliment of anchialine species endemic to the area. Anchialine pools are considered focal points of higher productivity relative to the subterranean groundwater habitat around them. Their productivity promotes an increase in population levels of anchialine species within the pools themselves and throughout the subterranean habitat surrounding them.

~~No realistic mechanisms are envisioned for re-injecting fresh water into these systems to maintain their ecological balance as an anchialine system. These ponds will be changed from a brackish water system to a marine system. But, those ponds in the area of the shoreline park and cultural park will be cleaned of vegetation and protected from other physical alteration. A buffer zone around these newly established marine ponds will be protected as well.~~

~~The anchialine pond shrimp (*Metabetaeus lohena)* and the orangeback damsel fly (*Megalagrion xanthomelas)* are listed as candidate endangered species in the Federal Register and were both recorded in surveys of these anchialine ponds done in 2004 by US Geological Survey Biological Resources Division and the NPS Inventory and Monitoring Program. Low numbers of *Metabetaeus lohena* were encountered in three of the 22 ponds surveyed in the southern pond complex. *Megalagrion xanthomelas* was not encountered in any of the southern pond complex ponds during the recent study. The low density of *Metabetaeus lohena* and the observed absence of *Megalagrion xanthomelas* may be due to the impacts from high nutrient input and general degradation of the ponds.~~

~~An attempt should be made to move as much of the existing population of *Metabetaeus lohena* from these anchialine ponds before they become too saline, to possible newly excavated ponds that may be developed off-site. These shrimp should not be introduced into existing populated ponds to avoid any potential pathogenic impacts to the healthy ponds.~~

~~Public education on the unique ecology of the anchialine ponds and the need for preserving their ecology will reduce future human impacts in other healthy ponds.~~

~~Further recommended mitigation includes restoration to degraded anchialine ponds off the project site, preferably those located at the adjacent Kaloko-Honokōhau National Historical Park.~~

Karlton Kau

From: Karlton Kau

Sent: Monday, February 05, 2007 1:28 PM

To: Karlton Kau

Subject: FW: Request for a 60-day extension /Jacoby DEIS

From: Duane [mailto:derway@hawaii.rr.com]
Sent: Friday, February 02, 2007 2:40 PM
To: Dayan Vithanage
Cc: Genevieve Salmonson, director
Subject: Request for a 60-day extension /Jacoby DEIS
Importance: High

Aloha, Dayan !!!

The Office of Environmental Quality Control was established to help stimulate, expand and coordinate efforts to maintain the optimum quality of the State's environment. In the case of huge and complex document represented by the Jacoby Draft EIS, 45 days is too short to expect reasonable knowledge of and opinions to be formed. Some report difficulty in getting the DEIS appendices to download and open.

I respectfully request a 60-day extension for public comment.

Plan To Protect Kona is a 501c3 organization formed to encourage land use and economic development decisions that reflect Sustainable Development and Smart Growth policies.

Duane Erway, President

Plan to Protect Kona

oceanit®
innovation through engineering & scientific excellence

February 5, 2007

Duane Erway, President
Plan to Protect Kona
74-5602-A Alapa Street, Suite 725
Kailua-Kona, Hawaii 96740

Dear Mr. Erway:

Subject: Kona Kai Ola Draft Environmental Impact Statement (DEIS)

This letter responds to your email request to me on February 2, 2007 to extend the comment period for the Kona Kai Ola DEIS.

The DEIS was published in the Office of Environmental Quality Control Bulletin on December 23, 2006. The 45-day comment period ends on February 6, 2007.

Regarding your request, we will include your comments and our response in the Final EIS if your transmittal is postmarked by February 13, 2007. Please contact me if you would like hard copies or electronic files of the DEIS.

Thank you for your interest in the Kona Kai Ola project, and we look forward to receiving your comments.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Homelands
Jacoby Development, Inc.

Envelope Postmarked 07 Feb 2007

PLAN TO PROTECT KONA
74-5602-A Alapa Street
Suite 725
Kailua-Kona, HI 96740

February 5, 2007

Dayan Vithanage
Oceanit
Oceanit Center
828 Fort Street Mall, 6th Fl.
Honolulu, HI 96813

Re: *Jacoby Development Inc's Draft Environmental Impact Statement.*

Aloha Dayan!

The Draft EIS is fatally flawed for three reasons.

1. The project conflicts with respect to the County General Plan.
2. Only "no action" is offered as an alternative to the project.
3. Traffic stress and infrastructure needs of off-site employees and their families ignored.

County General Plan Conflicts

The DEIS fails to consider conflict with respect to the County General Plan. The LUPAG map, as amended in 2006, allows Urban Expansion. This does NOT allow a resort of the scale proposed by Jacoby Development Inc.

This is an attempt to sneak around our County General Plan and is not appreciated. What is being attempted is illegal.

Only "no action" offered

The Draft EIS fails to consider alternatives that would be of interest to decision makers including:

- Having the marina funded partial with State Bond funds for a harbor with 800 slips

- *Having the marina funded partial with State Bond funds for a* harbor with 600 slips

- A much smaller marina which may not need such a large income generating component.

Instead the DEIS offers only the alternative of "no action."

Jacoby Development Inc. should have been watching the court case over the EIS for the Stryker Brigade. Their EIS was judged inadequate because the Army failed to consider other reasonable alternatives.

The lack of alternatives is a major problem for decision makers and a violation of State Rules, according to Hawaii County Planning Director Chris Yuen. The State "requires a DEIS to describe a range of alternatives, regardless of cost, and explain the environmental impacts and why they were rejected."

<u>**Traffic stress and infrastructure needs**</u>

The DEIS fails to consider or quantify the traffic stress of an additional 1,267 off-site jobs nor the need and cost for schools, parks, hospitals, and doctors. There is a shortage of workers today so *the needs of new workers must be addressed*.

<u>**Conclusion**</u>

Until these items are rectified, and other issues raised by other organizations and individuals is properly addressed, the draft EIS needs to go back to the "drawing boards"

Sincerely,

Duane D. Erway

Duane Erway, President
Plan to Protect Kona
PO Box 2807
Kailua-Kona, HI 96745
808-324-4624

****

Plan To Protect Kona is a 501c3 organization formed to encourage land use and economic development decisions that reflect Sustainable Development and Smart Growth policies.

Cc: Dept. of Hawaiian Homelands
Oceanit
Office of Environmental Quality Control

Plan To Protect, Inc.
74-5602A Alapa St. (Suite 725)
Kailua-Kona, HI 96740

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FEB 08 2007

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oceanit

innovation through engineering & scientific excellence

July 23, 2007

Duane Erway, President
Plan to Protect Kona
P.O. Box 2807
Kailua-Kona, Hawai'i 96745

Dear Mr. Erway:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Dated February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement.

We acknowledge your three areas of concerns, but respectfully disagree that the DEIS is fatally flawed for these reasons. Discussion of these three areas follow.

County General Plan Conflicts

Kona Kai Ola is consistent with the General Plan designation for the project site. In December 2005, the County Planning Director proposed that the DLNR portion of the Kona Kai Ola project that was designated "Open" in the 2005 General Plan, be amended to "Urban Expansion Area." On November 29, 2006, the Hawai'i County Council approved this amendment.

Kona Kai Ola is consistent with the Urban Expansion Area designation. The agreement between the developer and the State identifies hotel and time-share uses as possible development at Kona Kai Ola. The project is not a resort. A resort is a concept in which visitors are attracted to spend most, if not all, of their stay within the resort area through the design of amenities that fulfill the needs of a particular visitor market segment. This self-containment is achieved to varying degrees in resort development, depending on the natural, historic/cultural, and recreational resources within a resort site and the intended scale of the resort.

State and County laws recognize this distinction between a "resort" and a "hotel" or "time-share unit." Section 514E-5, Hawai'i Revised Statutes, authorizes time- share units to be located in a resort area or any other area in which a county may by ordinance allow a hotel unit. The Hawai'i County Code correspondingly permits hotels and time share units in non-resort zoning districts. The proposed project may include up to 700 hotel units and 1,803 time-share units, and depending on the eventual location of these project components, rezoning may be required for implementation.

Oceanit Center 828 Fort Street Mall, Suite 600 Honolulu, Hawaii 96813 Phone: 808.531.3017 Fax: 808.531.3177
www.oceanit.com

Only "no action" offered

As explained in the DEIS, the agreement between JDI and the State of Hawai'i established a required scope and scale of the project for which the impact analysis was provided. Several comments have addressed the fact that alternatives, other than the No Project Alternative, were not addressed in the DEIS Section 2, Alternatives Analysis.

Kona Kai Ola is of the position that alternative actions, other than a No Project alternative, are not currently feasible without an amendment to the agreement with the State. Agency and public comments in response to the DEIS, as well as additional information generated as a result of inquiry into issues raised by the comments, have been helpful in identifying alternative actions that will serve the State's goal of providing additional marina slips for the Kona area. These alternative actions also serve to reduce or mitigate anticipated effects of the proposed development.

Thus, agencies such as the Land Division of the Department of Land and Natural Resources, the U.S. Department of the Interior Fish and Wildlife Service, and the Planning Department of the County of Hawai'i, and the Office of Environmental Quality Control (OEQC), as well as community organizations have commented that a reduced scale marina and related facilities should be considered. The OEQC has also asked that the alternative of a reduced scale project be evaluated under the assumption that DHHL may determine that a downsized project would be preferred.

In response to these comments on the DEIS and in consideration of measures to mitigate anticipated impacts, the EIS Section 2, Alternatives Analysis, has been revised to describe the following alternatives, which are discussed in more detail in the EIS:

- Alternative 1 is a project involving a 400-slip marina, 400 hotel units, 1,100 time share units, and commercial and support facilities. This alternative would enhance water quality and avoid the need to widen the existing harbor entrance channel, as well as reduce traffic and socioeconomic impacts.
- Alternative 2 is an alternative that had been previously discussed, but not included in the proposed project that includes an 800-slip harbor and a golf course.
- Alternative 3 is the no-action alternative.

A comparison between impacts related to the proposed project concept and impacts related to Alternative 1 indicates that a reduction in the acreage and number of slips in the marina, as well as the reduction in hotel and time-share units, would generate less environmental, traffic, social and economic impacts. Although positive economic impacts would be reduced, Alternative 1 can be considered as a preferable alternative because of reduced environmental impacts. However, while it can be concluded that the 25-acre marina in Alternative 1 would be the preferred size, the DLNR agreement establishes the size of the marina at 45 acres and 800 slips. An amendment to the DLNR agreement is required in order to allow Alternative 1 to proceed. Hence, selection of Alternative 1 is an unresolved issue at this time.

The additional EIS text that includes the added EIS Section 2, Alternative Analysis, is contained in Attachment 1 of this letter.

Traffic stress and infrastructure needs

A study of workforce housing requirements was prepared to evaluate secondary impacts. Findings are summarized in an added EIS Section 4.6.5, Workforce Housing Impacts, and Appendix C-1 contains the new study. It is estimated that Kona Kai Ola will generate a workforce housing need of 625 units, based on the ratio set forth in Hawai'i County Ordinance Chapter 11, Section 4, Affordable Housing Requirements. Another method of calculating the need for affordable worker housing units is based on approximately 80 percent of the total in-migrant workers needing housing that meet affordable housing pricing guidelines. This results in a high end range of 859 units.

As agreements between the State and JDI prohibit residential development at Kona Kai Ola, workforce housing would need to be located off-site. The most suitable location for workforce housing units is the Villages at La'i'Opua community, a DHHL project, or within the Hawai'i Housing Finance and Development Corporation affordable housing development planned for Keahuolu. These are two State-owned undertakings directly across the highway in the same or adjacent ahupua'a. Locating workforce affordable housing units in these communities would substantially lessen the traffic impacts associated with a community subject workforce. Alternatively, the State lands adjacent to Waikoloa Village would be appropriate for workforce housing.

JDI will comply with all affordable housing requirements of applicable Hawai'i County ordinances.

In that the specific locations of these workforce units are undetermined at this time, it is not possible to accurately and fully assess impacts related to traffic and educational, medical and recreational facilities, as related to these new units. However, if the new workforce housing units are located in the aforementioned communities in the same or adjacent ahupua'a, then impacts related to these units are absorbed as part of the development of these communities.

The additional EIS text that includes the added EIS Section 4.6.5, Workforce Housing Impacts, is contained in Attachment 2 of this letter.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

2 Alternatives Analysis

~~In typical land development projects, the initial planning process includes the exploration of alternatives to development objectives. In the EIS process, these alternatives are presented with a disclosure of reasons for the dismissal of non-preferred alternatives.~~

~~Kona Kai Ola does not follow this same pattern of alternatives evaluation.~~ As discussed in Section 1.4, the proposed Kona Kai Ola project is the result of agreements between JDI and the State DLNR and DHHL. The agreements and leases between the State and JDI stipulate the parameters of development for this site in terms of uses, quantities and size of many features, resulting in a limited range of land uses. Unlike a private property project, JDI is required to meet the criteria outlined in the agreements, thereby affording less flexibility in options and uses. From the developer's perspective, the agreements must also provide sufficient flexibility to allow for a development product that responds to market needs and provides a reasonable rate of return on the private investment.

The agreements between JDI and DLNR specify that the proposed harbor basin is to be 45 acres and accommodate 800 slips. This development proposal is the subject of this EIS. In response to DEIS comments, additional water quality studies and modeling were conducted. These studies determined that the water circulation in a 45-acre 800-slip marina would be insufficient to maintain the required standard of water quality. The models of water circulation suggest that a new 25-acre harbor basin could successfully maintain required water quality in the new harbor. Comments on the DEIS from DLNR, from other government agencies, the neighbors and the general community also called for the consideration of alternatives in the EIS, including a project with a smaller harbor basin and less density of hotel and time-share units.

In response to these comments on the DEIS, three alternatives are evaluated in this Final EIS and include Alternative 1, which is a plan with a 25-acre 400-slip harbor basin including a decrease in hotel and time-share units; Alternative 2, which is an alternative that had been previously discussed but not included in the proposed project, that includes an 800-slip harbor and a golf course; and Alternative 3, the no-project alternative. Each alternative is included in the EIS with an evaluation of their potential impacts. These project alternatives are presented to compare the levels of impacts and mitigation measures of the proposed project and alternative development schemes pursuant to requirements set forth in Chapter 343, HRS.

~~JDI is required to provide a new marina basin not less than 45 acres and a minimum of 800 new boat slips. Further, the agreements provide the following options for land uses at the project site:~~

- ~~Golf Course~~
- ~~Retail Commercial Facilities~~
- ~~Hotel Development Parcels~~
- ~~Marina Development Parcels~~
- ~~Community Benefit Development Parcels~~

~~JDI is not pursuing the golf course option and is proposing instead to create various water features throughout the project site. All other optional uses have been incorporated in Kona Kai Ola.~~

2.1 Project Alternatives

2.1.1 Alternative 1: 400-Slip Marina

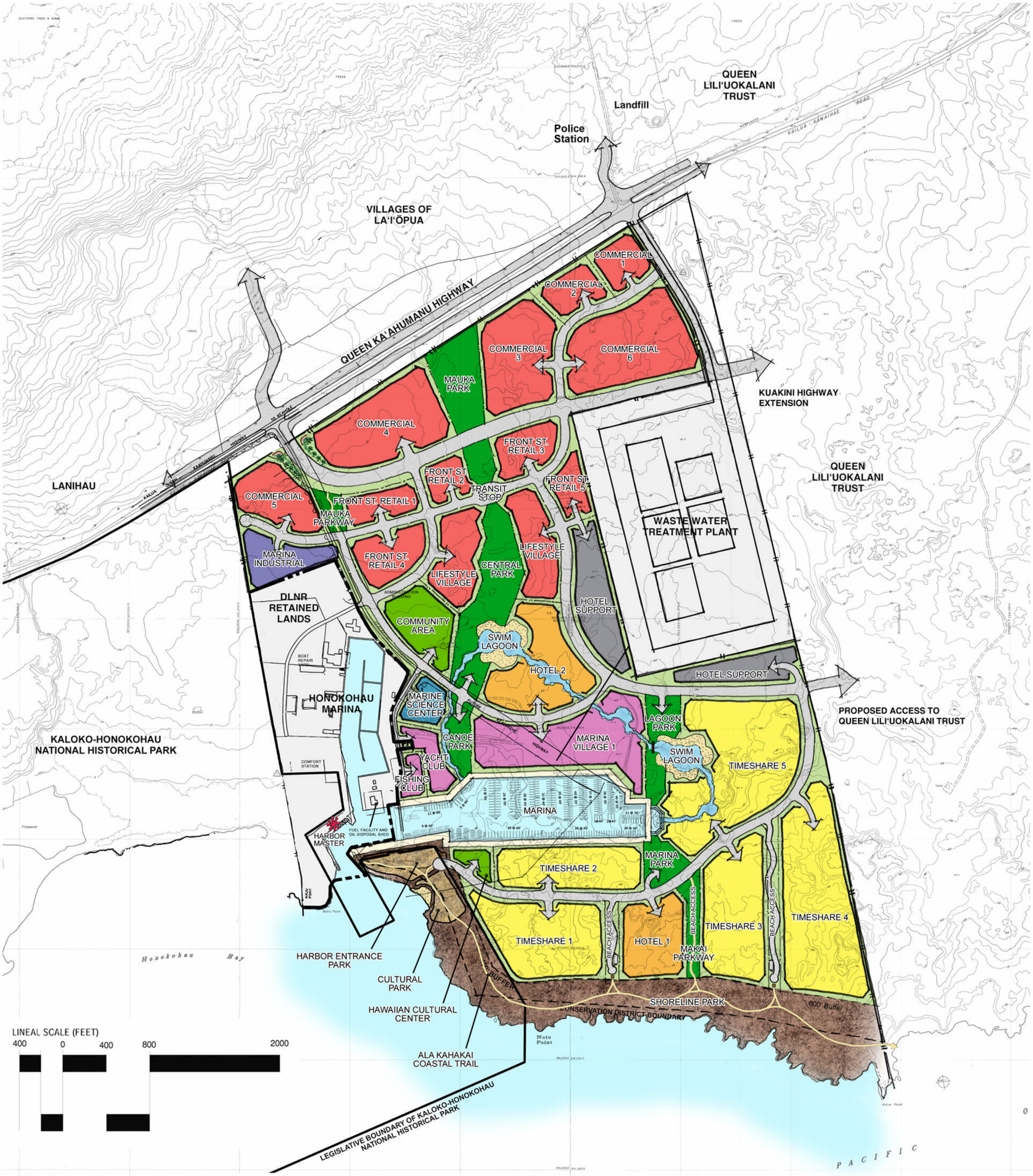
Studies conducted in response to DEIS comments found the construction and operation of an 800-slip marina may significantly impact the water quality within the marina and along the shoreline. Specifically, the Harbor Water Quality Modeling Study, as contained in Appendix U, found that the water circulation in a 45-acre 800-slip harbor was insufficient to maintain an acceptable level of water quality. Further, the existing harbor channel, which would serve both the existing and new harbors, could not adequately serve the increased boat traffic generated by an 800-slip marina during peak traffic. Mitigation measures to accommodate peak boat traffic included the widening of the existing channel, an action that would entail a complex process of Federal and State approvals and encounter significant environmental concern.

Concerns related to the proposed density of hotel and time-share units were also expressed in comments to the DEIS from members of the public, neighbors to the project site, especially the Kaniohale Community Association, and government agencies. Common themes in DEIS comments were related to impacts regarding traffic, project requirements of potable water and infrastructure systems, including sewer, drainage, utility and solid waste systems, and socioeconomic impacts.

In response to the water quality study results, and to the DEIS comments, an alternative plan was developed with a smaller marina with less boat slips, and a related decrease in hotel and time share units. Illustrated in Figure G, Alternative 1 reflects this lesser density project, and features a 400-slip marina encompassing 25 acres. For the purposes of the Alternative 1 analysis, JDI assumed 1,100 time-share units and 400 hotel rooms. Project components include:

- 400 hotel units on 34 acres
- 1,100 time-share units on 106 acres
- 143 acres of commercial uses
- 11 acres of marina support facilities
- 214 acres of parks, roads, open spaces, swim lagoons and community use areas

In addition, Alternative 1 would include the construction of a new intersection of Kealakehe Parkway with Queen Ka'ahumanu Highway, and the extension of Kealakehe Parkway to join Kuakini Highway to cross the lands of Queen Lili'uokalani Trust, and connecting with Kuakini Highway in Kailua-Kona. This is a significant off-site infrastructure improvement and is included in the agreements between the State and JDI.



Source: PBR HAWAII

Plan is conceptual only and subject to change

Figure G: Alternative 1: 400-Slip Marina

LEGEND

TIME SHARE	MARINA SUPPORT / COMMERCIAL	UTILITIES
HOTEL	MARINE SCIENCE CENTER	PARKS & GREEN SPACE
RETAIL / COMMERCIAL	COMMUNITY AREA / CULTURAL CENTER	SHORELINE
MARINA RETAIL	SWIM LAGOON	HARBOR ENTRANCE PARK / CULTURAL PARK
	MARINA	

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JDI
JACOBY DEVELOPMENT, INC.

Like the proposed project, Alternative 1 would have a strong ocean orientation, and project components that support this theme would include various water features including seawater lagoons and a marine science center. The new Alternative 1 harbor would include a yacht club, fishing club, a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. The coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use. Additional Alternative 1 community areas would include facilities and space for community use, including programs of the Kona Kai Ola Community Foundation, which supports community programs in health care, culture, education, and employment training for the local community, especially to native Hawaiians. Like the original proposed plan, Alternative 1 includes 40 percent of the land in parks, roads, open spaces, swim lagoons and community use areas.

2.1.2 Alternative 2: Golf Course Feature

Alternative 2 was among the alternatives discussed at a community charrette in September 2003. It includes a golf course, which is a permitted use in the DLNR agreement and DHHL lease. As Figure H illustrates, an 18-hole championship golf course would occupy 222 acres on the southern portion of the project site. As with the proposed project, Alternative 2 includes an 800-slip marina on a minimum of 45 acres.

To support the economic viability of the project, other Alternative 2 uses include:

- Golf course clubhouse on three acres
- 1,570 visitor units on 88 acres fronting the marina
- 118 acres of commercial uses
- 23 acres of community uses

Community uses in Alternative 2 include an amphitheater, a canoe facilities park, a community health center, a Hawaiian cultural center and fishing village, a marine science center and employment training center. The sea water lagoon features contained in the proposed project and Alternative 1 are not included in this alternative.

2.1.3 Alternative 3: No Action

In Alternative 3, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.

~~The economic viability and sustainability of the project is determined by the density and uses proposed. Because JDI is obligated to develop an 800-slip marina for the State, complete road improvements, and provide various public enhancement features at its own expense, the density proposed for the income generating features of the development must be sufficient to provide an acceptable level of economic return for JDI. The market study, which is discussed in Section 4.6, reviewed various development schemes and determined that the currently proposed density and mix is the optimum to meet the anticipated financing and development cost obligations for the public features associated with the development.~~

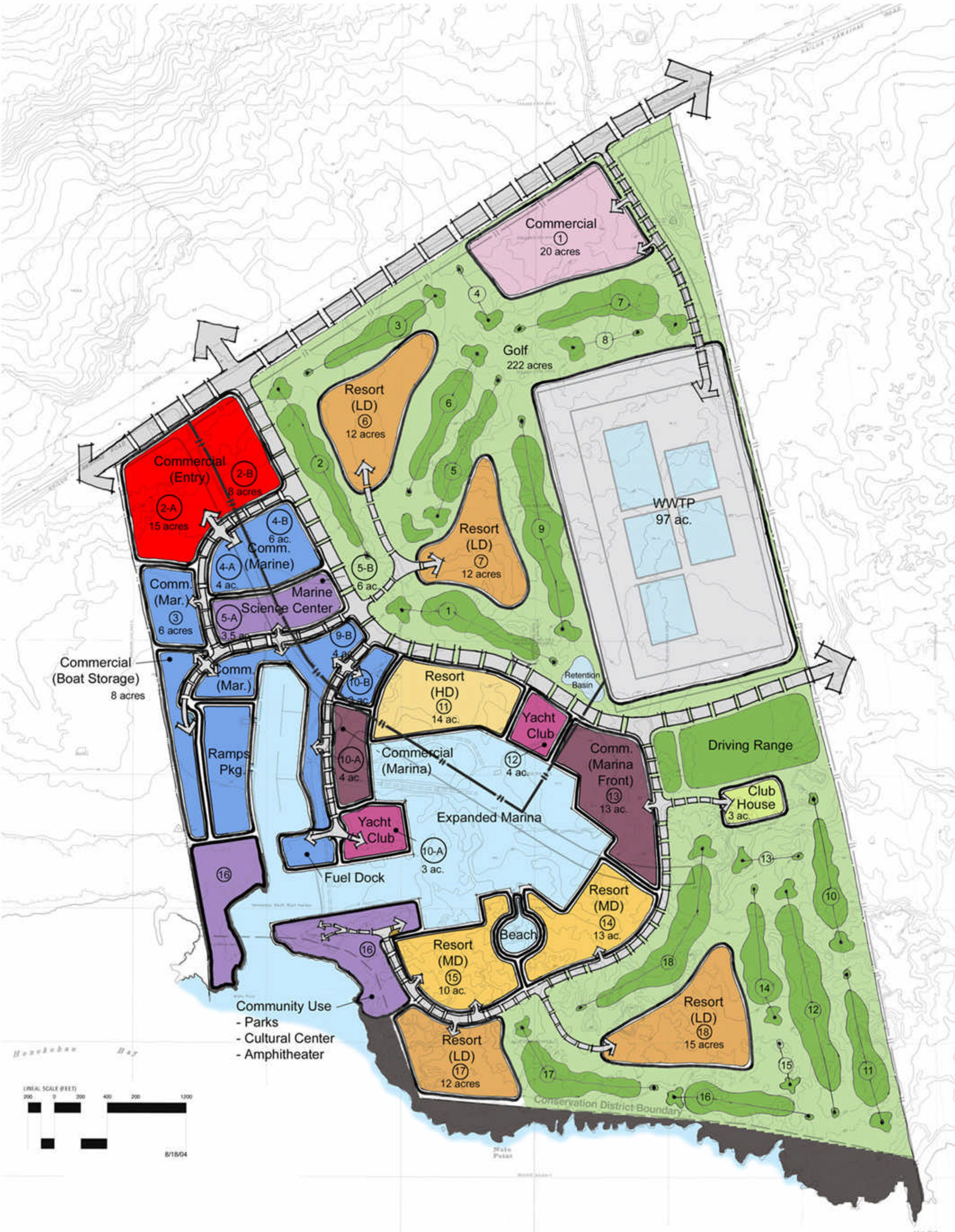

Figure H. Alternative 2: Golf Course Alternative

Legend

JDI

Jacoby Development, Inc.

2.2 Alternatives Analysis

As discussed in Section 2.1, the proposed Kona Kai Ola project (also referred to as "proposed project") is defined by development requirements related for a marina and the related uses that would be needed to generate a reasonable rate of return that covers development costs.

Beginning with Section 2.2.1, the alternative development concepts are comparatively assessed for potential impacts that may reasonably be expected to result from each alternative. Following is an overview of the primary observations of such assessment.

Alternative 1 includes half of the State-required boat slips and 60 percent of the proposed hotel and time-share units and, due to the decreased density, this alternative would generate significantly less environmental and socio-economic impacts. A harbor water quality model found the reduction of the volume of the new marina basin by about half (approximately 25 acres) significantly improved the water circulation and quality. Further, the reduced number of boat slips would generate less boat traffic, thereby reducing congestion and the need to mitigate impacts further by the widening of the existing harbor channel.

A project with fewer hotel and time-share units and increased commercial space with a longer (14 years) absorption period would change the mix of employment offered by the project, and slightly increase the overall employment count. The public costs/benefits associated with Alternative 1 would change, compared to the proposed project, with a general increase in tax collections, and a general decrease in per capita costs. Detailed discussion of Alternative 1 potential economic impacts are provided in Section 4.6.6. Comparisons of levels of impact are presented throughout this FEIS.

While this analysis might indicate that the 25-acre marina in Alternative 1 would be the more prudent choice, the DLNR agreement establishes the minimum size and slip capacity of the marina at 45 acres and 800 slips, respectively. Amendments to the DLNR agreement would be required in order to allow Alternative 1 to proceed as the preferred alternative. Hence, selection of the preferred alternative is an unresolved issue at the writing of this FEIS.

Alternative 2, the golf course alternative, was not previously considered to be the preferred alternative primarily because market conditions at the time of project development might not likely support another golf course. Further, DHHL has a strategy goal to have more revenue-generating activities on the commercial lease lands within the project area. In addition, concerns have been expressed as to environmental impacts of coastal golf courses, including the potential adverse impact on Kona's water supply if potable water is used for golf course irrigation.

While Alternative 3, the no-project alternative, would not generate adverse impacts related to development of these lands associated with the construction and long-term operations, it would also not allow for an expanded public marina that would meet public need and generate income for the public sector. Further, the no-project alternative would foreclose the opportunity to create a master-planned State-initiated development that would result in increased tax revenue, recreation options and community facilities. Crucial privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities, and public access would not be contributed.

~~Hence, the only valid alternative to the proposed project is the no-action alternative. In this alternative, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.~~

~~The no-project alternative would therefore not generate adverse impacts associated with the construction and long-term operations would not occur.~~

~~Likewise, the creation of a master-planned state-initiated development, resulting in increased employment, tax revenue, recreation options and community facilities, would not be created. Privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities and public access would not be contributed.~~

Further, the creation of revenue-producing businesses on the DHHL property to fund homestead programs would not occur, resulting in fewer potential benefits for Hawaiians.

Hence, the agreements and leases between the State and JDI indicate that the no-action alternative is not in the public interest~~has been rejected at this time~~.

2.2.1 Impact Comparison

Grading and Excavation

The proposed project requires grading and excavation. Both actions may impact groundwater due to rainfall runoff during construction. Alternative 1 would require a significantly smaller excavation for the marina basin and would therefore carry a lesser risk of potential adverse effects on water quality. Alternative 2 would require the same basin excavation as the proposed project, and would also include extensive grading and filling to build the golf course, the latter of which would generate additional impacts. Alternative 3 would result in no change to the geography, topography and geology.

Further discussion on grading and excavation is contained in Section 3.3.

Natural Drainage

Most precipitation infiltrates into the porous ground at the site, and no significant sheet flow is likely. Alternative 1 would generate similar levels of impacts on natural drainage as those of the proposed project and thus require similar mitigation measures. The golf course in Alternative 2 would not be as porous since the site would be graded, soil would be placed, and grass and other landscaping would be grown. Sheet flow and runoff can occur on a golf course, and drainage patterns might change. Alternative 3 would result in no change to the existing natural drainage pattern. Further discussion on natural drainage is contained in Section 3.4.

Air Quality

Air quality will be affected by construction activities, as well as pollutants from vehicular, industrial, natural, and agricultural sources. Alternative 1 would generate less construction air quality impacts than the proposed project due to the reduced amount of intensive groundwork associated with the smaller marina basin and fewer long-term impacts by reducing traffic 35 and 40 percent during, respectively, AM and PM peak traffic times. Construction of Alternative 2 would result in fugitive dust and exhaust from equipment and is expected to generate the same level of air quality impact as the proposed project. Alternative 3 would result in no change to existing air quality. Further discussion on air quality is contained in Section 3.5.

Terrestrial Environment

To provide additional habitat for shorebirds and some visiting seabirds, the project proposes to construct a brackishwater pond area suitable for avian fauna, including stilts, coots and ducks. While habitat expansion is beneficial, there is also a possibility that these species may be exposed to activity that may harm them. Alternative 1 would not include a brackish water pond, but will include 5 acres of seawater features, which is 74 percent less than the 19 acres of seawater features in the proposed project. While this would reduce beneficial impacts, it would also decrease exposure to potentially harmful activity. Alternative 2 does not include the brackish water pond features, but would include drainage retention basins that would attract avian fauna and expose them to chemicals used to maintain golf course landscaping. While Alternative 3 would result in no increase in potentially harmful activity, it would also not provide additional habitat for avian fauna. Further discussion on the terrestrial environment is contained in Section 3.7.

Groundwater

Groundwater at the project site occurs as a thin basal brackish water lens. It is influenced by tides and varies in flow direction and salt content. The existing Honokōhau Harbor acts as a drainage point for local groundwater. Any impact to groundwater flow from the proposed harbor is likely to be localized. The proposed marina basin will not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance.

There will be differences in the flow to the marina entrance between the proposed project and Alternative 1. Alternative 1, being smaller in size, will have less impact on groundwater flow than the proposed marina. Alternative 2 will have a similar impact to groundwater quality as the proposed project. Alternative 2 may also impact water quality by contributing nutrients and biocides to the groundwater from the golf course. Alternative 3 would result in no change in existing groundwater conditions. Further discussion on groundwater is contained in Section 3.8.1.

Surface Water

There are no significant natural freshwater streams or ponds at the site, but there are brackish anchialine pools. Surface water at the project site will be influenced by rainfall. Runoff typically percolates rapidly through the permeable ground. The proposed project will include some impermeable surfaces, which together with building roofs, will change runoff and seepage patterns.

Alternative 1 is a lower density project that is expected to have proportionally less impact on surface water and runoff patterns and less potential impact on water quality than the proposed project. Alternative 2 would have more impact on surface water quality than the proposed project due to fertilizers and biocides carried by runoff from the golf course. Alternative 3 would result in no change to surface water conditions. Further discussion on surface water is contained in Section 3.8.2.

Nearshore Environment and Coastal Waters

The potential adverse impacts to the marine environment from the proposed project are due to the construction of an 800-slip marina and the resulting inflow of higher salinity seawater and inadequate water circulation, both of which are anticipated to impair water quality to the extent of falling below applicable standards. One possible mitigation measure is to significantly reduce the size of the marina expansion.

The reduced marina size (from 45 to 25 acres) and reduced lagoon acreage in Alternative 1 are expected to result in a proportionate reduction in seawater discharging into the new harbor and increased water circulation. Alternative 2 includes the same marina basin size and is therefore subject to the same factors that are expected to adversely affect water quality.

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water quality in the proposed harbor depends on several components. These include salinity, nutrients, and sediments that come from the ocean, rainfall runoff, water features with marine animals, and dust. The smaller project offered as Alternative 1 is expected to produce a reduced amount of pollutants and reduce the risk of adverse impact upon water quality.

It is notable that the 45-acre marina basin planned in the proposed project and Alternative 2 only becomes viable from a water quality impact standpoint if the additional brackish groundwater inflow into the new marina exceeds 60 mgd. The resulting flushing from such inflow would be expected to better maintain water quality. However, it is unclear whether 60 mgd of brackish groundwater would be available. As proposed in Alternative 1, reduction of the volume of the new marina basin by 45 percent will significantly improve the flushing and water quality because the lower volume can be flushed by the available groundwater flow.

In addition, there could be higher rainfall runoff from the Alternative 2 golf course into the harbor, because the grassed golf course will be less porous than the natural surface. The golf course will also require relatively high levels of fertilizer, biocides, and irrigation, all of which could contribute to adverse water quality impacts.

Further discussion on nearshore environment and coastal waters is contained in Section 3.9.1.

Anchialine Pools

Anchialine pools are located north of Honokōhau Harbor, and south of the harbor on the project site. The marine life in these pools is sensitive to groundwater quality, and changes due to construction and operation of the project could degrade the viability of the pool ecosystem. In the southern complex, 3 anchialine pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction in the proposed project and Alternatives 1 and 2.

Predicting the extent of change in groundwater flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is therefore extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Due to the uncertainty of changes in groundwater flow and quality due to marina construction, the variability in impacts between the proposed project and Alternatives 1 and 2 is unknown at this time. Alternative 3 would result in no change in groundwater flow. While this would eliminate the potential for adverse impacts, Alternative 3 would also continue the pattern of existing degradation related to human activity and the introduction of alien species. Further discussion on anchialine pools is contained in Section 3.9.2.

Marine Fishing Impacts

The proposed marina will increase the number of boats in the area and it is reasonable to assume that a portion of these new boats will engage in fishing activities. The increase in boats in the area would be primarily related to the marlin and tuna / pelagic fishery, coral reefs due to extractive fisheries, and SCUBA activities. The pressure on fish and invertebrate stocks is expected to increase with or without the marina. Harbor expansion provides the opportunity to address existing conditions to consolidate, focus, and fund management and enforcement activities at one location.

Compared to the proposed project, Alternative 1 would result in a 21 percent decrease in boat traffic, thereby lessening the potential for marine fishing impacts. The level of impacts in Alternative 2 would be similar to that of the proposed project. Alternative 3 would result in no change in existing marine fishing conditions, and no opportunity to address already existing pressure on fish and invertebrate stocks. Further discussion on marine fishing impacts is contained in Section 3.9.3.

Cultural and Archaeological Resources

The proposed project will integrate cultural and archaeological resources in the overall development. Archaeological sites recommended for preservation will be preserved, and cultural practices will be encouraged. Kona Kai Ola includes a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. Proposed is a 400-foot shoreline setback that would serve as a buffer between the ocean and developed areas. This coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use.

Alternative 1 would contain all of the cultural archaeological features and the shoreline setback area would be 400 feet in the northern portion of the site and increase to 600 feet in the southern portion. Alternative 2 would preserve cultural and archaeological resources, but does not include a 400-foot shoreline setback. Alternative 3 would result in no change to existing cultural and archaeological resources and no addition of cultural and community facilities and activities. Further discussion on cultural and archaeological resources is contained in, respectively, Sections 4.1 and 4.2.

Noise

Project-generated noise is due to construction equipment and blasting, boats, marina activities, vehicle traffic, and the Kealakehe Wastewater Treatment Plant operations. Alternative 1 would generate less noise impacts due to reduced construction activities, fewer boats, less traffic and less on-site activity. Alternative 2 would also generate less noise due to reduced traffic and less on-site activity, but noise related to the excavation of the marina basin and an increase in the number of boats would be similar to that of the proposed project. Further discussion on noise impacts is presented in Section 4.4.

Socioeconomic Impacts

The proposed project will generate an increase in de facto population of an estimated 5,321 persons due to the increase in hotel and time-share units. The estimated de facto population increase in Alternative 1 is 37 percent less, at 3,363 persons, than the proposed project. The de facto population increase in Alternative 2 is similar to Alternative 1.

Employment in the commercial components will nearly double in Alternative 1, from a stabilized level of 1,429 full-time equivalent (FTE) positions in the proposed project to 2,740 in the Alternative 1.

Under Alternative 1, the total operating economic activity at Kona Kai Ola will increase due to the added commercial space more than off-setting the fewer visitor units, moving upward from $557.6 million per year to circa $814.3 million annually. The total base economic impact resulting from development and operation of Alternative 1 will similarly be higher by between 35 and 45 percent than that of the proposed project.

Alternative 1, which has a reduced marina size of 25 acres, and fewer hotel and time-share units, would have a meaningful market standing, create significant economic opportunities, and provide a net benefit to State and County revenues. From a market perspective, a smaller Kona Kai Ola would still be the only mixed use community in the Keahole to Kailua-Kona Corridor offering competitive hotel and time-share product.

The estimated absorption periods for marketable components of Alternative 1 are generally shorter than those for the same components in the proposed project. Marina slips under Alternative 1 are estimated to be absorbed within 2 years after groundbreaking, as compared with 9 years for absorption of slips in the proposed project. Hotel rooms under Alternative 1 are estimated to be absorbed within 4 years after groundbreaking, as compared with 7 years under the proposed project. Time-share units would be absorbed within 10 years under Alternative 1, while 15 years are projected under the proposed project. Due to the planned increase in commercial facilities under Alternative 1, the absorption period of commercial space is estimated at 14 years, as compared with 8 years for absorption of such facilities under the proposed project.

The State and County will still both receive a net benefit (tax receipts relative to public expenditures) annually on a stabilized basis under the Alternative 1. The County net benefits will be some $12.2 million per year under the Alternative 1 versus $14.9 million under the proposed project. The State net benefits will increase under the Alternative 1 to about $37.5 million annually, up substantially from the $11.4 million in the proposed project.

Due to the lower de facto population at build-out, the effective stabilized public costs for both the State and County will decline meaningfully under the Alternative 1, dropping from $7.7 million annually for the County and $36.5 million for the State, to $4.9 million and $23 million per year, respectively.

Alternative 3 would result in no increase in de facto population and improvement to economic conditions. Further discussion on social and economic impacts are contained in, respectively, Sections 4.5 and 4.6.

Vehicular Traffic

The proposed project will impact the nearby road network that currently is congested during peak traffic times. The proposed project includes roadway improvements that would reduce the impact and improve roadway conditions for the regional community.

Alternative 1 includes the same roadway system improvements as the proposed project, yet would reduce vehicular traffic by 35 percent when compared to the proposed project. Alternative 2 would have similar traffic conditions and roadway improvements as Alternative 1. Alternative 3 would result in no increase in traffic and no roadway improvements.

Marina Traffic Study

The increase in boat traffic due to the proposed 800-slip marina would cause entrance channel congestion during varying combinations of existing and new marina peak traffic flow. Worst case conditions of active sport fishing weekend and summer holiday recreational traffic result in traffic volumes exceeding capacity over a short afternoon period. Mitigation to address boat traffic in the proposed project include widening the entrance channel, traffic control, implementation of a permanent traffic control tower, or limiting vessel size.

Alternative 1 would result in a 21 percent reduction in boat traffic congestion under average existing conditions and ten percent reduction during peak existing conditions. The reduction to 400 slips also reduces the impacts of congestion at the entrance channel, thereby reducing the need for any modifications to the entrance channel.

Alternative 2 would have the same level of boat traffic as the proposed project. Alternative 3 would not meet the demand for additional boat slips and would not generate additional boat traffic. Further discussion on marina traffic is contained in Section 4.8.

Police, Fire and Medical Services

The proposed project will impact police, fire and medical services due to an increase in de facto population and increased on-site activity. Alternatives 1 and 2 would have similar levels of impact as the proposed project due to increased on-site activity. Further discussion on police, fire and medical services are contained, respectively, in Sections 4.10.1, 4.10.2 and 4.10.3.

Drainage and Storm Water Facilities

The proposed project will increase drainage flows, quantities, velocities, erosion, and sediment runoff.

Alternative 1 involves a reduction of the project density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces associated with hotel and time-share development and to the creation of more open space. However, roadway areas will increase by about 30 percent in Alternative 1. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings. The golf course in Alternative 2 may also change drainage characteristics from those of the proposed project and may not reduce impacts. Alternative 3 would result in no change in existing conditions and no improvements to drainage infrastructure. Further discussion on drainage and storm water facilities is contained in Section 4.10.5

Wastewater Facilities

The proposed development is located within the service area of the Kealakehe WWTP and a sewer system will be installed that connects to the WWTP. The sewer system will be comprised of a network of gravity sewers, force mains, and pumping stations which collect and convey wastewater to the existing Kealakehe WWTP. Project improvements will incorporate the usage of recycled / R1 water. Improvements implemented by the proposed project will also accommodate the needs of the regional service population.

Alternative 1 would generate approximately 10 percent less wastewater flow than the proposed project. Wastewater flow in Alternative 2 is undetermined. Alternative 3 would result in no additional flow, as well as no improvements that will benefit the regional community. Further discussion on wastewater facilities is contained in Section 4.10.6.

Potable Water Facilities

The proposed project average daily water demand is estimated at 1.76 million gallons per day. Existing County sources are not adequate to meet this demand and source development is required. The developer is working with DLNR and two wells have been identified that will produce a sustainable yield that will serve the project. These wells will also serve water needs beyond the project.

Alternative 1 would result in net decrease of about five percent of potable water demand. Alternative 2 may have a lower water demand than the proposed project as long as potable water is not used for irrigation. Alternative 3 would result in no additional flow, as well as no source development that will benefit the regional community. Further discussion on potable water facilities is contained in Section 4.10.8.

Energy and Communications

Regarding Alternative 1, preliminary estimates for electrical, telecommunications, and cable resulted in a net demand load that remains similar to the proposed project. Further discussion on energy and communications is contained in Section 4.10.9.1.

The proposed project will increase the demand for electrical energy and telecommunications. The demand would be reduced in Alternative 1 because the number of boat slips and units would decrease. Similarly, Alternative 2 would have fewer units than the proposed project and therefore reduce energy demands. Further reduction in energy demand for either alternative could be achieved by using seawater air conditioning (SWAC) and other energy reduction measures, as planned by the developer. Further discussion on energy and telecommunications is contained in Section 4.10.9.2.

Water Features and Lagoons

The proposed project includes a brackishwater pond, lagoons, and marine life exhibits supplied by clean seawater. The water features in Alternative 1 would significantly decrease by 74 percent from 19 acres in the proposed project to five acres in Alternative 1. This decrease in water features would result in a corresponding decrease in water source requirements and seawater discharge. Alternative 2 does not include the seawater features. Alternative 3 would result in no additional demand for water source requirements and seawater discharge.

2.2.2 Conformance with Public Plans and Policies

State of Hawai'i

Chapter 343, Hawai'i Revised Statutes

Compliance with this chapter is effected, as described in Section 5.1.1 in regard to the proposed project and the alternatives discussed.

- State Land Use Law, Chapter 205, Hawai'i Revised Statutes

  The discussion in Section 5.1.2 is directly applicable to Alternative 1, the proposed project. Alternative 1 will involve a setback of 400 feet that increases to 600 feet along the southern portion of the project site's shoreline area. Alternative 2 does not provide for such a setback, but may still require approvals from DLNR for cultural, recreational, and community uses and structures within the Conservation district.

- Coastal Zone Management Program, Chapter 205A, Hawai'i Revised Statutes

  Recreational Resources:

  In addition to the discussion of consistency with the associated objective and policies, as described in Section 5.1.3, the reduction from the proposed project's 800-slip marina to a 400-slip marina under Alternative 1 will still expand the region's boating opportunities and support facilities. The existing harbor entrance will still be utilized under this alternative; however, potential risks relating to boat traffic and congestion in the marina entrance area will be reduced significantly. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities, and marine science center remain important recreational components under Alternative 1.

Alternative 2 includes a golf course component, which would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Alternative 2, like the proposed project, will expand the region's boating opportunities and support facilities through its 800-slip marina. However, the potential adverse impacts of increased boat traffic from the size of the marina are significant enough to offset the benefits of increased boating opportunities.

Coastal Ecosystems:

The discussion in Section 5.1.3 is directly applicable to Alternative 1.

Alternative 1 not only reduces the number of slips proposed by 50 percent, but it also reduces the size of the marina from 45 acres to 25 acres. The 25-acre marina will increase the body of water within the existing harbor, but to a significantly lesser extent than the proposed project's estimated increase, which is also applicable to the 45-acre size that is proposed for the marina under Alternative 2.

The findings of the Harbor Water Quality Modeling Study conclude that a reduction in the size of the harbor expansion is an alternative that will mitigate the risk of significant impacts upon water quality within the marina and existing harbor. Accordingly, the reduction in both the number of slips and the size of the marina basin under Alternative 1, in combination with proper facilities design, public education, and enforcement of harbor rules and regulations, would result in fewer long-term impacts to water quality and coastal ecosystems. Short-term (construction-related) impacts would likely remain the same although the reduction in the total acreage of excavation is expected to result in a shorter duration of such impacts.

In addition to its 800-slip marina and potential adverse impacts upon water quality and the marine environment, Alternative 2 includes a golf course component, which has the potential to impact coastal ecosystems by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Economic Uses

Although reduced in the number of slips, the smaller marina under Alternative 1 will nevertheless serve public demand for more boating facilities in West Hawai'i and is consistent with the objective and policies and discussion set forth in Section 5.1.3. The economic impacts of Alternative 2, while comparable to those of the proposed project's marina development, are notably marginal as to the golf course component, based on the marketability analysis that indicates a condition of saturation within the region.

Coastal Hazards

The discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Tsunami risks mainly affect the large shoreline setback area that is proposed for the project and Alternative 1. Alternative 2 projects a transient accommodation site that is partially within the tsunami hazard zone and thus carries a higher hazard risk. However, the essential requirement for these alternatives, as well as the proposed project, is a well-prepared and properly implemented evacuation plan.

Beach Protection

Discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Alternative 1 and, to a lesser extent, Alternative 2, will retain the shoreline area in its natural condition.

Similar to the proposed project, Alternative 1 provides for a shoreline setback of considerable width within which no structure, except for possible culturally-related structures, would be allowed. Alternatives 1 and 2 will thus be designed to avoid erosion of structures and minimize interference with natural shoreline processes.

Marine Resources

The discussion in Section 5.1.3 is also applicable to Alternative 1 which is described to be an alternative that is specifically projected to mitigate anticipated adverse impacts on water quality and the marine environment that might otherwise result from the original harbor design and scale, which is also incorporated in Alternative 2 . The reduced marina size under Alternative 1 is projected to meet water quality standards and enable greater compliance with the objective and policies addressed in this section.

Alternative 2 includes a golf course component and thus the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Hawai'i State Plans, Chapter 226, Hawai'i Revised Statutes

Section 226-4 (State goals), 5 (Objectives and policies for population, and 6 (Objective and policies for economy in general):

The discussion in Section 5.1.4 is applicable to Alternatives 1 and 2, in addition to the proposed project. These development concepts generally conform to the goals, objectives, and policies set forth in these sections because they will provide some degree of economic viability, stability, and sustainability for future generations. Kona Kai Ola will convert essentially vacant land into a mixed-use development with a distinctive marina and boating element, providing a wide range of recreational, business, and employment opportunities to the community.

Section 226-8 Objective and policies for the economy – the visitor industry:

Alternatives 1 and 2 will be consistent with the State's economic objective and policies relating to the tourism industry for the same reasons that are discussed in regard to the proposed project in Section 5.1.4. They will incorporate JDI's commitment to sustainability principles in the planning and design of the development concepts in Alternatives 1 and 2. Although the total hotel and time-share unit count is reduced to approximately 1,500 in Alternatives 1 and 2, the transient accommodations component of these alternatives will still further the State's objective and policies for increased visitor industry employment opportunities and training, foster better visitor understanding of Hawai'i's cultural values, and contribute to the synergism of this mixed-use project concept that addresses the needs of the neighboring community, as well as the visitor industry.

Section 226-11 Objectives and policies for the physical environment: land-based, shoreline and marine resources:

Alternative 1 is expected to involve less potential adverse impacts upon these environmental resources than the proposed project. Likewise, and Alternative 2 would have less adverse impact because of its reduction in the size of the marina and in the total hotel and time-share unit count. Alternative 1 carries less potential risk to water quality and related impacts upon the marine environment and anchialine pool ecosystems. Although approximately three anchialine pools are expected to be destroyed, the great majority of pools will be preserved within and outside of the proposed 400-foot shoreline setback.

The golf course component in Alternative 2 has the potential to impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the marina basin and nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools by introducing the chemicals into the pond systems.

Section 226-12 Objective and policies for the physical environment: scenic, natural beauty, and historic resources:

The discussion in Section 5.1.4 is directly applicable to Alternative 1 and describes the compliance with the objective and policies addressed.

The golf course component of Alternative 2 would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area.

Just as with the proposed project, Alternatives 1 and 2 would also be designed to blend with the natural terrain and to honor and protect the cultural history, resources, and practices of these lands.

Section 226-13 Objectives and policies for the physical environment: land, air and water quality:

As stated above, because of the reduction in both the number of slips and the size of the marina basin, with proper facilities design, public education and enforcement of harbor rules and regulations, Alternative 1 is anticipated to cause fewer long-term impacts to water quality than either the proposed project or Alternative 2. Based on the findings of the Harbor Water Quality Modeling Study, water quality resulting from a reduced marina basin size as proposed under Alternative 1 is expected to be similar to existing conditions.

As previously noted, Alternative 2 has the potential to adversely impact water quality by increasing the nutrient loading in surface runoff and groundwater by introducing pesticides, herbicides and other chemicals common in golf course development and maintenance into the marina basin and nearshore waters surrounding the project site.

Section 226-14 Objectives and policies for facility systems - general:

Alternatives 1 and 2 will conform to the objective and policies of this section on the grounds that are discussed in regard to the proposed project in Section 5.1.4. The master-planning and phasing of the project concepts under these alternatives will be coordinated with associated public and private infrastructural planning and related private and public infrastructural financing. The cost of the marina construction and project-related infrastructure is to be borne by the developer, resulting in considerable savings for the public. In addition, the projected lease revenue from these public lands will provide additional public benefits by establishing a revenue stream for capital improvements and maintenance of a range of State facilities.

Section 226-15 Objectives and policies for facility systems - solid and liquid wastes:

In addition to the developer's commitment to sustainable development design, the project will involve upgrades to the County of Hawai'i's Kealakehe Wastewater Treatment Plant to meet current needs, as well as the project's future needs. This commitment is applicable to Alternatives 1 and 2, as well as the proposed project that is discussed in Section 5.1.4.

Section 226-16 Objectives and policies for facility systems – water:

The discussion of water conservation methods and the need to secure additional potable water sources in Section 5.1.4 is also applicable to Alternative 1 and demonstrates conformity to the objective and policies for water facilities. Alternative 2 involves greater irrigation demands in regard to its golf course component and greater potable water demands for human consumption than those for Alternative 1. Alternative 2 is expected to face more serious challenges in securing adequate and reliable sources of water.

Section 229-17 Objectives and policies for facility systems – transportation:

Alternatives 1 and 2 will conform to this objective and policies because they will present water transportation opportunities, including the possible use of transit water shuttles to Kailua-Kona, as described in regard to the proposed project in Section 5.1.4.

Section 226-18 Objectives and policies for facility systems – energy:

Alternatives 1 and 2 conform to these objective and policies through the use of energy efficient design and technology and commitment to the use and production of renewable energy to serve the project's needs. Solar energy production, solar hot water heating, and the use of deep cold seawater for cooling systems are currently identified as means of saving substantial electrical energy costs for the community and the developer.

Section 226-23 Objectives and policies for socio-cultural advancement – leisure:

Alternative 1 conforms to this objective and related policies for the reasons offered in Section 5.1.4 in regard to the proposed project. Alternative 1 will be of greater conformity with the policy regarding access to significant natural and cultural resources in light of the 400-600 foot shoreline setback that has been designed for this alternative.

Although it does not propose the considerable shoreline setback that is planned for Alternative 1, Alternative 2 is consistent with this objective and related policies in incorporating opportunities for shoreline-oriented activities, such as the walking trails. In addition, the golf course component adds a more passive recreation alternative to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Section 226-25 Objectives and policies for socio-cultural advancement-culture:

The discussion in Section 5.1.4 is relevant to Alternatives 1 and 2 and demonstrate their conformity the objective and policies of this section.

Both alternatives involve the preservation and protection of cultural features that have been identified by the Cultural Impact Assessment and archaeological studies for the project area. Both provide for public shoreline access, and both will continue the policy of close consultation with the local Hawaiian community and cultural and lineal descendants in the planning of cultural resource preservation and protection.

Section 226-103 Economic priority guidelines:

Alternatives 1 and 2 conform to these guidelines for the same reasons that are set forth in Section 5.1.4. They involve private investment in a public project that will create economic diversification through a mix of marina, industrial, commercial, visitor, and cultural facilities. This presents a wide range of entrepreneurial opportunities, long-term employment opportunities, and job training opportunities.

Section 226-104 Population growth and land resources priority guidelines:

As described in Section 5.1.4, the policy support for the proposed project also extends to the similar development concepts considered in Alternatives 1 and 2. Those alternatives conform to the guidelines of this section because they involve an urban development under parameters and within geographical bounds that are supported by the County's General Plan, a preliminary form of the Kona Community Development Plan, the County's Keahole to Kailua Regional Development Plan, and the reality of being located along the primary commercial/industrial corridor between Keahole Airport and Kailua-Kona. As with the proposed project, the development concepts of Alternatives 1 and 2 are essentially alternatives for the implementation and "in-filling" of the urban expansion area in North Kona.

DHHL Hawai'i Island Plan

This 2002 plan projects DHHL's Honokōhau makai lands for commercial use. As compared to the proposed project and Alternative 2, Alternative 1 presents an expanded commercial component that provides greater compliance with the plan, while addressing certain beneficiaries' concerns about the scale of the marina originally required in the Project. Alternative 2 also conforms to the recommended commercial uses in the makai lands but to a lesser degree than Alternative 1 because of its more limited commercial component. Like the proposed project, its marina size and number of slips raise environmental issues, as more specifically discussed in Part 3, and community concerns.

County of Hawai'i General Plan

HCGP Section 4 – Environmental Quality Goals, Policies and Courses of Action:

Alternative 1 is consistent with this section. It presents a reduction in both the number of slips and the size of the marina basin that, in combination with proper facilities design, public education and enforcement of harbor rules and regulations, would result in very few long term impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions.

Alternative 2 is the least consistent with this section. In addition to the potential significant impacts of its 800 slip marina basin, its golf course component has the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides and other chemicals common in golf course use and management into the nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools beyond their current conditions by introducing such substances into the pool systems.

HCGP Section 7 – Natural Beauty Goals and Policies:

Alternative 2 conforms to some degree with this section. Its golf course component would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area, as demonstrated in other makai golf courses within the region.

HCGP Section 8 – Natural Resources and Shoreline:

Alternative 1 is most consistent with the goals and policies of this section. It would require considerably less marina excavation than the proposed project and Alternative 2 and would reduce the potential risk of long-term adverse impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions with the degree of reduction in marina basin size that is proposed under Alternative 1. This reduction is also expected to reduce potential impacts upon anchialine pools and their ecosytems, as well as shoreline and marine resources that are affected by water quality. Alternative 1 also retains the shoreline preservation and protection concepts that are proposed in and described for the Project.

HCGP Section 10 – Public Facilities Goals and Policies:

The discussion in Section 5.2.1. in relation to the proposed project is applicable to Alternatives 1 and 2. Improvements to public facilities are are integral to the Kona Kai Ola development. The provision of additional boat slips and numerous road improvements, including a makai extension of Kuakini Highway south to Kailua-Kona are incorporated into plans for the project's development. In light of these elements, Alternatives 1 and 2 are consistent with the goals and policies of this section.

HCGP Section 11 – Public Utility Goals, Policies:

As with the proposed project, Alternatives 1 and 2 are consistent with the goals and policies of this section, based on the relevant grounds set forth in Section 5.2.1. The developer is committed to design, fund, and develop environmentally sensitive and energy efficient utility systems to the extent possible, as described previously in Part 5. Its master planning provides for the coordinated development of such systems with the objective of achieving significant savings for the public. As previously-mentioned example, the project development involves the upgrading of the Kealakehe Wastewater Treatment Plant.

HCGP Section 12 – Recreation:

Alternative 1 is consistent with the goals, policies, and courses of action for North Kona in this section.

Although the number of slips is reduced under Alternative 1, the region's boating opportunities and support facilities will still be expanded. The existing marina entrance would still be utilized under this alternative. However, concerns relating to increased activity leading to increased congestion in the marina entrance area would be mitigated to a certain extent. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities and marine science center remain important components of Alternative 1.

The golf course component of Alternative 2 would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola. Alternative 2 is also considered to be consistent with this section.

HCGP Section 13 and 13.2 – Transportation:

The reduced marina component under Alternative 1 will still provide transportation opportunities and provide for possible use of transit water shuttles to Kailua-Kona, although to a lesser degree than under the proposed project and Alternative 2 . However, in each scenario, internal people-movers are planned, and numerous roadway improvements are planned for coordination with public agencies, including but not limited to the construction of the Kuakini Highway extension between Honokōhau and Kailua-Kona. Accordingly, both Alternatives 1 and 2 are consistent with the goals, policies, and courses of action for North Kona under these sections of the General Plan.

HCGP Section 14.3 – Commercial Development:

For the reasons presented in the discussion under Section 226-104 of the State Plan, the planned commercial component under Alternatives 1 and 2 are consistent with this section.

HCGP Section 14.8 – Open Space:

Alternatives 1 and 2 are consistent with the goals and policies of this section. Alternative 1 provides a considerable (400-600 foot) shoreline setback along the entire ocean frontage of the project site as a means of protecting the area's scenic and open space resources, as well as natural and cultural resources. Although it does not incorporate the shoreline setback planned in Alternative 1, Alternative 2 provides a golf course component would contribute to the amount of open space that is currently proposed and allow additional view corridors to be created.

Community Development Plans

Community development plans are being formulated for different regions in the County in order to supplement the County's General Plan. The Kona Kai Ola project is located in the Kona Community Development Plan (CDP) area. Maps associated with the preliminary work phases

of the Kona CDP include the Kona Kai Ola project site within the "Preferred Urban Growth" boundary of the North Kona district. The Kona CDP process is guided by a Steering Committee composed of a broad cross-section of the community. The Steering Committee will eventually complete its work and recommend the CDP's adoption.

After the DEIS was published, the Kona CDP has progressed to the development of plans for the major urban growth corridor north of Kailua-Kona. The Kona CDP has produced a draft plan showing a transit oriented development that includes a midlevel public transit corridor along the mauka residential elevation, and a makai transit corridor that runs along a proposed new frontage road just makai and parallel to Queen Kaahumanu Highway. The development plan for Alternative 1 includes the Kuakini Highway as part of this proposed frontage road and transit line from Kailua Kona to the Kealakehe area, along with a transit stop at Kona Kai Ola. The Alternative 1 plan also includes a road that could be extended to be part of the proposed frontage road should it be approved and implemented. In addition, the Kona CDP has continued to emphasize the principles of smart growth planning with mixed use urban areas where people can live, work, play and learn in the same region. Kona Kai Ola has been specifically designed to be consistent with this policy in order to provide a stable employment base close to where people live in the mauka residential areas already planned for DHHL and HHFDC lands.

It should be noted that currently and over the years, the 1990 Keāhole to Kailua Development Plan (K-to-K Plan) guides land use actions by the public and private sectors. It is intended to carry out the General Plan goals and policies related to the development of the portion of North Kona area, including the Kona Kai Ola site. The "Preferred Growth Plan" of the Keāhole to Kailua Development Plan identifies the project site as a new regional urban center to include commercial, civic, and financial business related uses, an expanded "Harbor Complex," a shoreline road, and a shoreline park. The proposed project and the development concepts in Alternatives 1 and 2 are therefore consistent with the recommendations in the Keāhole to Kailua Development Plan.

Hawai'i County Zoning

As shown on Figure AA, the project site is zoned "Open". Under Section 25-5-160 of the Hawai'i County Code, "The O (Open) district applies to areas that contribute to the general welfare, the full enjoyment, or the economic well-being of open land type use which has been established, or is proposed. The object of this district is to encourage development around it such as a golf course and park, and to protect investments which have been or shall be made in reliance upon the retention of such open type use, to buffer an otherwise incompatible land use or district, to preserve a valuable scenic vista or an area of special historical significance, or to protect and preserve submerged land, fishing ponds, and lakes (natural or artificial tide lands)".

Some of the proposed uses at Kona Kai Ola are permitted uses in the Open zone such as:

- Heiau, historical areas, structures, and monuments;
- Natural features, phenomena, and vistas as tourist attractions;
- Private recreational uses involving no aboveground structure except dressing rooms and comfort stations;

- Public parks;
- Public uses and structures, as permitted under Section 25-4-11.

In addition to those uses permitted outright, the following uses are permitted after issuance of a use permit:

- Yacht harbors and boating facilities; provided that the use, in its entirety, is compatible with the stated purpose of the O district.
- Uses considered directly accessory to the uses permitted in this section shall also be permitted in the O district.

The proposed time-share and hotel units and commercial uses would not be consistent with the zoning designation of “Open”. Project implementation therefore requires rezoning of portions of the project to the appropriate zoning category or use permits for certain uses.

Special Management Area

As shown in Figure AB, the entire project area up to the highway is within the coastal zone management zone known as the Special Management Area (“SMA”). At the County level, implementation of the CZM Program is through the review and administering of the SMA permit regulations. Kona Kai Ola complies with and implements the objectives and policies of the Coastal Zone Management (CZM) Program, and a full discussion is provided in Section 5.1.3. The development concepts in the proposed project and Alternatives 1 and 2 will be subject to applicable SMA rules and regulations.

Attachment 2

4.6.5 Workforce Housing Impacts

In response to DEIS comments, a study of possible workforce requirements and related secondary impacts was conducted by The Hallstrom Group; this study is presented in Appendix C-2. This study was based on a four-step study process that included 1) quantification of population and employment projections, 2) .analysis of West Hawai‘i employment demand and supply, 3) characterization of the subject workforce, and 4) quantification of subject workforce housing impacts.

The population and job count on the Hawai‘i Island are forecast to increase by approximately 70 percent during the 24 year projection period that ends in 2030. On average, at least 60 percent of the population growth will be a result of net in-migration to the County.

Although trends will be slowing relative to recent decades, a significant portion of the population and business expansion will be directed towards West Hawai‘i. In the next two decades, the population and job count in West Hawai‘i will increase by about 80 percent, reaching 128,200 residents and 87,400 employment positions by 2030. The available approved or entitled, proposed and announced new projects and their associated forecast job creation supply will not be sufficient to meet estimated employment demand over time. Further, with the approaching build-out of the major West Hawai‘i resorts and residential-orientation of the newer resort communities, few opportunities will exist for expansion in the historically-vital tourism economic sector.

As discussed in Section 4.6.3.2, implementation of the Kona Kai Ola master plan will create a total of 3,842 on-site full time equivalent employment positions in the operating businesses of the development. The project is estimated to be operational around 2012, following completion of infrastructure and Phase I construction, and will continue until the community reaches build-out and stabilization in 2026.

Approximately 45 percent of the jobs will be entry level positions with an average annual wage of $20,000 in current dollars. Another 40 percent will be mid-level jobs with average yearly pay of $32,000, and, 15 percent will be management/high-skill positions with wages averaging $50,000.

Approximately 2,147 of the jobs in the subject project will be filled by persons who have in-migrated to the Big Island. However, only a nominal portion would be specifically relocated to West Hawai‘i as a result of the development.

The total net housing load created by Kona Kai Ola in-migrant workers will be 1,074 units. This in-migration will generate a need for a range of 625 to 859 affordable housing units, as follows:

- As discussed in Section 4.5.2.2, under Hawai‘i County Ordinance Chapter 11, Section 4 Affordable Housing Requirements, hotel uses generating more than 100 employees on a full-time equivalent basis must earn one affordable housing credit for every four full-time equivalent jobs created. Application of the "1 to 4" ratio to all of the transient units proposed for Kona Kai Ola (hotel and time-share) results in a workforce housing requirement of 625 units.

- Another method of calculating the need for affordable worker housing units is to estimate that approximately 80 percent of the total in-migrant worker need housing that meet affordable housing pricing guidelines. This results in a high end range of 859 units.

Based on affordable housing pricing guidelines, affordable housing units will have an estimated sales price of $216,000 to $292,000.

As agreements between the State and JDI prohibit residential development at Kona Kai Ola, workforce housing would need to be located off-site. Probable and desirable locations for workforce housings were based on availability, efficiencies and surveys conducted of area workers. Possible locations in support of Kona Kai Ola included the mid-elevation lands of the Keahole to Kailua-Kona Corridor, between the Queen Ka'ahumanu fronting commercial/industrial developments and Mamalahoa Highway; and in the Waikoloa Village expansion areas.

The most suitable location for workforce housing units is the Villages at La'i'Ōpua community, a DHHL project, or within the Hawai'i Housing Finance and Development Corporation affordable housing development planned for Keahuolū. These are two State-owned undertakings directly across the highway in the same ahupua'a . Locating workforce affordable housing units in these communities would substantially lessen the traffic impacts associated with a community subject workforce. Alternatively, the State lands adjacent to Waikoloa Village would be appropriate.

JDI will comply with all affordable housing requirements of applicable Hawai'i County ordinances.

4.6.6 Market and Economic Impacts Associated with Alternative 1

Alternative 1, which has a reduced marina size of 25 acres, and fewer hotel and time-share units, would have a meaningful market standing, create significant economic opportunities, and provide a net benefit to State and County coffers. From a market perspective, a smaller Kona Kai Ola would still be the only mixed use community in the Keahole to Kailua-Kona Corridor offering competitive hotel and time-share product.

The additional commercial sites in the near-highway lands will also be in demand as the area continues its evolution into the northerly gateway of the Kona urban center. The increased retail acreage will further capitalize on the available frontage-related opportunities by generating greater cumulative attraction for the development and enabling increased product diversity supporting a wider spectrum of businesses.

Absorption of the visitor-oriented inventory would be proportionately shorter with fewer hotel and time-share sites and units to be marketed, and fewer marina slips to be filled. The absorption time-frame for the larger commercial component will be longer, while the amount of marina-support and other leasable acreage is the same as in the proposed project and will require a similar absorption period.

Table 3 compares the primary marketable components of the proposed project and Alternative 1 and their estimated absorptions:

Envelope PostMarked 06Feb2007

February 4, 2007

I request a sixty day extension for public comment in regards to the development project at Alula for the following reasons:

1. The Jacoby DEIS was issued on December 19, 2006, and publicly noticed by the Office of Environmental Quality on December 23rd, just before the Holidays. Thus, not giving enough time to properly prepare for comments.

2. The document was not available on-line until January 2, 2007–two weeks into the 6 week public comment period.

Given the above, reasonable knowledge of and opinions about such a substantial document cannot be gained and presented with in 45 days.

3. Lastly, and more importantly, this area is a very special and important cultural area, with much cultural significance to the past as well as to the present. Personally, I can speak for my halau, Na Wai Iwi Ola, of which I am a student. We use Alula Bay for our annual H'uwai (cleansing), as well as throughout the year for other cultural events. Alula has been an inspiration for all of us, and a place for us to go and find peace and enlightenment. It is the inspiration for our halau's greeting chant, which we chant at each meeting and practice. Below is our welina chant. And I hope with all my heart you will take this letter into consideration, and please save our precious Alula.

Greeting Chant–Kumu Keala Ching

Welina Hawai'i
Kama a papa

Papawai ka'i'iwi
Papa a Hina

Hina 'ia ke aloha
E Alula

Lalani o ka uka
Lalani o ke kai

'O kai ma 'oki 'oki e

Alice Bailey Knight

Alice Bailey Knight, student Na Wai Iwi Ola

Alice Bailey Knight
75-6008 Alii Drive #201
Kailua Kona, Hawaii 96740

HONOLULU HI 968
06 FEB 2007 PM 1 L

attn Dayan Vithanage
Oceanit Center
828 Fort St Mall 6th Fl
Honolulu HI 96813

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FEB 20 2007

[redacted]

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July 23, 2007

Alice Bailey Knight
75-6008 Ali'i Drive, #201
Kailua-Kona, Hawai'i 96740

Dear Ms. Knight:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Dated February 4, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses are provided in the numerical sequence of your letter.

1. The DEIS was published in the Office of Environmental Quality Control Bulletin on December 23, 2006. The required 45-day comment period ended on February 6, 2007. The comment period time frame is set forth in Hawai'i Administrative Rules, Section 11-200-22 (b), which states that "The period for public review and for submitting written comments shall commence as of the date notice of availability of the draft EIS is initially issued in the periodic bulletin and shall continue for a period of forty-five days."

   We note that, if we received a written request to extend the comment period, we responded that we would include comments and our responses in the Final EIS if the transmittal was postmarked by February 13, 2007. We also invited people to contact me if they wanted hard copies or electronic files of the DEIS.

   We further note that your letter was postmarked February 6, 2007, and we received it on February 20, 2007.

2. The online posting of documents are handled by the State Office of Environmental Quality Control; we do not have any control over this matter.

3. We assure that the development of Kona Kai Ola is not intended to destroy 'Alula Bay and the anchialine pools south of the harbor. In fact, the Kona Kai Ola project is designed to protect these resources and enhance the community experience when you visit or encounter these resources.

   The developer fully respects the value of 'Alula Bay, a small pocket beach located a short distance to the south. We understand that 'Alula provides the only safe ocean access during calm seas and that 'Alula beach is also used regularly by kupuna from the region, and hula halau for cleansing ceremonies, or hiu wai.

The Cultural Impact Study, which is summarized in EIS Section 4.1, Cultural Impacts, and contained in Appendix L-1, included ‘Alula in its study, and notes that this white sand beach is known in chants and stories as ‘Alula. In Emerson‘s map of 1888, ‘Alula was a canoe and small boat landing. According to some interviewees in the Cultural Impact Study, the original name for the beach was ‘Aulaula, which describes the broad current of the bay. ‘Alula is susceptible to an inundation of northwest swells, which travel far inland. There is an ‘opelu koa or ‘opelu fishing ground in the bay.

The Kona Kai Ola project includes a 400-foot setback, or buffer zone, along the entire length of the project’s shoreline. Improvements within this buffer zone will be limited to lateral shoreline public trails, mauka-makai access trails from the project site, and cultural or environmental-related improvements relating to existing features within the buffer zone. No buildings or structures shall be proposed within the 400-foot shoreline setback area, with the possible exception of culturally-related structures. ‘Alula Bay will therefore be protected in Kona Kai Ola.

In response to DEIS comments and to further study the pools south of the entrance channel of Honokohau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2 of the EIS and is summarized in EIS Sections 3.9.2.1 and 3.9.2.2. In addition, further comment on the groundwater hydrology effects on anchialine pools was prepared by Waimea Water Services and is contained in Appendix G-3 of the EIS. Attachment 1 contains the EIS Sections 3.9.2.1 and 3.9.2.2.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

The conditions with the project constructed were found to be phosphorous limited. Several simulations were performed including and excluding the inflow from the marine exhibits which provides an additional nitrogen load and also varying the location of this inflow. It was found that the inflow from the marine exhibits can have a beneficial effect on flushing, especially when positioned within the existing harbor basin. However, its effect is significantly less than the effect due to the brackish groundwater inflow. When the exhibit inflow is excluded or positioned at the east end of the new marina, its effect is small in terms of flushing due to its high salinity. From a water quality perspective, since the loads from the exhibit inflow consist primarily of nitrogen, it does not cause increased algae growth. However, this exhibit inflow does raise the concentrations of ammonia and nitrate in the system.

Simulation results indicate that under the conditions when the post-expansion system receives an additional brackish inflow into the new 25-acre marina on the order of 30 mgd or more, water quality within the harbor system and in the surrounding waters remained similar to existing conditions. These conditions are expected to occur based on the findings reported by Waimea Water Services (2007), which states that the proposed marina would exhibit the same or similar flushing action as the existing marina.

An additional mitigation measure proposed by Waimea Water Services (2007), if sufficient inflow is not intercepted, consists of drilling holes in the bottom of the new marina to enhance this inflow and facilitate flushing within the proposed system.

~~3.9.3~~3.9.2 Anchialine ~~Ponds~~ Pools

Two studies on anchialine pools were conducted in this EIS process. The anchialine ~~ponds~~ pools water quality studies and ~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute and is~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute in October 2006 and are included as Appendix ~~G~~H-1. That survey included pools located both north and south of Honokōhau Harbor. In response to DEIS comments and to further study the pools south of entrance channel of Honokōhau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2.

~~3.9.3.1~~3.9.2.1 Existing Conditions

Anchialine ~~ponds~~ pools exist in inland lava depressions near the ocean. Two anchialine ~~pond~~ pool complexes are located immediately to the north and south of the Honokōhau Harbor entrance channel. The complex to the north is located wholly within the designated boundaries of the Kaloko-Honokōhau National Historical Park as shown in Figure Q~~O~~. Many of the ~~ponds~~ pools in the southern complex are within the park administrative boundary as well. ~~Ponds~~ Pools in the northern complex show little evidence of anthropogenic impacts. Many contain typical vegetation and crustacean species in high abundance.

Figure R locates anchialine pools near the harbor entrance and pools~~Ponds~~ in the southern complex are depicted in Figure S.

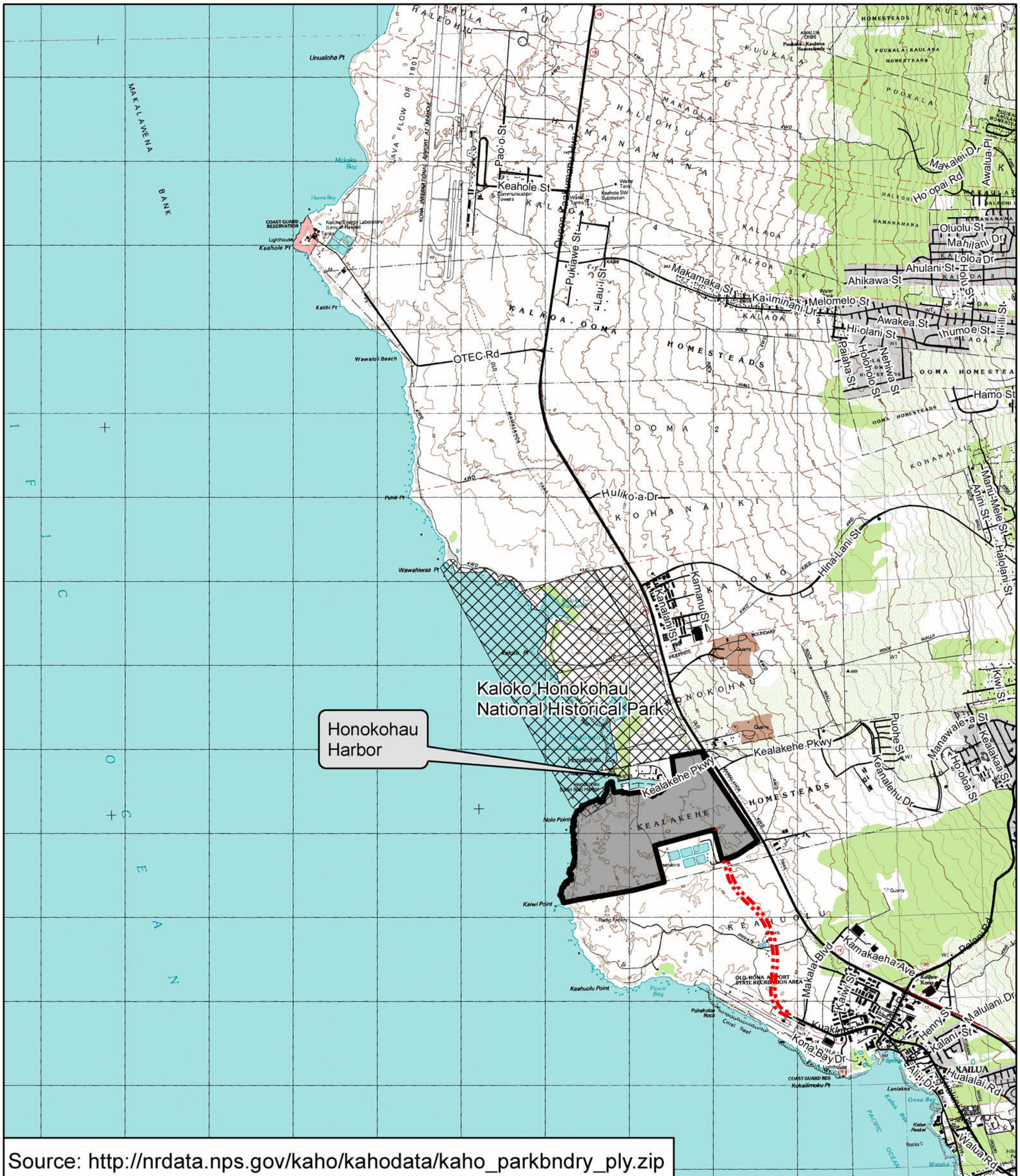

Figure Q: National Historical Park Service Legislative Boundary Map

Legend

- Project Site
- Proposed Parkway
- National Park Boundary

N W E S

0 2,500 5,000 Feet

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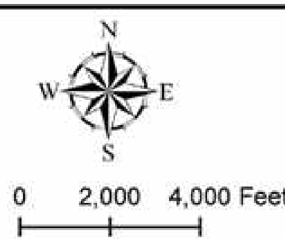
Source: Oceanic Institute

Figure R: Anchialine Pool Locations



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Source: Aquatic Resources Management And Design

Figure S: Anchialine Pool Locations in Southern Complex

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The 2006 study identified 22 pools in the southern complex. The 2007 study found that three of the 22 pools are part of an estuary complex with direct connection to the ocean. While there were several signs of direct human use and disturbance, such as trash receptacles and toilet facilities, the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickleweed and mangrove. ~~are moderately to heavily impacted, with many containing exotic fish that exclude the anchialine crustaceans. The ponds also show evidence of human impact, including discarded bottles, cans, wrappers, diapers, toilet paper, etc. Water quality conditions within the ponds generally reflect the conditions of the underlying groundwater.~~

~~Figure P locates anchialine ponds near the harbor entrance. The study conducted as a part of this EIS show that the anchialine ponds south of the harbor entrance are moderately to heavily impacted by human activities and introduced fish populations. The study found that the nitrogen phosphorus concentrations in these ponds are significantly higher compared to the ponds north of the harbor entrance. The sources of these additional nutrients are not known. Continuous influx of nutrients will eventually degrade the water quality to levels that could alter the pond ecology.~~

Biota surveys in the two pond systems clearly indicate that counts of typical pond denizens show a remarkable difference between the northern and southern ~~ponds~~ pools. In the northern ~~ponds~~ pools the number of *Halocaridina rubra* ranged from a low of 20–25 to too numerous to count. The biota rich pond bottoms appeared red due to the *Halocaridina rubra* numbers. The only other species visible was the predatory shrimp *Metabetaeus lohena*. In contrast, only four out of the 22 ~~ponds~~ pools examined in the southern pond complex showed a decreased presence of *Halocaridina rubra* (6 to 200) individuals in the pond, and three ~~ponds~~ pools contained *Metabetaeus lohena*. Eight of the ~~ponds~~ pools contained numbers of introduced minnows which is an apparent predator of *Halocaridina rubra* and *Metabetaeus lohena*.

The 2007 study found three of the pools identified in the 2006 study were part of an estuary complex with direct connection to the ocean, and that the southern complex contained 19 anchialine pools. The study further found that a majority of the southern pools are degraded biologically and physically, primarily due to the effects of introduced fish and plant species. Six pools are currently devoid of alien fish, but they face a high level of threat due to the proximity of pools that have these species. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction.

The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 ppt. and that the anchialine biology would then perish. There is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and final determination of anchialine salinity following the harbor construction. The assessment that all anchialine pools will be barren with the construction of the harbor may be premature. *Halocaridina rubra* (opae ula) are routinely drawn from high salinity wells at 30-32 ppt.

Within the 19 pools, native and non-native fauna included 14 species comprised of 5 fish, 2 mollusca, and 6 crustacea. Algae within the pools primarily consisted of a mixed assemblage of diatoms and cyanobacteria, with several pools dominated by matted filamentous *Cladophora*, sp. The darker cave/overhang pools and high tide pools had epilithic *Hildenbrandia* sp. covering the rock substrate. Riparian vegetation was dominated by introduced species consisting of Pickleweed (*Batis maritima*), Mangrove (*Rhyzophora mangle*), and Christmasberry (*Shinus terebenthifolius*). Only two species of native plants Akulikuli (*Sesuvium portulacastrum*) and Makaloa (*Cyperus laevigatus*) existed near the pools and comprised only few small patches and a single tuft (respectively).

Most of the hypogeal anchialine shrimp have adapted to the presence of minnows by foraging in the pools at night. During daylight hours, only the adult shrimp appear to coexist at low population levels with the smaller *P. reticulata*, but the larger *G. affinis* and *Oreochromis* prevent the daytime appearance of hypogeal shrimp due to predation.

The average salinity in Kealakehe pools is relatively high at 13.5 ppt compared to most other pools along the West Hawaiʻi coastline, having an average of approximately 7 ppt. This high salinity appears to be characteristic of this region, and is similar to the average of most pools within the adjacent ahupua'a of Honokōhau and Kaloko. The levels of nitrate-nitrogen levels are relatively high compared to other undeveloped areas, but fall in the range of some developed landscapes. Other water quality parameters, including pH and temperature, fall into normal ranges for anchialine pools.

This relatively high salinity is the likely reason aquatic insects were not found in any pools at Kealakehe. Though the rare damselfly *Megalagrion xanthomelas* has been observed and collected from Kaloko, a statewide assessment of its range has not found it to occur in water with salinity greater than 3ppt. However, there has been an unsubstantiated occurrence of the nymph in a pool of up to 8ppt (Polhemus, 1995).

Another species of concern is the hypogeal decapod shrimp *Metabetaeus lohena.* These shrimp are sometimes predatory on *H. rubra* but are more often opportunistic omnivores similar to *H. rubra.* Predusk and nocturnal sampling at high tide is clearly the optimal method to determine habitat range and population densities for this species. These shrimp were found in 13 of the 19 pools, 7 of which had *M. lohena* only at night. The occurrences of *H. rubra* were found in 16 of 19 sampled pools, 8 of which had ʻŌpaeʻula observed only at night. Consequently, despite having numerous degraded anchialine resources at Kealakehe, there are opportunities for many of the pools to be restored and enhanced to a level where large populations of anchialine shrimp and other native species may return to inhabit the pools as they likely have in the past.

~~As mentioned earlier, the southern ponds also had elevated concentrations of nutrients indicating water quality degradation. These factors indicate that if no restoration or maintenance activities are instituted to reserve these ponds, these ecosystems will degrade beyond recovery.~~

~~3.9.3.2~~3.9.2.2 Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

The anchialine ~~ponds~~ pools that are located north of the existing harbor are not likely to be impacted because no development activities are proposed north of the existing harbor. It is highly unlikely that existing groundwater flows to the Kaloko-Honokōhau pond system to the north of the existing harbor will be impacted by the proposed marina to the south.

Of the 19 pools in the southern complex, three would be eliminated due to harbor construction. Regarding the remaining pools, the DEIS noted that t~~T~~he change in the local groundwater flow pattern in the vicinity of the proposed marina ~~will~~ would impact the anchialine ~~ponds~~ pools that are located between the proposed marina and the shoreline south of the harbor entrance. The 2006 study (Appendix H-1) noted that t~~T~~he salinity of the anchialine ~~ponds~~ pools ~~will~~ would increase due to reduction of brackish groundwater, and that ~~. Some ponds will be excavated to make the new harbor basin. T~~those ~~ponds~~ pools that are not excavated will revert to full salinity, causing the loss of their habitat. ~~and associated aquatic flora and fauna. However, current investigations indicate that these ponds are already enriched by nutrients and the density of associated aquatic fauna is very low. In addition, trash from visitors, and introduction of minnows has already degraded the pond ecology.~~ Even without the potential impacts from the proposed marina construction, the pond ecology might change irreversibly from the nutrient input, human indifference and expansion of non native fauna species.

Further studies conducted in response to DEIS comments (Appendix H-2, and Appendix G-3) indicate that the remaining pools may not increase in salinity to levels unhealthy for *H. rubra* and *M. lohena* and other anchialine pool fauna. In addition, these studies determined that there are realistic mechanisms employed elsewhere that would mitigate changes due to groundwater changes. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore.

Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented. The mitigation plan will be based on the following objectives:

Objective 1 To preserve, maintain, and foster the long-term health and native ecological integrity of anchialine pools at Kealakehe.

Objective 2 To protect and promote cultural practices and traditions surrounding anchialine resources at Kealakehe.

Objective 3 To provide education, interpretation, and interactive opportunities for the community to learn about and appreciate the anchialine resources.

Objective 4 To acquire a pond manager to implement the program, conduct monitoring, research, and reporting, and provide education to the community about anchialine and estuarine resources.

Mitigation measures to facilitate the long-term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on the environment can be measured. The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment and possible new pools.

As a mitigation measure, bioretention, which is a Best Management Practice (BMP) is a feasible application for the proposed development. There is a probability that nutrients and other potential pollutants will runoff landscaping and impermeable surfaces such as roadways and parking lots during medium or high rainfall events. Some of these pollutants could enter the groundwater table and into anchialine pools and ultimately the ocean. As an alternative to directing runoff into the ground through drywells, storm water should be directed into bioretention areas such as constructed surface or subsurface wetlands, vegetated filter strips, grass swales, and planted buffer areas. Storm water held and moved through these living filter systems are essentially stripped of most potential pollutants, and allowed to slowly infiltrate back to the groundwater table.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Another mitigation measure that may be included in the management plan is salinity adjustment. In the 2006 assessment regarding the impact to the southern pools from the proposed construction of the harbor, it was stated that this construction would cause the salinity in the anchialine pools to become equivalent to the ocean at 35ppt. It was then concluded that the anchialine biology would perish.

However, there is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and a final determination of anchialine salinity following the harbor construction. The dynamics of groundwater movement through a porous lava medium both seaward and laterally along the coastline is an inexact science. This is compounded by the variations in water density, including stratification of salinity within the proposed harbor and capillary movement of low-density surface water through the substrata.

The assessment that all anchialine pools will be barren with the construction of the harbor may therefore be premature. *H. rubra* are routinely drawn from high salinity wells at 30 – 32 ppt and survive in this salinity for years. Further, high populations *H. rubra* and *M. lohena* have thrived and reproduced in pool salinities of 27ppt. If the pools do become full strength seawater at 35ppt, there exists uncertainty on the long-term effects to anchialine organisms, since there are no long-term studies or examples of native anchialine ecosystems at 35ppt. Native anchialine pool vegetation also has relatively high salinity tolerance.

If the salinity were expected to rise to 35 ppt, possible mitigation in the management plan will include methods to surcharge man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water. If sufficient volume is used, it is theoretically possible to lower salinity in adjacent natural anchialine pools. This surcharge method has been successfully used to raise salinity in anchialine pools and cause the salinity rise in adjacent pools of at least up to 10 meters away. Surcharging with low salinity should work as well or better since the lower density water will essentially float atop the higher salinity water at the surface layer, and move throughout the complex of natural pools. Surcharging may also be a viable mitigation to dilute and more rapidly disperse any pollutants that may be detected in the pools.

Another mitigation measure includes the creation of new anchialine pools. There is significant opportunity to create new anchialine pools and greatly expand the native habitat and resource. It has been demonstrated at several projects in West Hawaiʻi that anchialine pools can be created and will be colonized with a full compliment of anchialine species endemic to the area. Anchialine pools are considered focal points of higher productivity relative to the subterranean groundwater habitat around them. Their productivity promotes an increase in population levels of anchialine species within the pools themselves and throughout the subterranean habitat surrounding them.

~~No realistic mechanisms are envisioned for re-injecting fresh water into these systems to maintain their ecological balance as an anchialine system. These ponds will be changed from a brackish water system to a marine system. But, those ponds in the area of the shoreline park and cultural park will be cleaned of vegetation and protected from other physical alteration. A buffer zone around these newly established marine ponds will be protected as well.~~

~~The anchialine pond shrimp (*Metabetaeus lohena)* and the orangeback damsel fly (*Megalagrion xanthomelas)* are listed as candidate endangered species in the Federal Register and were both recorded in surveys of these anchialine ponds done in 2004 by US Geological Survey Biological Resources Division and the NPS Inventory and Monitoring Program. Low numbers of *Metabetaeus lohena* were encountered in three of the 22 ponds surveyed in the southern pond complex. *Megalagrion xanthomelas* was not encountered in any of the southern pond complex ponds during the recent study. The low density of *Metabetaeus lohena* and the observed absence of *Megalagrion xanthomelas* may be due to the impacts from high nutrient input and general degradation of the ponds.~~

~~An attempt should be made to move as much of the existing population of *Metabetaeus lohena* from these anchialine ponds before they become too saline, to possible newly excavated ponds that may be developed off-site. These shrimp should not be introduced into existing populated ponds to avoid any potential pathogenic impacts to the healthy ponds.~~

~~Public education on the unique ecology of the anchialine ponds and the need for preserving their ecology will reduce future human impacts in other healthy ponds.~~

~~Further recommended mitigation includes restoration to degraded anchialine ponds off the project site, preferably those located at the adjacent Kaloko-Honokōhau National Historical Park.~~

Three Ring Ranch
Exotic Animal Sanctuary

75-809 Keaolani Dr.,Kailua-Kona, Hawaii 96740 phone and fax 808 331-8773
animals@threeringranch.org www.threeringranch.org

February 1, 2007

To Whom it May Concern,

The Jacoby EIS plan as submitted is flawed regarding the Hawaiian Hoary bat.

The report - page 34 states that the bat has been seen flying over the subject property but the parcel does not sustain the bat. Oh contraire!

The bats use a migratory flyway mauka to makai on a seasonal basis to feed. Several flyways are included in this parcel. The only reason the bats are seen every winter into early spring is for feeding activity along the shore. The bats come down every night to feed on the insects which fly this time of the year. The added protein in the flying ant, winged insect and termite species provides the required protein for breeding activities which take place a little later in the season.

In late Fall the first males come to the shore and later the females join in the feeding activity. Research leads to the possibility that the bats actually mingle at the shoreline and both male and female share feeding areas in this breeding season. The bats return to the higher elevations each night to roost. Hawaiian hoary bats fly regularly from mauka to makai and a 12-15 mile nightly flight is not unusual.

The loss of this highly sensitive feeding and breeding area would do irreparable harm to our West side populations (already in decline due to loss of migratory routs, loss of roosting habitat etc). I have monitored the bats during feeding and migratory behavior for 14 years now. One of my sites for observation is the shoreline near the harbor and the playing fields of Kealakehe High school. I have witnessed a decline in total numbers over time but the bats still do regularly congregate to feed in these areas and should be protected.

Federal law prohibits any activity that kills, threatens or damages the bats or the activity required to sustain the population. Allowing this flawed EIS report to be accepted would be tantamount to ignoring the Federal EIS act. The bats require this area for feeding and must be included in any plan for the area. A 14 year construction project would effectively forever alter the ability of the bats to forage along this area of shoreline. Individual groups of bats will die when unable to migrate to the coast. Others will fail to gain the required weight for breeding and thus not reproduce.

I urge our Land use managers, regulatory agencies and Hawaii County Council to require a full and detailed study of the Hawaiian hoary bats use of the land and halt the Jacoby project as written.

Regards,
Ann Goody PhD

Three Ring Ranch Exotic Animal Sanctuary
Kona, Hawaii
Ann Goody, Curator
www.threeringranch.org <http://www.threeringranch.org/>

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Honolulu Hi 96813

Attn: Dayan Vithanage

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July 23, 2007

Ann Goody, Ph.D.
Three Ring Ranch Exotic Animal Sanctuary
75-809 Keaolani Dr.
Kailua-Kona, Hawai'i 96740

Dear Ms. Goody:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Dated February 1, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement.

Your comments suggest that the subject property supports the Hawaiian hoary bat. The property does not provide roosting habitat for this species, and given the vegetation on the site, it is unlikely that the site represents a significant foraging site for this species.

Recent research completed by US Geological Survey on this species has concluded that the Hawaiian hoary bat is ubiquitous on the island of Hawaii in all areas that support trees and dense vegetation, and that the bat is a human commensal species. Thus the planting of landscape trees, ornamental vegetation, and the presence of street lights associated with the development will likely enhance the foraging resources in the area for this species. Their research also indicates that the Hawaiian hoary bat maintains a significant population on Hawaii, and in fact the natural resource agencies have been discussing the steps that will be necessary to de-list this species, at least on Hawaii and the population appears to have recovered.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Amber Adams
Kailua-Kona, Hawaii

February 2, 2007

Mr. Scott Condra
Jacoby Development, Inc.
171 17th Street, NW Suite 1550
Atlanta, GA 30363

Subject: DEIS- Kona Kai Ola, Kealakehe, North Kona District, Island of Hawaii

Dear Mr. Condra,

Looking out Kailua Kona and seeing everything this is being done, it breaks my heart in a way. So, many things are being charged; so much development hat is not needed. To be honest, this town is being destroyed by people who only care about money!! The land that should be preserved is being made into hotels, condos, and restaurants. Things are being built that we don't even need. We have enough condos, restaurants. Honokohau Harbor is not only a place for us but a place for marine life. Nobody seems to care about the danger they will be bringing if this project Kona Kai Ola continues! They are destroying the heart of Kona!!! The harbor is a special place that people can gather at. If the natural ponds are removed, it will damage the ecosystem of what lives in those ponds. Living creatures that feed on other creatures in those ponds would die. It is such a beautiful place and for Jacoby Development, Inc. to come in and destroy what is already there would be awful! I feel that this project needs to stop. If we wanna keep Kona well and beautiful it's going to take a lot. Hawaii needs to be cared for. I mean we're not having earthquakes for no reason. We humans are doing something wrong! Something needs to be done soon; this Kona Kai Ola project needs to be stopped. A petition needs to be started to try and stop this new and up coming development! Maybe if enough people sign it can be stopped!! This is going to affect the next generation and the generation after that. I mean there is going to be more damage than anyone would have thought of.

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July 23, 2007

Amber Adams
c/o West Hawaii Explorations Academy
73-4460 Queen Kaahumanu Hwy, Ste. 105
Kailua-Kona, HI 96740

Dear Ms. Adams:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are given below.

We disagree with your comment that only hotels, condos, and restaurants are included in Kona Kai Ola Development project.

The development of Kona Kai Ola is broader than providing a resort for tourists. The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, Jacoby Development, Inc. (JDI) will protect natural resources through the various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities, such as parks, other recreational facilities, and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community.

The developer continues to work with public agencies in developing new water sources, and the success of these efforts will not only benefit Kona Kai Ola, but also, the adjacent communities that are also subject to an insufficient water supply.

The anticipated infrastructure improvements to the wastewater treatment plant are anticipated to actually improve the health and safety of the community by bringing an older facility up to higher operational standards. All structures will be built to current building and safety codes, while access to the shore and around the site will be improved.

The roadway system will also be improved beyond mitigation for project-related impacts. In Phase 1 of the project, JDI will not only provide access to the commercial parcel, but also address regional traffic issues through the improvements of the roadway system. JDI plans to improve the intersection of the Queen Ka'ahumanu Highway and the Kealakehe WWTP Access Road. The Kealakehe WWTP Access Road is planned to be realigned and widened to an 80-foot road right-of-way (ROW) that will serve the Commercial Parcel No. 1, and eventually intersect with the proposed Kuakini Highway Extension to the west. Such improvements will ensure that the project minimizes its own impacts, while improving existing conditions. Further, with development of Kona Kai Ola, the Kuakini Highway extension road is anticipated to be built on a more accelerated schedule than it would occur without the Kona Kai Ola project.

No State funds will be used to develop any portion of the proposed development project. Funds used for the project will come entirely form private resources.

In response to Draft Environmental Impact Statement (DEIS) comments and to further study the pools south of the entrance channel of Honokohau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design, in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys, and limited water quality analysis of the southern group of anchialine pools, exclusively. The report is contained in Appendix H-2 of the Environmental Impact Statement (EIS) and is summarized in EIS Sections 3.9.2.1 and 3.9.2.2. In addition, further comment on the groundwater hydrology effects on anchialine pools has been prepared by Waimea Water Services, and is contained in Appendix G-3 of the EIS.

The DEIS identified 22 anchialine pools. Further studies determined that three of these pools are actually part of an estuary complex with direct connection to the ocean. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of 20 m^2 would be eliminated due to the harbor construction.

While the second survey confirmed the presence of direct human use and disturbance, such as trash receptacles and toilet facilities, it found that the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickelweed and mangrove.
The additional studies indicate that the remaining pools may not increase in salinity to levels unhealthy for anchialine pool fauna. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult, if not impossible, even with numerous boreholes and intense sampling. The tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge, which will either be the channel or the shore. Another factor that could influence groundwater

quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally, but is not quantified at this time.

Hence, the additional studies found that changes in groundwater quality may, or may not, impact biological communities in the anchialine and estuarine environment. In either case, the developer is committed to practicing good stewardship over the pools to be preserved, and eliminating or reducing alien species to the extent practicable. The developer recognizes it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Mitigation measures to facilitate the long term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on these environments can be measured.

The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment, and possible new pools. These measures are described in detail in EIS Section 3.9.2, Anchialine Pools.

Every effort will also be made to protect, preserve, and improve the anchialine pools to the south of the harbor. Two additional studies were conducted in response to DEIS comments, including your comments, and these additional studies are summarized in EIS Section 3.9.2, and presented in Appendices G-3 and H-2.

These additional studies indicated that with the construction of the new harbor basin, the anchialine pools makai of the proposed basin may not necessarily be negatively impacted by the construction of the proposed project.

In addition, these studies determined that there are mechanisms to mitigate potential impacts. Mitigation measures to facilitate the long term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. As a mitigation measure, bioretention, which is a Best Management Practice (BMP), is a highly appropriate application for the proposed development to prevent any nonpoint source pollution of groundwater. Another mitigation measure that may be included in the management plan is salinity adjustment of the anchialine pools to maintain healthy habitat for the anchialine ecosystem by surcharging man-made anchialine pools created adjacent to, or, in the vicinity of natural pools with low salinity well water.

The EIS has been revised to include information from these additional studies, and Attachment 1 contains Section 3.9.2, Anchialine Pools.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

The conditions with the project constructed were found to be phosphorous limited. Several simulations were performed including and excluding the inflow from the marine exhibits which provides an additional nitrogen load and also varying the location of this inflow. It was found that the inflow from the marine exhibits can have a beneficial effect on flushing, especially when positioned within the existing harbor basin. However, its effect is significantly less than the effect due to the brackish groundwater inflow. When the exhibit inflow is excluded or positioned at the east end of the new marina, its effect is small in terms of flushing due to its high salinity. From a water quality perspective, since the loads from the exhibit inflow consist primarily of nitrogen, it does not cause increased algae growth. However, this exhibit inflow does raise the concentrations of ammonia and nitrate in the system.

Simulation results indicate that under the conditions when the post-expansion system receives an additional brackish inflow into the new 25-acre marina on the order of 30 mgd or more, water quality within the harbor system and in the surrounding waters remained similar to existing conditions. These conditions are expected to occur based on the findings reported by Waimea Water Services (2007), which states that the proposed marina would exhibit the same or similar flushing action as the existing marina.

An additional mitigation measure proposed by Waimea Water Services (2007), if sufficient inflow is not intercepted, consists of drilling holes in the bottom of the new marina to enhance this inflow and facilitate flushing within the proposed system.

~~3.9.3~~3.9.2 Anchialine ~~Ponds~~ Pools

Two studies on anchialine pools were conducted in this EIS process. The anchialine ~~ponds~~ pools water quality studies and ~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute and is~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute in October 2006 and are included as Appendix ~~G~~H-1. That survey included pools located both north and south of Honokōhau Harbor. In response to DEIS comments and to further study the pools south of entrance channel of Honokōhau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2.

~~3.9.3.1~~3.9.2.1 Existing Conditions

Anchialine ~~ponds~~ pools exist in inland lava depressions near the ocean. Two anchialine ~~pond~~ pool complexes are located immediately to the north and south of the Honokōhau Harbor entrance channel. The complex to the north is located wholly within the designated boundaries of the Kaloko-Honokōhau National Historical Park as shown in Figure Q~~O~~. Many of the ~~ponds~~ pools in the southern complex are within the park administrative boundary as well. ~~Ponds~~ Pools in the northern complex show little evidence of anthropogenic impacts. Many contain typical vegetation and crustacean species in high abundance.

Figure R locates anchialine pools near the harbor entrance and pools~~Ponds~~ in the southern complex are depicted in Figure S.

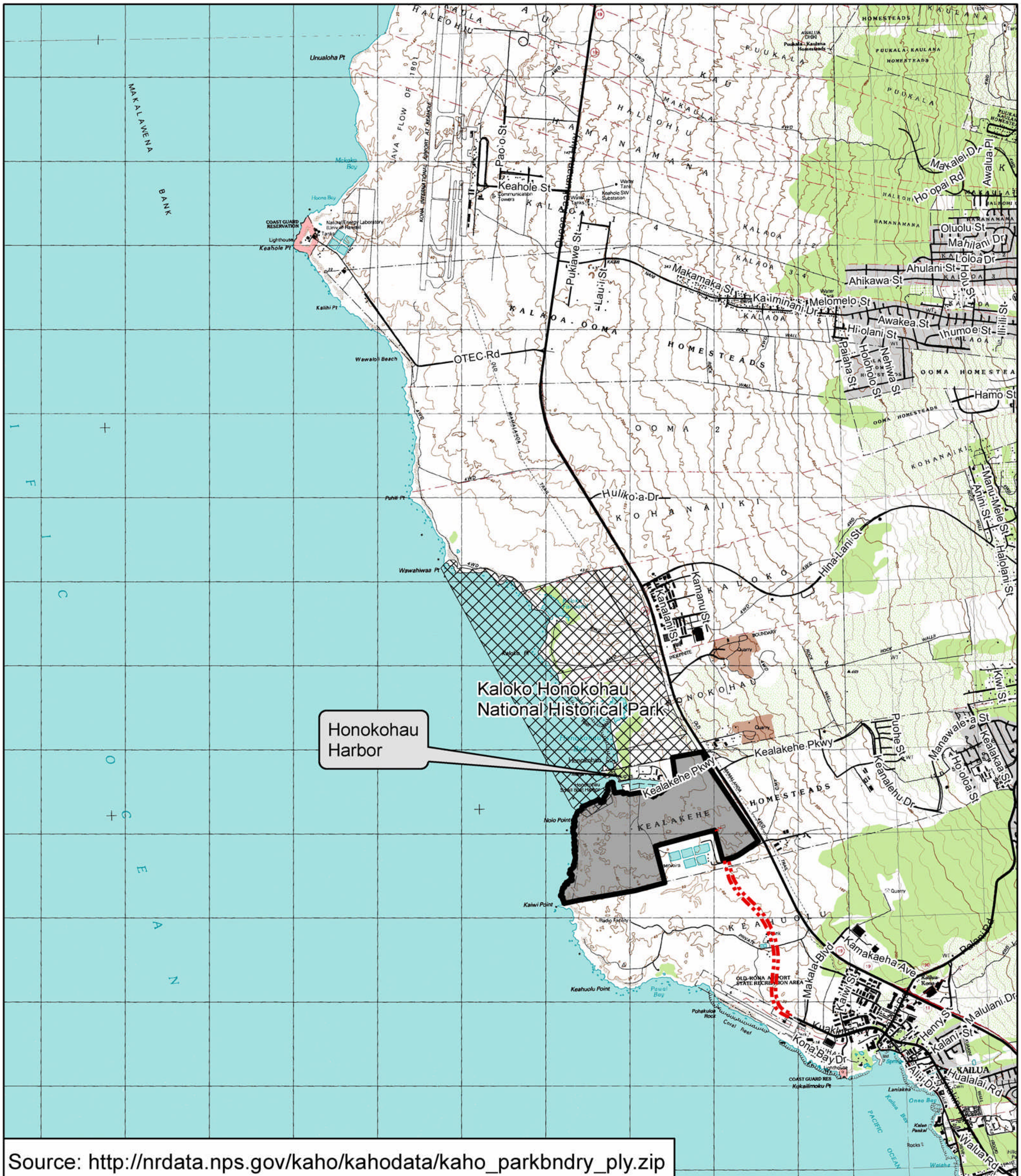

Figure Q: National Historical Park Service Legislative Boundary Map

Legend

- Project Site
- Proposed Parkway
- National Park Boundary

0 2,500 5,000 Feet

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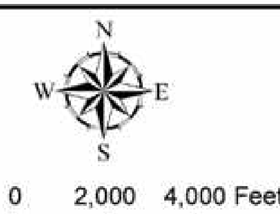
Source: Oceanic Institute

Figure R: Anchialine Pool Locations



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Jacoby Development, Inc.

Source: Aquatic Resources Management And Design

Figure S: Anchialine Pool Locations in Southern Complex

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W E
S

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JACOBY DEVELOPMENT, INC.

The 2006 study identified 22 pools in the southern complex. The 2007 study found that three of the 22 pools are part of an estuary complex with direct connection to the ocean. While there were several signs of direct human use and disturbance, such as trash receptacles and toilet facilities, the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickleweed and mangrove. ~~are moderately to heavily impacted, with many containing exotic fish that exclude the anchialine crustaceans. The ponds also show evidence of human impact, including discarded bottles, cans, wrappers, diapers, toilet paper, etc. Water quality conditions within the ponds generally reflect the conditions of the underlying groundwater.~~

~~Figure P locates anchialine ponds near the harbor entrance. The study conducted as a part of this EIS show that the anchialine ponds south of the harbor entrance are moderately to heavily impacted by human activities and introduced fish populations. The study found that the nitrogen phosphorus concentrations in these ponds are significantly higher compared to the ponds north of the harbor entrance. The sources of these additional nutrients are not known. Continuous influx of nutrients will eventually degrade the water quality to levels that could alter the pond ecology.~~

Biota surveys in the two pond systems clearly indicate that counts of typical pond denizens show a remarkable difference between the northern and southern ~~ponds~~ pools. In the northern ~~ponds~~ pools the number of *Halocaridina rubra* ranged from a low of 20–25 to too numerous to count. The biota rich pond bottoms appeared red due to the *Halocaridina rubra* numbers. The only other species visible was the predatory shrimp *Metabetaeus lohena*. In contrast, only four out of the 22 ~~ponds~~ pools examined in the southern pond complex showed a decreased presence of *Halocaridina rubra* (6 to 200) individuals in the pond, and three ~~ponds~~ pools contained *Metabetaeus lohena*. Eight of the ~~ponds~~ pools contained numbers of introduced minnows which is an apparent predator of *Halocaridina rubra* and *Metabetaeus lohena*.

The 2007 study found three of the pools identified in the 2006 study were part of an estuary complex with direct connection to the ocean, and that the southern complex contained 19 anchialine pools. The study further found that a majority of the southern pools are degraded biologically and physically, primarily due to the effects of introduced fish and plant species. Six pools are currently devoid of alien fish, but they face a high level of threat due to the proximity of pools that have these species. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction.

The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 ppt. and that the anchialine biology would then perish. There is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and final determination of anchialine salinity following the harbor construction. The assessment that all anchialine pools will be barren with the construction of the harbor may be premature. *Halocaridina rubra* (opae ula) are routinely drawn from high salinity wells at 30-32 ppt.

Within the 19 pools, native and non-native fauna included 14 species comprised of 5 fish, 2 mollusca, and 6 crustacea. Algae within the pools primarily consisted of a mixed assemblage of diatoms and cyanobacteria, with several pools dominated by matted filamentous *Cladophora*, sp. The darker cave/overhang pools and high tide pools had epilithic *Hildenbrandia* sp. covering the rock substrate. Riparian vegetation was dominated by introduced species consisting of Pickleweed (*Batis maritima*), Mangrove (*Rhyzophora mangle*), and Christmasberry (*Shinus terebenthifolius*). Only two species of native plants Akulikuli (*Sesuvium portulacastrum*) and Makaloa (*Cyperus laevigatus*) existed near the pools and comprised only few small patches and a single tuft (respectively).

Most of the hypogeal anchialine shrimp have adapted to the presence of minnows by foraging in the pools at night. During daylight hours, only the adult shrimp appear to coexist at low population levels with the smaller *P. reticulata*, but the larger *G. affinis* and *Oreochromis* prevent the daytime appearance of hypogeal shrimp due to predation.

The average salinity in Kealakehe pools is relatively high at 13.5 ppt compared to most other pools along the West Hawai‘i coastline, having an average of approximately 7 ppt. This high salinity appears to be characteristic of this region, and is similar to the average of most pools within the adjacent ahupua’a of Honokōhau and Kaloko. The levels of nitrate-nitrogen levels are relatively high compared to other undeveloped areas, but fall in the range of some developed landscapes. Other water quality parameters, including pH and temperature, fall into normal ranges for anchialine pools.

This relatively high salinity is the likely reason aquatic insects were not found in any pools at Kealakehe. Though the rare damselfly *Megalagrion xanthomelas* has been observed and collected from Kaloko, a statewide assessment of its range has not found it to occur in water with salinity greater than 3ppt. However, there has been an unsubstantiated occurrence of the nymph in a pool of up to 8ppt (Polhemus, 1995).

Another species of concern is the hypogeal decapod shrimp *Metabetaeus lohena.* These shrimp are sometimes predatory on *H. rubra* but are more often opportunistic omnivores similar to *H. rubra.* Predusk and nocturnal sampling at high tide is clearly the optimal method to determine habitat range and population densities for this species. These shrimp were found in 13 of the 19 pools, 7 of which had *M. lohena* only at night. The occurrences of *H. rubra* were found in 16 of 19 sampled pools, 8 of which had ‘Ōpae‘ula observed only at night. Consequently, despite having numerous degraded anchialine resources at Kealakehe, there are opportunities for many of the pools to be restored and enhanced to a level where large populations of anchialine shrimp and other native species may return to inhabit the pools as they likely have in the past.

~~As mentioned earlier, the southern ponds also had elevated concentrations of nutrients indicating water quality degradation. These factors indicate that if no restoration or maintenance activities are instituted to reserve these ponds, these ecosystems will degrade beyond recovery.~~

~~3.9.3.2~~3.9.2.2 Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

The anchialine ~~ponds~~ pools that are located north of the existing harbor are not likely to be impacted because no development activities are proposed north of the existing harbor. It is highly unlikely that existing groundwater flows to the Kaloko-Honokōhau pond system to the north of the existing harbor will be impacted by the proposed marina to the south.

Of the 19 pools in the southern complex, three would be eliminated due to harbor construction. Regarding the remaining pools, the DEIS noted that t~~T~~he change in the local groundwater flow pattern in the vicinity of the proposed marina ~~will~~ would impact the anchialine ~~ponds~~ pools that are located between the proposed marina and the shoreline south of the harbor entrance. The 2006 study (Appendix H-1) noted that t~~T~~he salinity of the anchialine ~~ponds~~ pools ~~will~~ would increase due to reduction of brackish groundwater, and that ~~. Some ponds will be excavated to make the new harbor basin. T~~those ~~ponds~~ pools that are not excavated will revert to full salinity, causing the loss of their habitat. ~~and associated aquatic flora and fauna. However, current investigations indicate that these ponds are already enriched by nutrients and the density of associated aquatic fauna is very low. In addition, trash from visitors, and introduction of minnows has already degraded the pond ecology.~~ Even without the potential impacts from the proposed marina construction, the pond ecology might change irreversibly from the nutrient input, human indifference and expansion of non native fauna species.

Further studies conducted in response to DEIS comments (Appendix H-2, and Appendix G-3) indicate that the remaining pools may not increase in salinity to levels unhealthy for *H. rubra* and *M. lohena* and other anchialine pool fauna. In addition, these studies determined that there are realistic mechanisms employed elsewhere that would mitigate changes due to groundwater changes. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore.

Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented. The mitigation plan will be based on the following objectives:

Objective 1 To preserve, maintain, and foster the long-term health and native ecological integrity of anchialine pools at Kealakehe.

Objective 2 To protect and promote cultural practices and traditions surrounding anchialine resources at Kealakehe.

Objective 3 To provide education, interpretation, and interactive opportunities for the community to learn about and appreciate the anchialine resources.

Objective 4 To acquire a pond manager to implement the program, conduct monitoring, research, and reporting, and provide education to the community about anchialine and estuarine resources.

Mitigation measures to facilitate the long-term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on the environment can be measured. The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment and possible new pools.

As a mitigation measure, bioretention, which is a Best Management Practice (BMP) is a feasible application for the proposed development. There is a probability that nutrients and other potential pollutants will runoff landscaping and impermeable surfaces such as roadways and parking lots during medium or high rainfall events. Some of these pollutants could enter the groundwater table and into anchialine pools and ultimately the ocean. As an alternative to directing runoff into the ground through drywells, storm water should be directed into bioretention areas such as constructed surface or subsurface wetlands, vegetated filter strips, grass swales, and planted buffer areas. Storm water held and moved through these living filter systems are essentially stripped of most potential pollutants, and allowed to slowly infiltrate back to the groundwater table.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Another mitigation measure that may be included in the management plan is salinity adjustment. In the 2006 assessment regarding the impact to the southern pools from the proposed construction of the harbor, it was stated that this construction would cause the salinity in the anchialine pools to become equivalent to the ocean at 35ppt. It was then concluded that the anchialine biology would perish.

However, there is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and a final determination of anchialine salinity following the harbor construction. The dynamics of groundwater movement through a porous lava medium both seaward and laterally along the coastline is an inexact science. This is compounded by the variations in water density, including stratification of salinity within the proposed harbor and capillary movement of low-density surface water through the substrata.

The assessment that all anchialine pools will be barren with the construction of the harbor may therefore be premature. *H. rubra* are routinely drawn from high salinity wells at 30 – 32 ppt and survive in this salinity for years. Further, high populations *H. rubra* and *M. lohena* have thrived and reproduced in pool salinities of 27ppt. If the pools do become full strength seawater at 35ppt, there exists uncertainty on the long-term effects to anchialine organisms, since there are no long-term studies or examples of native anchialine ecosystems at 35ppt. Native anchialine pool vegetation also has relatively high salinity tolerance.

If the salinity were expected to rise to 35 ppt, possible mitigation in the management plan will include methods to surcharge man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water. If sufficient volume is used, it is theoretically possible to lower salinity in adjacent natural anchialine pools. This surcharge method has been successfully used to raise salinity in anchialine pools and cause the salinity rise in adjacent pools of at least up to 10 meters away. Surcharging with low salinity should work as well or better since the lower density water will essentially float atop the higher salinity water at the surface layer, and move throughout the complex of natural pools. Surcharging may also be a viable mitigation to dilute and more rapidly disperse any pollutants that may be detected in the pools.

Another mitigation measure includes the creation of new anchialine pools. There is significant opportunity to create new anchialine pools and greatly expand the native habitat and resource. It has been demonstrated at several projects in West Hawai'i that anchialine pools can be created and will be colonized with a full compliment of anchialine species endemic to the area. Anchialine pools are considered focal points of higher productivity relative to the subterranean groundwater habitat around them. Their productivity promotes an increase in population levels of anchialine species within the pools themselves and throughout the subterranean habitat surrounding them.

~~No realistic mechanisms are envisioned for re-injecting fresh water into these systems to maintain their ecological balance as an anchialine system. These ponds will be changed from a brackish water system to a marine system. But, those ponds in the area of the shoreline park and cultural park will be cleaned of vegetation and protected from other physical alteration. A buffer zone around these newly established marine ponds will be protected as well.~~

~~The anchialine pond shrimp (*Metabetaeus lohena)* and the orangeback damsel fly (*Megalagrion xanthomelas)* are listed as candidate endangered species in the Federal Register and were both recorded in surveys of these anchialine ponds done in 2004 by US Geological Survey Biological Resources Division and the NPS Inventory and Monitoring Program. Low numbers of *Metabetaeus lohena* were encountered in three of the 22 ponds surveyed in the southern pond complex. *Megalagrion xanthomelas* was not encountered in any of the southern pond complex ponds during the recent study. The low density of *Metabetaeus lohena* and the observed absence of *Megalagrion xanthomelas* may be due to the impacts from high nutrient input and general degradation of the ponds.~~

~~An attempt should be made to move as much of the existing population of *Metabetaeus lohena* from these anchialine ponds before they become too saline, to possible newly excavated ponds that may be developed off-site. These shrimp should not be introduced into existing populated ponds to avoid any potential pathogenic impacts to the healthy ponds.~~

~~Public education on the unique ecology of the anchialine ponds and the need for preserving their ecology will reduce future human impacts in other healthy ponds.~~

~~Further recommended mitigation includes restoration to degraded anchialine ponds off the project site, preferably those located at the adjacent Kaloko-Honokōhau National Historical Park.~~

Amber Matsumoto
2-2-07
Development Comments
73-1044 Ahulani St. #B
Kailua-Kona, Hawaii 96740

Harbor Development Comments

There is a part of me that agrees and disagrees with the Kona Kai Ola harbor development. I do believe that it would be a good idea to expand Kona and create more activates to do here. However, I do not agree on how much Jacoby Development Inc. (JDI) plans to do. I do think adding restaurants, a retail store, a marine science center, and a trail system for sporting activities would be nice but all the other things they have planed to do is a bit over-the-top.

I don't feel it's totally necessary to expand Honokohau into having an 800-slip marina; maybe 300-slips at the most, but 800 is a little extreme. I also strongly disagree on the location of where the development will take place. Building 670-770 hotel rooms and 1,800 timeshare housing near the coast is extremely harmful to marine life especially since it's close to Kaloko National Park. A numerous amount of endangered marine animals such as the spinner dolphin, green and hawksbill sea turtle, monk seal, humpback whale, and stilt bird all call Kaloko Nat. Park their home. Adding hotels and time share will bring in more people to Hawaii which will contribute to sewage, boat oils and propellers in the ocean, and noise pollution that will affect the lives of these endangered animals.

- Amber C. Matsumoto

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July 23, 2007

Amber Matsumoto
73-1044 Ahulani Street #B
Kailua-Kona, Hawaii 96740

Dear Ms. Matsumoto:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our response to your comments are given below.

Comment: *I don't feel it's totally necessary to expand Honokohau into having an 800-slip marina; may be 300-slips at the most, but 800 is a little extreme. I also strongly disagree on the location of where the development will take place. Building 670 – 770 hotel rooms and 1,800 timeshare housing near the coast is extremely harmful to marine life especially since it's close to the Kaloko National Park.*

Response: A comparison between impacts related to the proposed project concept (45 acres, 800 slips) and impacts related to Alternative 1 (25 acres, 400 slips) indicates that a reduction in the acreage and number of slips in the marina, as well as the reduction in hotel and timeshare units, would generate less environmental, social, and economic impacts. Although positive economic impacts would be reduced, Alternative 1 can be considered as a preferable alternative because of reduced environmental impacts. However, while it can be concluded that the 25-acre marina in Alternative 1 would be the preferred size, the DLNR agreement establishes the size of the marina at 45 acres and 800 slips. An amendment to the Department of Land and Natural Resources (DLNR) agreement is required in order to allow Alternative 1 to proceed. Hence, the selection of Alternative 1 is an unresolved issue at this time.

Alternative 1 is a project involving a 400-slip, 25-acre marina, 400 hotel units, 1,100 time share units, and commercial and support facilities. This alternative would enhance water quality and avoid the need to widen the existing harbor entrance channel, as well as, reduce traffic and socioeconomic impacts.

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www.oceanit.com

Comment: A numerous amount of endangered marine animals such as the spinner dolphin, green and hawkbill sea turtles, monk seal, humpback whale, and stilt bird all call at Kaloko National Park their home. Adding hotels and time shares will bring in more people to Hawaii which will contribute to sewage, boat oils, and propellers in the ocean, and noise pollution that will affect the lives of these endangered animals.

Response: Pollution from contaminants from boats and potential possibility of oil spills is a concern in all of Hawaii, not just for Honokohau Harbor. This issue has been addressed in the Environmental Impact Statement (EIS) in Section 3.9.1.3, including a list of mitigation actions. These include boater education, enforcement of good housekeeping practices on boats and docks, and environmentally sensitive hull cleaning practices.

A complete marine acoustics study was completed in response to comments received on the Draft Environmental Impact Statement (DEIS). The report is included in Appendix T-2. The model results showed that the noise levels in the developed scenario did not exceed the Level A impacts to marine mammals. Level B impacts to marine mammals and sea turtles generally occur within a range of ten meters. Although noise impacts may occur during blasting the new marina, these impacts could be greatly minimized by using good blasting practices. These are addressed in detail in the Environmental Impact Statement (EIS).

The EIS has been revised to include information from the additional study, and Attachment 1 contains Section 2, Alternatives Analysis.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

2 Alternatives Analysis

~~In typical land development projects, the initial planning process includes the exploration of alternatives to development objectives. In the EIS process, these alternatives are presented with a disclosure of reasons for the dismissal of non-preferred alternatives.~~

~~Kona Kai Ola does not follow this same pattern of alternatives evaluation.~~ As discussed in Section 1.4, the proposed Kona Kai Ola project is the result of agreements between JDI and the State DLNR and DHHL. The agreements and leases between the State and JDI stipulate the parameters of development for this site in terms of uses, quantities and size of many features, resulting in a limited range of land uses. Unlike a private property project, JDI is required to meet the criteria outlined in the agreements, thereby affording less flexibility in options and uses. From the developer's perspective, the agreements must also provide sufficient flexibility to allow for a development product that responds to market needs and provides a reasonable rate of return on the private investment.

The agreements between JDI and DLNR specify that the proposed harbor basin is to be 45 acres and accommodate 800 slips. This development proposal is the subject of this EIS. In response to DEIS comments, additional water quality studies and modeling were conducted. These studies determined that the water circulation in a 45-acre 800-slip marina would be insufficient to maintain the required standard of water quality. The models of water circulation suggest that a new 25-acre harbor basin could successfully maintain required water quality in the new harbor. Comments on the DEIS from DLNR, from other government agencies, the neighbors and the general community also called for the consideration of alternatives in the EIS, including a project with a smaller harbor basin and less density of hotel and time-share units.

In response to these comments on the DEIS, three alternatives are evaluated in this Final EIS and include Alternative 1, which is a plan with a 25-acre 400-slip harbor basin including a decrease in hotel and time-share units; Alternative 2, which is an alternative that had been previously discussed but not included in the proposed project, that includes an 800-slip harbor and a golf course; and Alternative 3, the no-project alternative. Each alternative is included in the EIS with an evaluation of their potential impacts. These project alternatives are presented to compare the levels of impacts and mitigation measures of the proposed project and alternative development schemes pursuant to requirements set forth in Chapter 343, HRS.

~~JDI is required to provide a new marina basin not less than 45 acres and a minimum of 800 new boat slips. Further, the agreements provide the following options for land uses at the project site:~~

- ~~Golf Course~~
- ~~Retail Commercial Facilities~~
- ~~Hotel Development Parcels~~
- ~~Marina Development Parcels~~
- ~~Community Benefit Development Parcels~~

~~JDI is not pursuing the golf course option and is proposing instead to create various water features throughout the project site. All other optional uses have been incorporated in Kona Kai Ola.~~

2.1 Project Alternatives

2.1.1 Alternative 1: 400-Slip Marina

Studies conducted in response to DEIS comments found the construction and operation of an 800-slip marina may significantly impact the water quality within the marina and along the shoreline. Specifically, the Harbor Water Quality Modeling Study, as contained in Appendix U, found that the water circulation in a 45-acre 800-slip harbor was insufficient to maintain an acceptable level of water quality. Further, the existing harbor channel, which would serve both the existing and new harbors, could not adequately serve the increased boat traffic generated by an 800-slip marina during peak traffic. Mitigation measures to accommodate peak boat traffic included the widening of the existing channel, an action that would entail a complex process of Federal and State approvals and encounter significant environmental concern.

Concerns related to the proposed density of hotel and time-share units were also expressed in comments to the DEIS from members of the public, neighbors to the project site, especially the Kaniohale Community Association, and government agencies. Common themes in DEIS comments were related to impacts regarding traffic, project requirements of potable water and infrastructure systems, including sewer, drainage, utility and solid waste systems, and socioeconomic impacts.

In response to the water quality study results, and to the DEIS comments, an alternative plan was developed with a smaller marina with less boat slips, and a related decrease in hotel and time share units. Illustrated in Figure G, Alternative 1 reflects this lesser density project, and features a 400-slip marina encompassing 25 acres. For the purposes of the Alternative 1 analysis, JDI assumed 1,100 time-share units and 400 hotel rooms. Project components include:

- 400 hotel units on 34 acres
- 1,100 time-share units on 106 acres
- 143 acres of commercial uses
- 11 acres of marina support facilities
- 214 acres of parks, roads, open spaces, swim lagoons and community use areas

In addition, Alternative 1 would include the construction of a new intersection of Kealakehe Parkway with Queen Ka'ahumanu Highway, and the extension of Kealakehe Parkway to join Kuakini Highway to cross the lands of Queen Lili'uokalani Trust, and connecting with Kuakini Highway in Kailua-Kona. This is a significant off-site infrastructure improvement and is included in the agreements between the State and JDI.

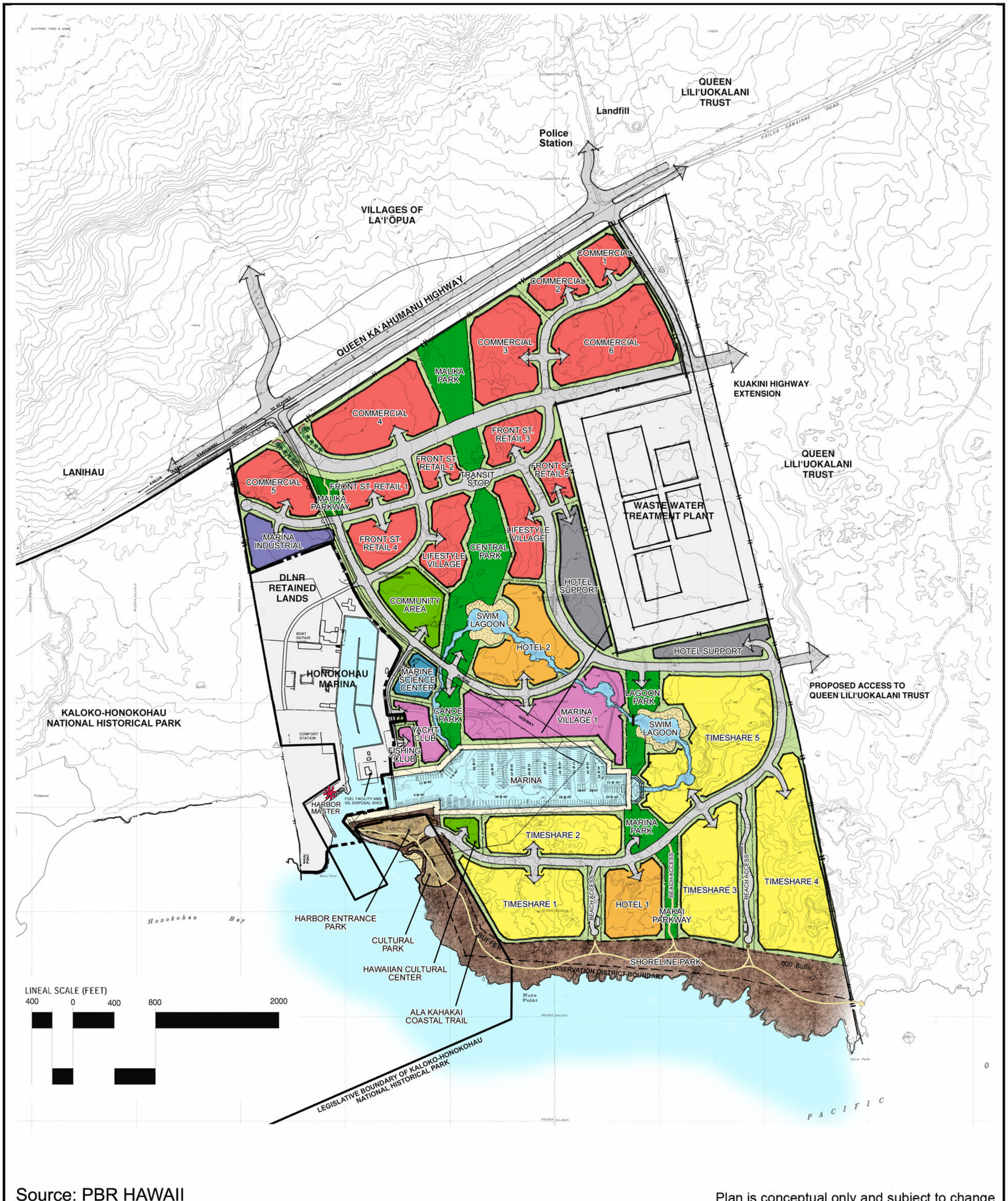

Figure G: Alternative 1: 400-Slip Marina

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JDI — Jacoby Development, Inc.

Like the proposed project, Alternative 1 would have a strong ocean orientation, and project components that support this theme would include various water features including seawater lagoons and a marine science center. The new Alternative 1 harbor would include a yacht club, fishing club, a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. The coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and ‘Alula for community use. Additional Alternative 1 community areas would include facilities and space for community use, including programs of the Kona Kai Ola Community Foundation, which supports community programs in health care, culture, education, and employment training for the local community, especially to native Hawaiians. Like the original proposed plan, Alternative 1 includes 40 percent of the land in parks, roads, open spaces, swim lagoons and community use areas.

2.1.2 Alternative 2: Golf Course Feature

Alternative 2 was among the alternatives discussed at a community charrette in September 2003. It includes a golf course, which is a permitted use in the DLNR agreement and DHHL lease. As Figure H illustrates, an 18-hole championship golf course would occupy 222 acres on the southern portion of the project site. As with the proposed project, Alternative 2 includes an 800-slip marina on a minimum of 45 acres.

To support the economic viability of the project, other Alternative 2 uses include:

- Golf course clubhouse on three acres
- 1,570 visitor units on 88 acres fronting the marina
- 118 acres of commercial uses
- 23 acres of community uses

Community uses in Alternative 2 include an amphitheater, a canoe facilities park, a community health center, a Hawaiian cultural center and fishing village, a marine science center and employment training center. The sea water lagoon features contained in the proposed project and Alternative 1 are not included in this alternative.

2.1.3 Alternative 3: No Action

In Alternative 3, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.

~~The economic viability and sustainability of the project is determined by the density and uses proposed. Because JDI is obligated to develop an 800-slip marina for the State, complete road improvements, and provide various public enhancement features at its own expense, the density proposed for the income generating features of the development must be sufficient to provide an acceptable level of economic return for JDI. The market study, which is discussed in Section 4.6, reviewed various development schemes and determined that the currently proposed density and mix is the optimum to meet the anticipated financing and development cost obligations for the public features associated with the development.~~

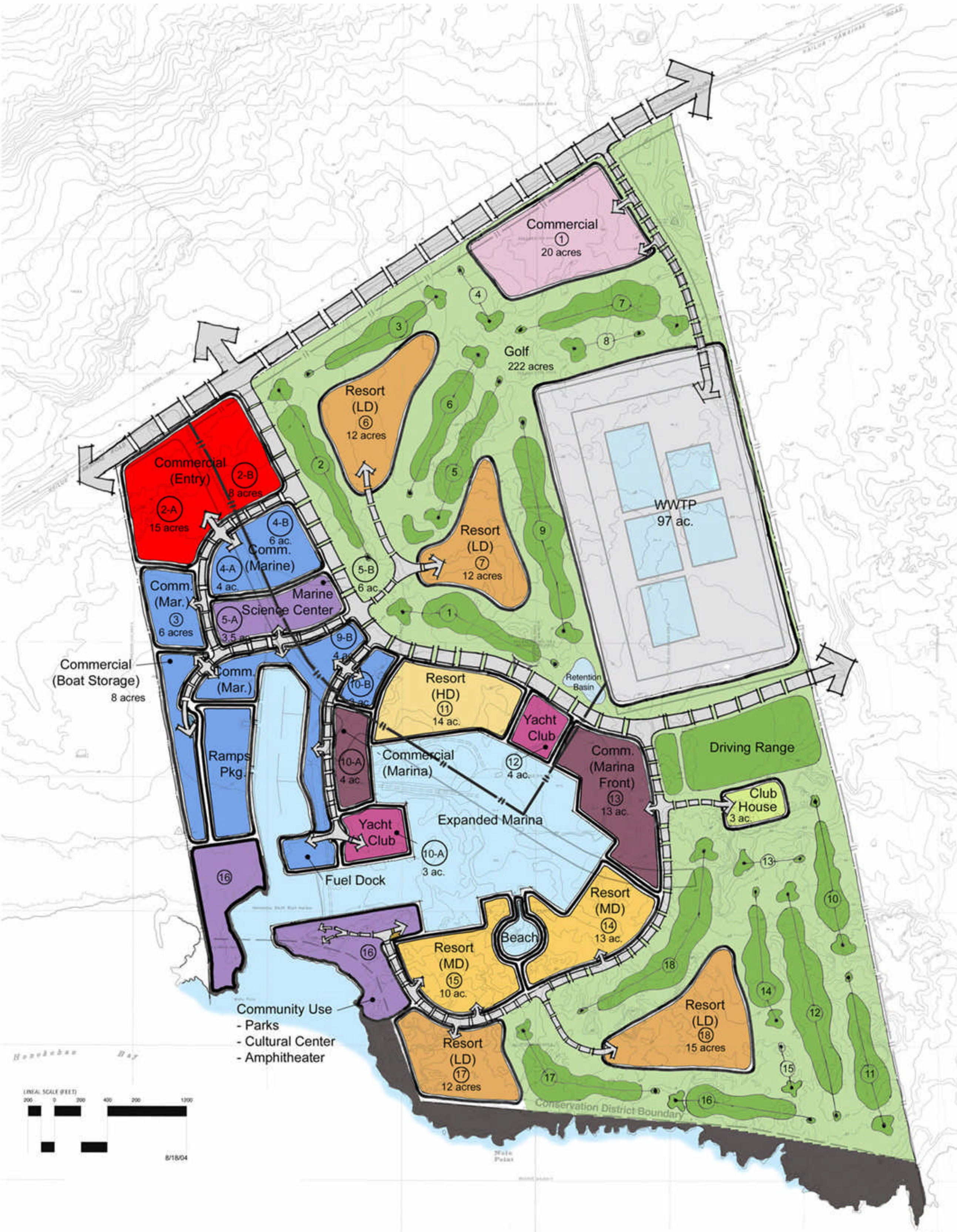

Figure H. Alternative 2: Golf Course Alternative

Legend

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2.2 Alternatives Analysis

As discussed in Section 2.1, the proposed Kona Kai Ola project (also referred to as "proposed project") is defined by development requirements related for a marina and the related uses that would be needed to generate a reasonable rate of return that covers development costs.

Beginning with Section 2.2.1, the alternative development concepts are comparatively assessed for potential impacts that may reasonably be expected to result from each alternative. Following is an overview of the primary observations of such assessment.

Alternative 1 includes half of the State-required boat slips and 60 percent of the proposed hotel and time-share units and, due to the decreased density, this alternative would generate significantly less environmental and socio-economic impacts. A harbor water quality model found the reduction of the volume of the new marina basin by about half (approximately 25 acres) significantly improved the water circulation and quality. Further, the reduced number of boat slips would generate less boat traffic, thereby reducing congestion and the need to mitigate impacts further by the widening of the existing harbor channel.

A project with fewer hotel and time-share units and increased commercial space with a longer (14 years) absorption period would change the mix of employment offered by the project, and slightly increase the overall employment count. The public costs/benefits associated with Alternative 1 would change, compared to the proposed project, with a general increase in tax collections, and a general decrease in per capita costs. Detailed discussion of Alternative 1 potential economic impacts are provided in Section 4.6.6. Comparisons of levels of impact are presented throughout this FEIS.

While this analysis might indicate that the 25-acre marina in Alternative 1 would be the more prudent choice, the DLNR agreement establishes the minimum size and slip capacity of the marina at 45 acres and 800 slips, respectively. Amendments to the DLNR agreement would be required in order to allow Alternative 1 to proceed as the preferred alternative. Hence, selection of the preferred alternative is an unresolved issue at the writing of this FEIS.

Alternative 2, the golf course alternative, was not previously considered to be the preferred alternative primarily because market conditions at the time of project development might not likely support another golf course. Further, DHHL has a strategy goal to have more revenue-generating activities on the commercial lease lands within the project area. In addition, concerns have been expressed as to environmental impacts of coastal golf courses, including the potential adverse impact on Kona's water supply if potable water is used for golf course irrigation.

While Alternative 3, the no-project alternative, would not generate adverse impacts related to development of these lands associated with the construction and long-term operations, it would also not allow for an expanded public marina that would meet public need and generate income for the public sector. Further, the no-project alternative would foreclose the opportunity to create a master-planned State-initiated development that would result in increased tax revenue, recreation options and community facilities. Crucial privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities, and public access would not be contributed.

~~Hence, the only valid alternative to the proposed project is the no-action alternative. In this alternative, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.~~

~~The no-project alternative would therefore not generate adverse impacts associated with the construction and long-term operations would not occur.~~

~~Likewise, the creation of a master-planned state-initiated development, resulting in increased employment, tax revenue, recreation options and community facilities, would not be created. Privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities and public access would not be contributed.~~

Further, the creation of revenue-producing businesses on the DHHL property to fund homestead programs would not occur, resulting in fewer potential benefits for Hawaiians.

Hence, the agreements and leases between the State and JDI indicate that the no-action alternative is not in the public interest~~has been rejected at this time~~.

2.2.1 Impact Comparison

Grading and Excavation

The proposed project requires grading and excavation. Both actions may impact groundwater due to rainfall runoff during construction. Alternative 1 would require a significantly smaller excavation for the marina basin and would therefore carry a lesser risk of potential adverse effects on water quality. Alternative 2 would require the same basin excavation as the proposed project, and would also include extensive grading and filling to build the golf course, the latter of which would generate additional impacts. Alternative 3 would result in no change to the geography, topography and geology.

Further discussion on grading and excavation is contained in Section 3.3.

Natural Drainage

Most precipitation infiltrates into the porous ground at the site, and no significant sheet flow is likely. Alternative 1 would generate similar levels of impacts on natural drainage as those of the proposed project and thus require similar mitigation measures. The golf course in Alternative 2 would not be as porous since the site would be graded, soil would be placed, and grass and other landscaping would be grown. Sheet flow and runoff can occur on a golf course, and drainage patterns might change. Alternative 3 would result in no change to the existing natural drainage pattern. Further discussion on natural drainage is contained in Section 3.4.

Air Quality

Air quality will be affected by construction activities, as well as pollutants from vehicular, industrial, natural, and agricultural sources. Alternative 1 would generate less construction air quality impacts than the proposed project due to the reduced amount of intensive groundwork associated with the smaller marina basin and fewer long-term impacts by reducing traffic 35 and 40 percent during, respectively, AM and PM peak traffic times. Construction of Alternative 2 would result in fugitive dust and exhaust from equipment and is expected to generate the same level of air quality impact as the proposed project. Alternative 3 would result in no change to existing air quality. Further discussion on air quality is contained in Section 3.5.

Terrestrial Environment

To provide additional habitat for shorebirds and some visiting seabirds, the project proposes to construct a brackishwater pond area suitable for avian fauna, including stilts, coots and ducks. While habitat expansion is beneficial, there is also a possibility that these species may be exposed to activity that may harm them. Alternative 1 would not include a brackish water pond, but will include 5 acres of seawater features, which is 74 percent less than the 19 acres of seawater features in the proposed project. While this would reduce beneficial impacts, it would also decrease exposure to potentially harmful activity. Alternative 2 does not include the brackish water pond features, but would include drainage retention basins that would attract avian fauna and expose them to chemicals used to maintain golf course landscaping. While Alternative 3 would result in no increase in potentially harmful activity, it would also not provide additional habitat for avian fauna. Further discussion on the terrestrial environment is contained in Section 3.7.

Groundwater

Groundwater at the project site occurs as a thin basal brackish water lens. It is influenced by tides and varies in flow direction and salt content. The existing Honokōhau Harbor acts as a drainage point for local groundwater. Any impact to groundwater flow from the proposed harbor is likely to be localized. The proposed marina basin will not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance.

There will be differences in the flow to the marina entrance between the proposed project and Alternative 1. Alternative 1, being smaller in size, will have less impact on groundwater flow than the proposed marina. Alternative 2 will have a similar impact to groundwater quality as the proposed project. Alternative 2 may also impact water quality by contributing nutrients and biocides to the groundwater from the golf course. Alternative 3 would result in no change in existing groundwater conditions. Further discussion on groundwater is contained in Section 3.8.1.

Surface Water

There are no significant natural freshwater streams or ponds at the site, but there are brackish anchialine pools. Surface water at the project site will be influenced by rainfall. Runoff typically percolates rapidly through the permeable ground. The proposed project will include some impermeable surfaces, which together with building roofs, will change runoff and seepage patterns.

Alternative 1 is a lower density project that is expected to have proportionally less impact on surface water and runoff patterns and less potential impact on water quality than the proposed project. Alternative 2 would have more impact on surface water quality than the proposed project due to fertilizers and biocides carried by runoff from the golf course. Alternative 3 would result in no change to surface water conditions. Further discussion on surface water is contained in Section 3.8.2.

Nearshore Environment and Coastal Waters

The potential adverse impacts to the marine environment from the proposed project are due to the construction of an 800-slip marina and the resulting inflow of higher salinity seawater and inadequate water circulation, both of which are anticipated to impair water quality to the extent of falling below applicable standards. One possible mitigation measure is to significantly reduce the size of the marina expansion.

The reduced marina size (from 45 to 25 acres) and reduced lagoon acreage in Alternative 1 are expected to result in a proportionate reduction in seawater discharging into the new harbor and increased water circulation. Alternative 2 includes the same marina basin size and is therefore subject to the same factors that are expected to adversely affect water quality.

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water quality in the proposed harbor depends on several components. These include salinity, nutrients, and sediments that come from the ocean, rainfall runoff, water features with marine animals, and dust. The smaller project offered as Alternative 1 is expected to produce a reduced amount of pollutants and reduce the risk of adverse impact upon water quality.

It is notable that the 45-acre marina basin planned in the proposed project and Alternative 2 only becomes viable from a water quality impact standpoint if the additional brackish groundwater inflow into the new marina exceeds 60 mgd. The resulting flushing from such inflow would be expected to better maintain water quality. However, it is unclear whether 60 mgd of brackish groundwater would be available. As proposed in Alternative 1, reduction of the volume of the new marina basin by 45 percent will significantly improve the flushing and water quality because the lower volume can be flushed by the available groundwater flow.

In addition, there could be higher rainfall runoff from the Alternative 2 golf course into the harbor, because the grassed golf course will be less porous than the natural surface. The golf course will also require relatively high levels of fertilizer, biocides, and irrigation, all of which could contribute to adverse water quality impacts.

Further discussion on nearshore environment and coastal waters is contained in Section 3.9.1.

Anchialine Pools

Anchialine pools are located north of Honokōhau Harbor, and south of the harbor on the project site. The marine life in these pools is sensitive to groundwater quality, and changes due to construction and operation of the project could degrade the viability of the pool ecosystem. In the southern complex, 3 anchialine pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction in the proposed project and Alternatives 1 and 2.

Predicting the extent of change in groundwater flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is therefore extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Due to the uncertainty of changes in groundwater flow and quality due to marina construction, the variability in impacts between the proposed project and Alternatives 1 and 2 is unknown at this time. Alternative 3 would result in no change in groundwater flow. While this would eliminate the potential for adverse impacts, Alternative 3 would also continue the pattern of existing degradation related to human activity and the introduction of alien species. Further discussion on anchialine pools is contained in Section 3.9.2.

Marine Fishing Impacts

The proposed marina will increase the number of boats in the area and it is reasonable to assume that a portion of these new boats will engage in fishing activities. The increase in boats in the area would be primarily related to the marlin and tuna / pelagic fishery, coral reefs due to extractive fisheries, and SCUBA activities. The pressure on fish and invertebrate stocks is expected to increase with or without the marina. Harbor expansion provides the opportunity to address existing conditions to consolidate, focus, and fund management and enforcement activities at one location.

Compared to the proposed project, Alternative 1 would result in a 21 percent decrease in boat traffic, thereby lessening the potential for marine fishing impacts. The level of impacts in Alternative 2 would be similar to that of the proposed project. Alternative 3 would result in no change in existing marine fishing conditions, and no opportunity to address already existing pressure on fish and invertebrate stocks. Further discussion on marine fishing impacts is contained in Section 3.9.3.

Cultural and Archaeological Resources

The proposed project will integrate cultural and archaeological resources in the overall development. Archaeological sites recommended for preservation will be preserved, and cultural practices will be encouraged. Kona Kai Ola includes a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. Proposed is a 400-foot shoreline setback that would serve as a buffer between the ocean and developed areas. This coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use.

Alternative 1 would contain all of the cultural archaeological features and the shoreline setback area would be 400 feet in the northern portion of the site and increase to 600 feet in the southern portion. Alternative 2 would preserve cultural and archaeological resources, but does not include a 400-foot shoreline setback. Alternative 3 would result in no change to existing cultural and archaeological resources and no addition of cultural and community facilities and activities. Further discussion on cultural and archaeological resources is contained in, respectively, Sections 4.1 and 4.2.

Noise

Project-generated noise is due to construction equipment and blasting, boats, marina activities, vehicle traffic, and the Kealakehe Wastewater Treatment Plant operations. Alternative 1 would generate less noise impacts due to reduced construction activities, fewer boats, less traffic and less on-site activity. Alternative 2 would also generate less noise due to reduced traffic and less on-site activity, but noise related to the excavation of the marina basin and an increase in the number of boats would be similar to that of the proposed project. Further discussion on noise impacts is presented in Section 4.4.

Socioeconomic Impacts

The proposed project will generate an increase in de facto population of an estimated 5,321 persons due to the increase in hotel and time-share units. The estimated de facto population increase in Alternative 1 is 37 percent less, at 3,363 persons, than the proposed project. The de facto population increase in Alternative 2 is similar to Alternative 1.

Employment in the commercial components will nearly double in Alternative 1, from a stabilized level of 1,429 full-time equivalent (FTE) positions in the proposed project to 2,740 in the Alternative 1.

Under Alternative 1, the total operating economic activity at Kona Kai Ola will increase due to the added commercial space more than off-setting the fewer visitor units, moving upward from $557.6 million per year to circa $814.3 million annually. The total base economic impact resulting from development and operation of Alternative 1 will similarly be higher by between 35 and 45 percent than that of the proposed project.

Alternative 1, which has a reduced marina size of 25 acres, and fewer hotel and time-share units, would have a meaningful market standing, create significant economic opportunities, and provide a net benefit to State and County revenues. From a market perspective, a smaller Kona Kai Ola would still be the only mixed use community in the Keahole to Kailua-Kona Corridor offering competitive hotel and time-share product.

The estimated absorption periods for marketable components of Alternative 1 are generally shorter than those for the same components in the proposed project. Marina slips under Alternative 1 are estimated to be absorbed within 2 years after groundbreaking, as compared with 9 years for absorption of slips in the proposed project. Hotel rooms under Alternative 1 are estimated to be absorbed within 4 years after groundbreaking, as compared with 7 years under the proposed project. Time-share units would be absorbed within 10 years under Alternative 1, while 15 years are projected under the proposed project. Due to the planned increase in commercial facilities under Alternative 1, the absorption period of commercial space is estimated at 14 years, as compared with 8 years for absorption of such facilities under the proposed project.

The State and County will still both receive a net benefit (tax receipts relative to public expenditures) annually on a stabilized basis under the Alternative 1. The County net benefits will be some $12.2 million per year under the Alternative 1 versus $14.9 million under the proposed project. The State net benefits will increase under the Alternative 1 to about $37.5 million annually, up substantially from the $11.4 million in the proposed project.

Due to the lower de facto population at build-out, the effective stabilized public costs for both the State and County will decline meaningfully under the Alternative 1, dropping from $7.7 million annually for the County and $36.5 million for the State, to $4.9 million and $23 million per year, respectively.

Alternative 3 would result in no increase in de facto population and improvement to economic conditions. Further discussion on social and economic impacts are contained in, respectively, Sections 4.5 and 4.6.

Vehicular Traffic

The proposed project will impact the nearby road network that currently is congested during peak traffic times. The proposed project includes roadway improvements that would reduce the impact and improve roadway conditions for the regional community.

Alternative 1 includes the same roadway system improvements as the proposed project, yet would reduce vehicular traffic by 35 percent when compared to the proposed project. Alternative 2 would have similar traffic conditions and roadway improvements as Alternative 1. Alternative 3 would result in no increase in traffic and no roadway improvements.

Marina Traffic Study

The increase in boat traffic due to the proposed 800-slip marina would cause entrance channel congestion during varying combinations of existing and new marina peak traffic flow. Worst case conditions of active sport fishing weekend and summer holiday recreational traffic result in traffic volumes exceeding capacity over a short afternoon period. Mitigation to address boat traffic in the proposed project include widening the entrance channel, traffic control, implementation of a permanent traffic control tower, or limiting vessel size.

Alternative 1 would result in a 21 percent reduction in boat traffic congestion under average existing conditions and ten percent reduction during peak existing conditions. The reduction to 400 slips also reduces the impacts of congestion at the entrance channel, thereby reducing the need for any modifications to the entrance channel.

Alternative 2 would have the same level of boat traffic as the proposed project. Alternative 3 would not meet the demand for additional boat slips and would not generate additional boat traffic. Further discussion on marina traffic is contained in Section 4.8.

Police, Fire and Medical Services

The proposed project will impact police, fire and medical services due to an increase in de facto population and increased on-site activity. Alternatives 1 and 2 would have similar levels of impact as the proposed project due to increased on-site activity. Further discussion on police, fire and medical services are contained, respectively, in Sections 4.10.1, 4.10.2 and 4.10.3.

Drainage and Storm Water Facilities

The proposed project will increase drainage flows, quantities, velocities, erosion, and sediment runoff.

Alternative 1 involves a reduction of the project density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces associated with hotel and time-share development and to the creation of more open space. However, roadway areas will increase by about 30 percent in Alternative 1. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings. The golf course in Alternative 2 may also change drainage characteristics from those of the proposed project and may not reduce impacts. Alternative 3 would result in no change in existing conditions and no improvements to drainage infrastructure. Further discussion on drainage and storm water facilities is contained in Section 4.10.5

Wastewater Facilities

The proposed development is located within the service area of the Kealakehe WWTP and a sewer system will be installed that connects to the WWTP. The sewer system will be comprised of a network of gravity sewers, force mains, and pumping stations which collect and convey wastewater to the existing Kealakehe WWTP. Project improvements will incorporate the usage of recycled / R1 water. Improvements implemented by the proposed project will also accommodate the needs of the regional service population.

Alternative 1 would generate approximately 10 percent less wastewater flow than the proposed project. Wastewater flow in Alternative 2 is undetermined. Alternative 3 would result in no additional flow, as well as no improvements that will benefit the regional community. Further discussion on wastewater facilities is contained in Section 4.10.6.

Potable Water Facilities

The proposed project average daily water demand is estimated at 1.76 million gallons per day. Existing County sources are not adequate to meet this demand and source development is required. The developer is working with DLNR and two wells have been identified that will produce a sustainable yield that will serve the project. These wells will also serve water needs beyond the project.

Alternative 1 would result in net decrease of about five percent of potable water demand. Alternative 2 may have a lower water demand than the proposed project as long as potable water is not used for irrigation. Alternative 3 would result in no additional flow, as well as no source development that will benefit the regional community. Further discussion on potable water facilities is contained in Section 4.10.8.

Energy and Communications

Regarding Alternative 1, preliminary estimates for electrical, telecommunications, and cable resulted in a net demand load that remains similar to the proposed project. Further discussion on energy and communications is contained in Section 4.10.9.1.

The proposed project will increase the demand for electrical energy and telecommunications. The demand would be reduced in Alternative 1 because the number of boat slips and units would decrease. Similarly, Alternative 2 would have fewer units than the proposed project and therefore reduce energy demands. Further reduction in energy demand for either alternative could be achieved by using seawater air conditioning (SWAC) and other energy reduction measures, as planned by the developer. Further discussion on energy and telecommunications is contained in Section 4.10.9.2.

Water Features and Lagoons

The proposed project includes a brackishwater pond, lagoons, and marine life exhibits supplied by clean seawater. The water features in Alternative 1 would significantly decrease by 74 percent from 19 acres in the proposed project to five acres in Alternative 1. This decrease in water features would result in a corresponding decrease in water source requirements and seawater discharge. Alternative 2 does not include the seawater features. Alternative 3 would result in no additional demand for water source requirements and seawater discharge.

2.2.2 Conformance with Public Plans and Policies

State of Hawai‘i

Chapter 343, Hawai‘i Revised Statutes

Compliance with this chapter is effected, as described in Section 5.1.1 in regard to the proposed project and the alternatives discussed.

- State Land Use Law, Chapter 205, Hawai‘i Revised Statutes

  The discussion in Section 5.1.2 is directly applicable to Alternative 1, the proposed project. Alternative 1 will involve a setback of 400 feet that increases to 600 feet along the southern portion of the project site’s shoreline area. Alternative 2 does not provide for such a setback, but may still require approvals from DLNR for cultural, recreational, and community uses and structures within the Conservation district.

- Coastal Zone Management Program, Chapter 205A, Hawai‘i Revised Statutes

  Recreational Resources:

  In addition to the discussion of consistency with the associated objective and policies, as described in Section 5.1.3, the reduction from the proposed project’s 800-slip marina to a 400-slip marina under Alternative 1 will still expand the region’s boating opportunities and support facilities. The existing harbor entrance will still be utilized under this alternative; however, potential risks relating to boat traffic and congestion in the marina entrance area will be reduced significantly. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities, and marine science center remain important recreational components under Alternative 1.

Alternative 2 includes a golf course component, which would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Alternative 2, like the proposed project, will expand the region's boating opportunities and support facilities through its 800-slip marina. However, the potential adverse impacts of increased boat traffic from the size of the marina are significant enough to offset the benefits of increased boating opportunities.

Coastal Ecosystems:

The discussion in Section 5.1.3 is directly applicable to Alternative 1.

Alternative 1 not only reduces the number of slips proposed by 50 percent, but it also reduces the size of the marina from 45 acres to 25 acres. The 25-acre marina will increase the body of water within the existing harbor, but to a significantly lesser extent than the proposed project's estimated increase, which is also applicable to the 45-acre size that is proposed for the marina under Alternative 2.

The findings of the Harbor Water Quality Modeling Study conclude that a reduction in the size of the harbor expansion is an alternative that will mitigate the risk of significant impacts upon water quality within the marina and existing harbor. Accordingly, the reduction in both the number of slips and the size of the marina basin under Alternative 1, in combination with proper facilities design, public education, and enforcement of harbor rules and regulations, would result in fewer long-term impacts to water quality and coastal ecosystems. Short-term (construction-related) impacts would likely remain the same although the reduction in the total acreage of excavation is expected to result in a shorter duration of such impacts.

In addition to its 800-slip marina and potential adverse impacts upon water quality and the marine environment, Alternative 2 includes a golf course component, which has the potential to impact coastal ecosystems by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Economic Uses

Although reduced in the number of slips, the smaller marina under Alternative 1 will nevertheless serve public demand for more boating facilities in West Hawai'i and is consistent with the objective and policies and discussion set forth in Section 5.1.3. The economic impacts of Alternative 2, while comparable to those of the proposed project's marina development, are notably marginal as to the golf course component, based on the marketability analysis that indicates a condition of saturation within the region.

Coastal Hazards

The discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Tsunami risks mainly affect the large shoreline setback area that is proposed for the project and Alternative 1. Alternative 2 projects a transient accommodation site that is partially within the tsunami hazard zone and thus carries a higher hazard risk. However, the essential requirement for these alternatives, as well as the proposed project, is a well-prepared and properly implemented evacuation plan.

Beach Protection

Discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Alternative 1 and, to a lesser extent, Alternative 2, will retain the shoreline area in its natural condition.

Similar to the proposed project, Alternative 1 provides for a shoreline setback of considerable width within which no structure, except for possible culturally-related structures, would be allowed. Alternatives 1 and 2 will thus be designed to avoid erosion of structures and minimize interference with natural shoreline processes.

Marine Resources

The discussion in Section 5.1.3 is also applicable to Alternative 1 which is described to be an alternative that is specifically projected to mitigate anticipated adverse impacts on water quality and the marine environment that might otherwise result from the original harbor design and scale, which is also incorporated in Alternative 2 . The reduced marina size under Alternative 1 is projected to meet water quality standards and enable greater compliance with the objective and policies addressed in this section.

Alternative 2 includes a golf course component and thus the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Hawai'i State Plans, Chapter 226, Hawai'i Revised Statutes

Section 226-4 (State goals), 5 (Objectives and policies for population, and 6 (Objective and policies for economy in general):

The discussion in Section 5.1.4 is applicable to Alternatives 1 and 2, in addition to the proposed project. These development concepts generally conform to the goals, objectives, and policies set forth in these sections because they will provide some degree of economic viability, stability, and sustainability for future generations. Kona Kai Ola will convert essentially vacant land into a mixed-use development with a distinctive marina and boating element, providing a wide range of recreational, business, and employment opportunities to the community.

Section 226-8 Objective and policies for the economy – the visitor industry:

Alternatives 1 and 2 will be consistent with the State's economic objective and policies relating to the tourism industry for the same reasons that are discussed in regard to the proposed project in Section 5.1.4. They will incorporate JDI's commitment to sustainability principles in the planning and design of the development concepts in Alternatives 1 and 2. Although the total hotel and time-share unit count is reduced to approximately 1,500 in Alternatives 1 and 2, the transient accommodations component of these alternatives will still further the State's objective and policies for increased visitor industry employment opportunities and training, foster better visitor understanding of Hawai'i's cultural values, and contribute to the synergism of this mixed-use project concept that addresses the needs of the neighboring community, as well as the visitor industry.

Section 226-11 Objectives and policies for the physical environment: land-based, shoreline and marine resources:

Alternative 1 is expected to involve less potential adverse impacts upon these environmental resources than the proposed project. Likewise, and Alternative 2 would have less adverse impact because of its reduction in the size of the marina and in the total hotel and time-share unit count. Alternative 1 carries less potential risk to water quality and related impacts upon the marine environment and anchialine pool ecosystems. Although approximately three anchialine pools are expected to be destroyed, the great majority of pools will be preserved within and outside of the proposed 400-foot shoreline setback.

The golf course component in Alternative 2 has the potential to impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the marina basin and nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools by introducing the chemicals into the pond systems.

Section 226-12 Objective and policies for the physical environment: scenic, natural beauty, and historic resources:

The discussion in Section 5.1.4 is directly applicable to Alternative 1 and describes the compliance with the objective and policies addressed.

The golf course component of Alternative 2 would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area.

Just as with the proposed project, Alternatives 1 and 2 would also be designed to blend with the natural terrain and to honor and protect the cultural history, resources, and practices of these lands.

Section 226-13 Objectives and policies for the physical environment: land, air and water quality:

As stated above, because of the reduction in both the number of slips and the size of the marina basin, with proper facilities design, public education and enforcement of harbor rules and regulations, Alternative 1 is anticipated to cause fewer long-term impacts to water quality than either the proposed project or Alternative 2. Based on the findings of the Harbor Water Quality Modeling Study, water quality resulting from a reduced marina basin size as proposed under Alternative 1 is expected to be similar to existing conditions.

As previously noted, Alternative 2 has the potential to adversely impact water quality by increasing the nutrient loading in surface runoff and groundwater by introducing pesticides, herbicides and other chemicals common in golf course development and maintenance into the marina basin and nearshore waters surrounding the project site.

Section 226-14 Objectives and policies for facility systems - general:

Alternatives 1 and 2 will conform to the objective and policies of this section on the grounds that are discussed in regard to the proposed project in Section 5.1.4. The master-planning and phasing of the project concepts under these alternatives will be coordinated with associated public and private infrastructural planning and related private and public infrastructural financing. The cost of the marina construction and project-related infrastructure is to be borne by the developer, resulting in considerable savings for the public. In addition, the projected lease revenue from these public lands will provide additional public benefits by establishing a revenue stream for capital improvements and maintenance of a range of State facilities.

Section 226-15 Objectives and policies for facility systems - solid and liquid wastes:

In addition to the developer’s commitment to sustainable development design, the project will involve upgrades to the County of Hawai‘i’s Kealakehe Wastewater Treatment Plant to meet current needs, as well as the project’s future needs. This commitment is applicable to Alternatives 1 and 2, as well as the proposed project that is discussed in Section 5.1.4.

Section 226-16 Objectives and policies for facility systems – water:

The discussion of water conservation methods and the need to secure additional potable water sources in Section 5.1.4 is also applicable to Alternative 1 and demonstrates conformity to the objective and policies for water facilities. Alternative 2 involves greater irrigation demands in regard to its golf course component and greater potable water demands for human consumption than those for Alternative 1. Alternative 2 is expected to face more serious challenges in securing adequate and reliable sources of water.

Section 229-17 Objectives and policies for facility systems – transportation:

Alternatives 1 and 2 will conform to this objective and policies because they will present water transportation opportunities, including the possible use of transit water shuttles to Kailua-Kona, as described in regard to the proposed project in Section 5.1.4.

Section 226-18 Objectives and policies for facility systems – energy:

Alternatives 1 and 2 conform to these objective and policies through the use of energy efficient design and technology and commitment to the use and production of renewable energy to serve the project's needs. Solar energy production, solar hot water heating, and the use of deep cold seawater for cooling systems are currently identified as means of saving substantial electrical energy costs for the community and the developer.

Section 226-23 Objectives and policies for socio-cultural advancement – leisure:

Alternative 1 conforms to this objective and related policies for the reasons offered in Section 5.1.4 in regard to the proposed project. Alternative 1 will be of greater conformity with the policy regarding access to significant natural and cultural resources in light of the 400-600 foot shoreline setback that has been designed for this alternative.

Although it does not propose the considerable shoreline setback that is planned for Alternative 1, Alternative 2 is consistent with this objective and related policies in incorporating opportunities for shoreline-oriented activities, such as the walking trails. In addition, the golf course component adds a more passive recreation alternative to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Section 226-25 Objectives and policies for socio-cultural advancement-culture:

The discussion in Section 5.1.4 is relevant to Alternatives 1 and 2 and demonstrate their conformity the objective and policies of this section.

Both alternatives involve the preservation and protection of cultural features that have been identified by the Cultural Impact Assessment and archaeological studies for the project area. Both provide for public shoreline access, and both will continue the policy of close consultation with the local Hawaiian community and cultural and lineal descendants in the planning of cultural resource preservation and protection.

Section 226-103 Economic priority guidelines:

Alternatives 1 and 2 conform to these guidelines for the same reasons that are set forth in Section 5.1.4. They involve private investment in a public project that will create economic diversification through a mix of marina, industrial, commercial, visitor, and cultural facilities. This presents a wide range of entrepreneurial opportunities, long-term employment opportunities, and job training opportunities.

Section 226-104 Population growth and land resources priority guidelines:

As described in Section 5.1.4, the policy support for the proposed project also extends to the similar development concepts considered in Alternatives 1 and 2. Those alternatives conform to the guidelines of this section because they involve an urban development under parameters and within geographical bounds that are supported by the County's General Plan, a preliminary form of the Kona Community Development Plan, the County's Keahole to Kailua Regional Development Plan, and the reality of being located along the primary commercial/industrial corridor between Keahole Airport and Kailua-Kona. As with the proposed project, the development concepts of Alternatives 1 and 2 are essentially alternatives for the implementation and "in-filling" of the urban expansion area in North Kona.

DHHL Hawai'i Island Plan

This 2002 plan projects DHHL's Honokōhau makai lands for commercial use. As compared to the proposed project and Alternative 2, Alternative 1 presents an expanded commercial component that provides greater compliance with the plan, while addressing certain beneficiaries' concerns about the scale of the marina originally required in the Project. Alternative 2 also conforms to the recommended commercial uses in the makai lands but to a lesser degree than Alternative 1 because of its more limited commercial component. Like the proposed project, its marina size and number of slips raise environmental issues, as more specifically discussed in Part 3, and community concerns.

County of Hawai'i General Plan

HCGP Section 4 – Environmental Quality Goals, Policies and Courses of Action:

Alternative 1 is consistent with this section. It presents a reduction in both the number of slips and the size of the marina basin that, in combination with proper facilities design, public education and enforcement of harbor rules and regulations, would result in very few long term impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions.

Alternative 2 is the least consistent with this section. In addition to the potential significant impacts of its 800 slip marina basin, its golf course component has the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides and other chemicals common in golf course use and management into the nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools beyond their current conditions by introducing such substances into the pool systems.

HCGP Section 7 – Natural Beauty Goals and Policies:

Alternative 2 conforms to some degree with this section. Its golf course component would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area, as demonstrated in other makai golf courses within the region.

HCGP Section 8 – Natural Resources and Shoreline:

Alternative 1 is most consistent with the goals and policies of this section. It would require considerably less marina excavation than the proposed project and Alternative 2 and would reduce the potential risk of long-term adverse impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions with the degree of reduction in marina basin size that is proposed under Alternative 1. This reduction is also expected to reduce potential impacts upon anchialine pools and their ecosytems, as well as shoreline and marine resources that are affected by water quality. Alternative 1 also retains the shoreline preservation and protection concepts that are proposed in and described for the Project.

HCGP Section 10 – Public Facilities Goals and Policies:

The discussion in Section 5.2.1. in relation to the proposed project is applicable to Alternatives 1 and 2. Improvements to public facilities are are integral to the Kona Kai Ola development. The provision of additional boat slips and numerous road improvements, including a makai extension of Kuakini Highway south to Kailua-Kona are incorporated into plans for the project's development. In light of these elements, Alternatives 1 and 2 are consistent with the goals and policies of this section.

HCGP Section 11 – Public Utility Goals, Policies:

As with the proposed project, Alternatives 1 and 2 are consistent with the goals and policies of this section, based on the relevant grounds set forth in Section 5.2.1. The developer is committed to design, fund, and develop environmentally sensitive and energy efficient utility systems to the extent possible, as described previously in Part 5. Its master planning provides for the coordinated development of such systems with the objective of achieving significant savings for the public. As previously-mentioned example, the project development involves the upgrading of the Kealakehe Wastewater Treatment Plant.

HCGP Section 12 – Recreation:

Alternative 1 is consistent with the goals, policies, and courses of action for North Kona in this section.

Although the number of slips is reduced under Alternative 1, the region's boating opportunities and support facilities will still be expanded. The existing marina entrance would still be utilized under this alternative. However, concerns relating to increased activity leading to increased congestion in the marina entrance area would be mitigated to a certain extent. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities and marine science center remain important components of Alternative 1.

The golf course component of Alternative 2 would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola. Alternative 2 is also considered to be consistent with this section.

HCGP Section 13 and 13.2 – Transportation:

The reduced marina component under Alternative 1 will still provide transportation opportunities and provide for possible use of transit water shuttles to Kailua-Kona, although to a lesser degree than under the proposed project and Alternative 2 . However, in each scenario, internal people-movers are planned, and numerous roadway improvements are planned for coordination with public agencies, including but not limited to the construction of the Kuakini Highway extension between Honokōhau and Kailua-Kona. Accordingly, both Alternatives 1 and 2 are consistent with the goals, policies, and courses of action for North Kona under these sections of the General Plan.

HCGP Section 14.3 – Commercial Development:

For the reasons presented in the discussion under Section 226-104 of the State Plan, the planned commercial component under Alternatives 1 and 2 are consistent with this section.

HCGP Section 14.8 – Open Space:

Alternatives 1 and 2 are consistent with the goals and policies of this section. Alternative 1 provides a considerable (400-600 foot) shoreline setback along the entire ocean frontage of the project site as a means of protecting the area's scenic and open space resources, as well as natural and cultural resources. Although it does not incorporate the shoreline setback planned in Alternative 1, Alternative 2 provides a golf course component would contribute to the amount of open space that is currently proposed and allow additional view corridors to be created.

Community Development Plans

Community development plans are being formulated for different regions in the County in order to supplement the County's General Plan. The Kona Kai Ola project is located in the Kona Community Development Plan (CDP) area. Maps associated with the preliminary work phases

of the Kona CDP include the Kona Kai Ola project site within the "Preferred Urban Growth" boundary of the North Kona district. The Kona CDP process is guided by a Steering Committee composed of a broad cross-section of the community. The Steering Committee will eventually complete its work and recommend the CDP's adoption.

After the DEIS was published, the Kona CDP has progressed to the development of plans for the major urban growth corridor north of Kailua-Kona. The Kona CDP has produced a draft plan showing a transit oriented development that includes a midlevel public transit corridor along the mauka residential elevation, and a makai transit corridor that runs along a proposed new frontage road just makai and parallel to Queen Kaahumanu Highway. The development plan for Alternative 1 includes the Kuakini Highway as part of this proposed frontage road and transit line from Kailua Kona to the Kealakehe area, along with a transit stop at Kona Kai Ola. The Alternative 1 plan also includes a road that could be extended to be part of the proposed frontage road should it be approved and implemented. In addition, the Kona CDP has continued to emphasize the principles of smart growth planning with mixed use urban areas where people can live, work, play and learn in the same region. Kona Kai Ola has been specifically designed to be consistent with this policy in order to provide a stable employment base close to where people live in the mauka residential areas already planned for DHHL and HHFDC lands.

It should be noted that currently and over the years, the 1990 Keāhole to Kailua Development Plan (K-to-K Plan) guides land use actions by the public and private sectors. It is intended to carry out the General Plan goals and policies related to the development of the portion of North Kona area, including the Kona Kai Ola site. The "Preferred Growth Plan" of the Keāhole to Kailua Development Plan identifies the project site as a new regional urban center to include commercial, civic, and financial business related uses, an expanded "Harbor Complex," a shoreline road, and a shoreline park. The proposed project and the development concepts in Alternatives 1 and 2 are therefore consistent with the recommendations in the Keāhole to Kailua Development Plan.

Hawai'i County Zoning

As shown on Figure AA, the project site is zoned "Open". Under Section 25-5-160 of the Hawai'i County Code, "The O (Open) district applies to areas that contribute to the general welfare, the full enjoyment, or the economic well-being of open land type use which has been established, or is proposed. The object of this district is to encourage development around it such as a golf course and park, and to protect investments which have been or shall be made in reliance upon the retention of such open type use, to buffer an otherwise incompatible land use or district, to preserve a valuable scenic vista or an area of special historical significance, or to protect and preserve submerged land, fishing ponds, and lakes (natural or artificial tide lands)".

Some of the proposed uses at Kona Kai Ola are permitted uses in the Open zone such as:

- Heiau, historical areas, structures, and monuments;
- Natural features, phenomena, and vistas as tourist attractions;
- Private recreational uses involving no aboveground structure except dressing rooms and comfort stations;

- Public parks;
- Public uses and structures, as permitted under Section 25-4-11.

In addition to those uses permitted outright, the following uses are permitted after issuance of a use permit:

- Yacht harbors and boating facilities; provided that the use, in its entirety, is compatible with the stated purpose of the O district.
- Uses considered directly accessory to the uses permitted in this section shall also be permitted in the O district.

The proposed time-share and hotel units and commercial uses would not be consistent with the zoning designation of “Open”. Project implementation therefore requires rezoning of portions of the project to the appropriate zoning category or use permits for certain uses.

Special Management Area

As shown in Figure AB, the entire project area up to the highway is within the coastal zone management zone known as the Special Management Area (“SMA”). At the County level, implementation of the CZM Program is through the review and administering of the SMA permit regulations. Kona Kai Ola complies with and implements the objectives and policies of the Coastal Zone Management (CZM) Program, and a full discussion is provided in Section 5.1.3. The development concepts in the proposed project and Alternatives 1 and 2 will be subject to applicable SMA rules and regulations.

Kona Kai Ola

I think that this developmental project is not the best thing for Kona right now. We already have enough places to park the boats. That is all fishing grounds out in the front of were they want to build and if the do any construction out there it will ruin that fishing. They haven't done any archeological surveys to see if there are any Hawaiian ruins.

They want 530 acres of the land to build a hotel, some time-shares, a yacht cub and 800 more boat slips. We don't need another hotel or a yacht club. We obviously don't need 800 boat slips in there because there is not 800 more boats on this island to park in there. That is my opinion on enlarging Honokahau Harbor

BJ Lawrence

76-6126 Plumeria RD
Kailua-Kona HI 96740

X

July 23, 2007

BJ Lawrence
76-6126 Plumeria Road
Kailua-Kona, HI 96740

Dear Mr. Lawrence:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are based on a paragraph designation.

Paragraph 1

The development of Kona Kai Ola is broader than providing a resort for tourists. The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, Jacoby Development, Inc. (JDI) will protect natural resources through the various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities such as parks, other recreational facilities and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community.

An extensive archaeological investigation was conducted during the preparation of the Draft Environmental Impact Statement (DEIS). Numerous sites, both in Department of Land and Natural Resources (DLNR) and Department of Hawaiian Home Lands (DHHL) land, were identified and inventoried. The complete report is included in the Environmental Impact Statement (EIS), Appendices M-1 and M-2. The archeological study identified eleven sites as culturally significant based on the presence of burials or ritual architecture. Fifty-four sites were mapped, photographed, and documented. Forty-seven sites were recommended through data recovery. Detailed data recovery plans will be prepared for the State Historic Preservation Division (SHPD) of DLNR for review and approval.

A comparison between impacts related to the proposed project concept and impacts related to Alternative 1 (25 acres, 400 slips) indicates that a reduction in the acreage and number of slips in the marina, as well as, the reduction in hotel and timeshare units, would generate less environmental, social, and economic impacts. Although positive economic impacts would be reduced, Alternative 1 can be considered as a preferable alternative because of reduced environmental impacts. However, while it can be concluded that the 25-acre marina in Alternative 1 would be the preferred size, the DLNR agreement establishes the size of the marina at 45 acres and 800 slips. An amendment to the DLNR agreement is required in order to allow Alternative 1 to proceed. Hence, selection of Alternative 1 is an unresolved issue at this time.

The EIS has been revised, and Attachment 1 contains Section 2, Alternatives Analysis.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

2 Alternatives Analysis

~~In typical land development projects, the initial planning process includes the exploration of alternatives to development objectives. In the EIS process, these alternatives are presented with a disclosure of reasons for the dismissal of non-preferred alternatives.~~

~~Kona Kai Ola does not follow this same pattern of alternatives evaluation.~~ As discussed in Section 1.4, the proposed Kona Kai Ola project is the result of agreements between JDI and the State DLNR and DHHL. The agreements and leases between the State and JDI stipulate the parameters of development for this site in terms of uses, quantities and size of many features, resulting in a limited range of land uses. Unlike a private property project, JDI is required to meet the criteria outlined in the agreements, thereby affording less flexibility in options and uses. From the developer's perspective, the agreements must also provide sufficient flexibility to allow for a development product that responds to market needs and provides a reasonable rate of return on the private investment.

The agreements between JDI and DLNR specify that the proposed harbor basin is to be 45 acres and accommodate 800 slips. This development proposal is the subject of this EIS. In response to DEIS comments, additional water quality studies and modeling were conducted. These studies determined that the water circulation in a 45-acre 800-slip marina would be insufficient to maintain the required standard of water quality. The models of water circulation suggest that a new 25-acre harbor basin could successfully maintain required water quality in the new harbor. Comments on the DEIS from DLNR, from other government agencies, the neighbors and the general community also called for the consideration of alternatives in the EIS, including a project with a smaller harbor basin and less density of hotel and time-share units.

In response to these comments on the DEIS, three alternatives are evaluated in this Final EIS and include Alternative 1, which is a plan with a 25-acre 400-slip harbor basin including a decrease in hotel and time-share units; Alternative 2, which is an alternative that had been previously discussed but not included in the proposed project, that includes an 800-slip harbor and a golf course; and Alternative 3, the no-project alternative. Each alternative is included in the EIS with an evaluation of their potential impacts. These project alternatives are presented to compare the levels of impacts and mitigation measures of the proposed project and alternative development schemes pursuant to requirements set forth in Chapter 343, HRS.

~~JDI is required to provide a new marina basin not less than 45 acres and a minimum of 800 new boat slips. Further, the agreements provide the following options for land uses at the project site:~~

- ~~Golf Course~~
- ~~Retail Commercial Facilities~~
- ~~Hotel Development Parcels~~
- ~~Marina Development Parcels~~
- ~~Community Benefit Development Parcels~~

~~JDI is not pursuing the golf course option and is proposing instead to create various water features throughout the project site. All other optional uses have been incorporated in Kona Kai Ola.~~

2.1 Project Alternatives

2.1.1 Alternative 1: 400-Slip Marina

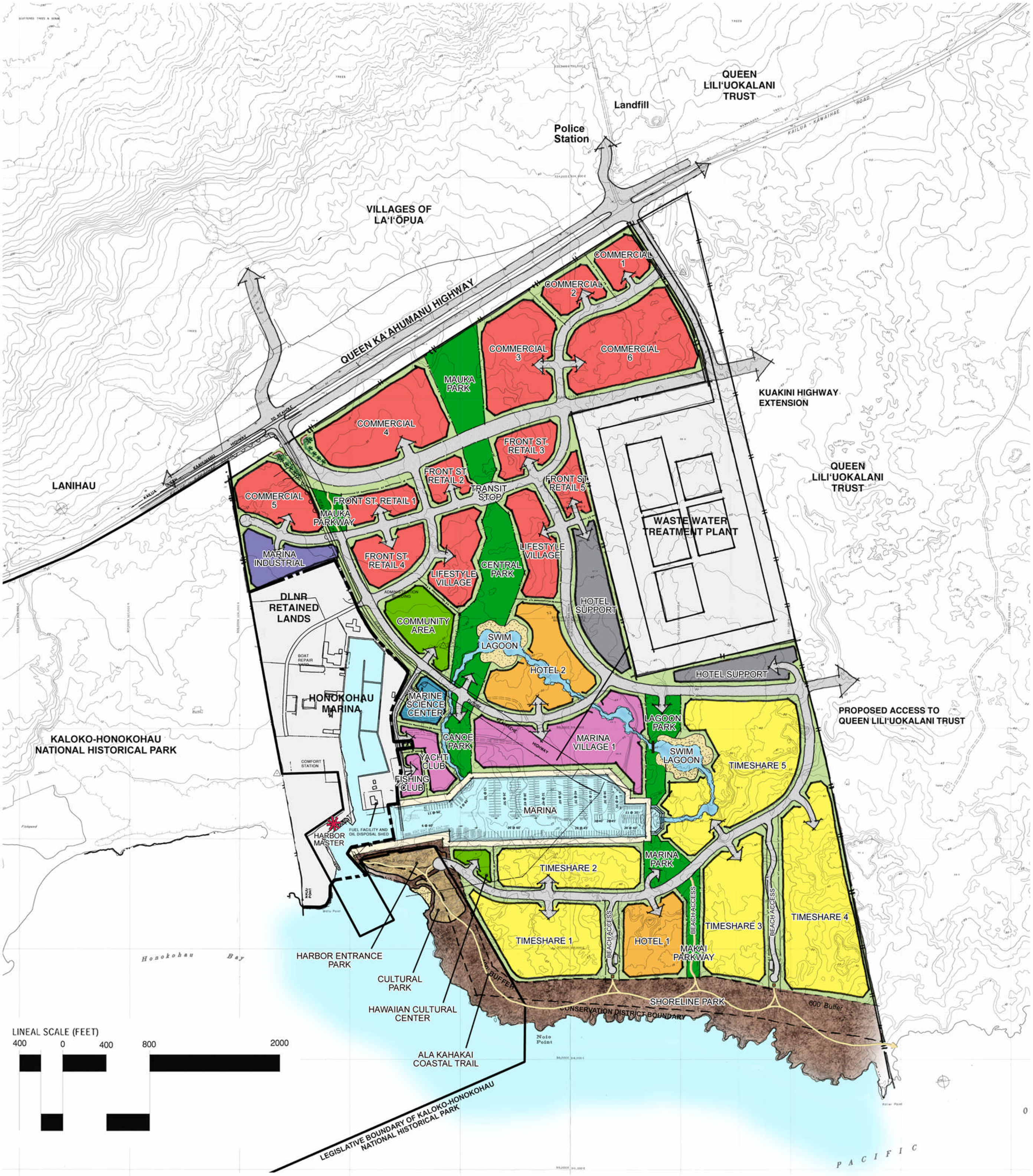
Studies conducted in response to DEIS comments found the construction and operation of an 800-slip marina may significantly impact the water quality within the marina and along the shoreline. Specifically, the Harbor Water Quality Modeling Study, as contained in Appendix U, found that the water circulation in a 45-acre 800-slip harbor was insufficient to maintain an acceptable level of water quality. Further, the existing harbor channel, which would serve both the existing and new harbors, could not adequately serve the increased boat traffic generated by an 800-slip marina during peak traffic. Mitigation measures to accommodate peak boat traffic included the widening of the existing channel, an action that would entail a complex process of Federal and State approvals and encounter significant environmental concern.

Concerns related to the proposed density of hotel and time-share units were also expressed in comments to the DEIS from members of the public, neighbors to the project site, especially the Kaniohale Community Association, and government agencies. Common themes in DEIS comments were related to impacts regarding traffic, project requirements of potable water and infrastructure systems, including sewer, drainage, utility and solid waste systems, and socioeconomic impacts.

In response to the water quality study results, and to the DEIS comments, an alternative plan was developed with a smaller marina with less boat slips, and a related decrease in hotel and time share units. Illustrated in Figure G, Alternative 1 reflects this lesser density project, and features a 400-slip marina encompassing 25 acres. For the purposes of the Alternative 1 analysis, JDI assumed 1,100 time-share units and 400 hotel rooms. Project components include:

- 400 hotel units on 34 acres
- 1,100 time-share units on 106 acres
- 143 acres of commercial uses
- 11 acres of marina support facilities
- 214 acres of parks, roads, open spaces, swim lagoons and community use areas

In addition, Alternative 1 would include the construction of a new intersection of Kealakehe Parkway with Queen Ka‘ahumanu Highway, and the extension of Kealakehe Parkway to join Kuakini Highway to cross the lands of Queen Lili‘uokalani Trust, and connecting with Kuakini Highway in Kailua-Kona. This is a significant off-site infrastructure improvement and is included in the agreements between the State and JDI.



Source: PBR HAWAII

Plan is conceptual only and subject to change

Figure G: Alternative 1: 400-Slip Marina

LEGEND

- TIME SHARE
- HOTEL
- RETAIL / COMMERCIAL
- MARINA RETAIL
- MARINA SUPPORT / COMMERCIAL
- MARINE SCIENCE CENTER
- COMMUNITY AREA / CULTURAL CENTER
- SWIM LAGOON
- MARINA
- UTILITIES
- PARKS & GREEN SPACE
- SHORELINE
- HARBOR ENTRANCE PARK / CULTURAL PARK

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JDI
JACOBY DEVELOPMENT, INC.

Like the proposed project, Alternative 1 would have a strong ocean orientation, and project components that support this theme would include various water features including seawater lagoons and a marine science center. The new Alternative 1 harbor would include a yacht club, fishing club, a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. The coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and ‘Alula for community use. Additional Alternative 1 community areas would include facilities and space for community use, including programs of the Kona Kai Ola Community Foundation, which supports community programs in health care, culture, education, and employment training for the local community, especially to native Hawaiians. Like the original proposed plan, Alternative 1 includes 40 percent of the land in parks, roads, open spaces, swim lagoons and community use areas.

2.1.2 Alternative 2: Golf Course Feature

Alternative 2 was among the alternatives discussed at a community charrette in September 2003. It includes a golf course, which is a permitted use in the DLNR agreement and DHHL lease. As Figure H illustrates, an 18-hole championship golf course would occupy 222 acres on the southern portion of the project site. As with the proposed project, Alternative 2 includes an 800-slip marina on a minimum of 45 acres.

To support the economic viability of the project, other Alternative 2 uses include:

- Golf course clubhouse on three acres
- 1,570 visitor units on 88 acres fronting the marina
- 118 acres of commercial uses
- 23 acres of community uses

Community uses in Alternative 2 include an amphitheater, a canoe facilities park, a community health center, a Hawaiian cultural center and fishing village, a marine science center and employment training center. The sea water lagoon features contained in the proposed project and Alternative 1 are not included in this alternative.

2.1.3 Alternative 3: No Action

In Alternative 3, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.

~~The economic viability and sustainability of the project is determined by the density and uses proposed. Because JDI is obligated to develop an 800-slip marina for the State, complete road improvements, and provide various public enhancement features at its own expense, the density proposed for the income generating features of the development must be sufficient to provide an acceptable level of economic return for JDI. The market study, which is discussed in Section 4.6, reviewed various development schemes and determined that the currently proposed density and mix is the optimum to meet the anticipated financing and development cost obligations for the public features associated with the development.~~

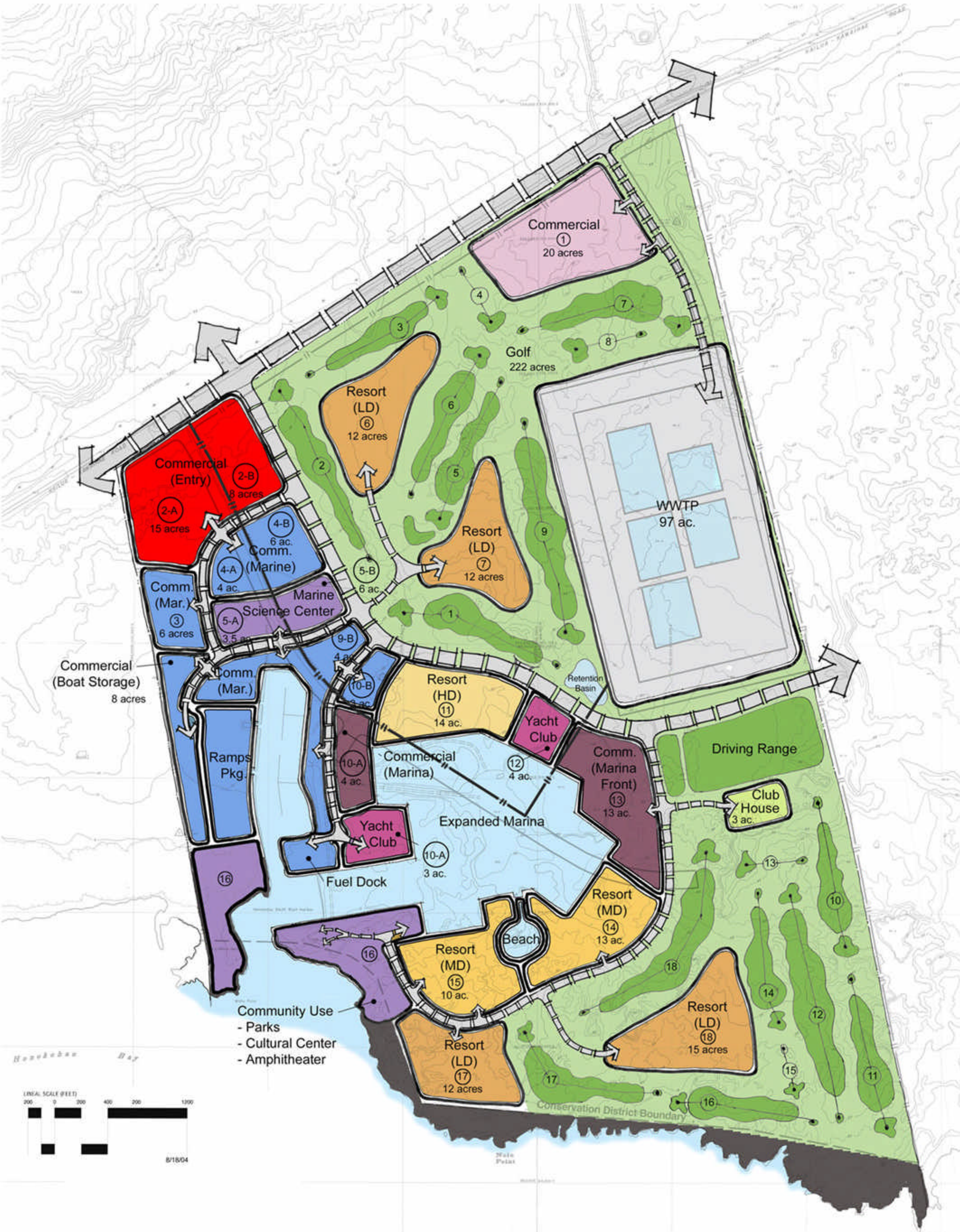

Figure H. Alternative 2: Golf Course Alternative

Legend

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JDI
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2.2 Alternatives Analysis

As discussed in Section 2.1, the proposed Kona Kai Ola project (also referred to as "proposed project") is defined by development requirements related for a marina and the related uses that would be needed to generate a reasonable rate of return that covers development costs.

Beginning with Section 2.2.1, the alternative development concepts are comparatively assessed for potential impacts that may reasonably be expected to result from each alternative. Following is an overview of the primary observations of such assessment.

Alternative 1 includes half of the State-required boat slips and 60 percent of the proposed hotel and time-share units and, due to the decreased density, this alternative would generate significantly less environmental and socio-economic impacts. A harbor water quality model found the reduction of the volume of the new marina basin by about half (approximately 25 acres) significantly improved the water circulation and quality. Further, the reduced number of boat slips would generate less boat traffic, thereby reducing congestion and the need to mitigate impacts further by the widening of the existing harbor channel.

A project with fewer hotel and time-share units and increased commercial space with a longer (14 years) absorption period would change the mix of employment offered by the project, and slightly increase the overall employment count. The public costs/benefits associated with Alternative 1 would change, compared to the proposed project, with a general increase in tax collections, and a general decrease in per capita costs. Detailed discussion of Alternative 1 potential economic impacts are provided in Section 4.6.6. Comparisons of levels of impact are presented throughout this FEIS.

While this analysis might indicate that the 25-acre marina in Alternative 1 would be the more prudent choice, the DLNR agreement establishes the minimum size and slip capacity of the marina at 45 acres and 800 slips, respectively. Amendments to the DLNR agreement would be required in order to allow Alternative 1 to proceed as the preferred alternative. Hence, selection of the preferred alternative is an unresolved issue at the writing of this FEIS.

Alternative 2, the golf course alternative, was not previously considered to be the preferred alternative primarily because market conditions at the time of project development might not likely support another golf course. Further, DHHL has a strategy goal to have more revenue-generating activities on the commercial lease lands within the project area. In addition, concerns have been expressed as to environmental impacts of coastal golf courses, including the potential adverse impact on Kona's water supply if potable water is used for golf course irrigation.

While Alternative 3, the no-project alternative, would not generate adverse impacts related to development of these lands associated with the construction and long-term operations, it would also not allow for an expanded public marina that would meet public need and generate income for the public sector. Further, the no-project alternative would foreclose the opportunity to create a master-planned State-initiated development that would result in increased tax revenue, recreation options and community facilities. Crucial privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities, and public access would not be contributed.

~~Hence, the only valid alternative to the proposed project is the no-action alternative. In this alternative, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.~~

~~The no-project alternative would therefore not generate adverse impacts associated with the construction and long-term operations would not occur.~~

~~Likewise, the creation of a master-planned state-initiated development, resulting in increased employment, tax revenue, recreation options and community facilities, would not be created. Privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities and public access would not be contributed.~~

Further, the creation of revenue-producing businesses on the DHHL property to fund homestead programs would not occur, resulting in fewer potential benefits for Hawaiians.

Hence, the agreements and leases between the State and JDI indicate that the no-action alternative is not in the public interest~~has been rejected at this time~~.

2.2.1 Impact Comparison

Grading and Excavation

The proposed project requires grading and excavation. Both actions may impact groundwater due to rainfall runoff during construction. Alternative 1 would require a significantly smaller excavation for the marina basin and would therefore carry a lesser risk of potential adverse effects on water quality. Alternative 2 would require the same basin excavation as the proposed project, and would also include extensive grading and filling to build the golf course, the latter of which would generate additional impacts. Alternative 3 would result in no change to the geography, topography and geology.

Further discussion on grading and excavation is contained in Section 3.3.

Natural Drainage

Most precipitation infiltrates into the porous ground at the site, and no significant sheet flow is likely. Alternative 1 would generate similar levels of impacts on natural drainage as those of the proposed project and thus require similar mitigation measures. The golf course in Alternative 2 would not be as porous since the site would be graded, soil would be placed, and grass and other landscaping would be grown. Sheet flow and runoff can occur on a golf course, and drainage patterns might change. Alternative 3 would result in no change to the existing natural drainage pattern. Further discussion on natural drainage is contained in Section 3.4.

Air Quality

Air quality will be affected by construction activities, as well as pollutants from vehicular, industrial, natural, and agricultural sources. Alternative 1 would generate less construction air quality impacts than the proposed project due to the reduced amount of intensive groundwork associated with the smaller marina basin and fewer long-term impacts by reducing traffic 35 and 40 percent during, respectively, AM and PM peak traffic times. Construction of Alternative 2 would result in fugitive dust and exhaust from equipment and is expected to generate the same level of air quality impact as the proposed project. Alternative 3 would result in no change to existing air quality. Further discussion on air quality is contained in Section 3.5.

Terrestrial Environment

To provide additional habitat for shorebirds and some visiting seabirds, the project proposes to construct a brackishwater pond area suitable for avian fauna, including stilts, coots and ducks. While habitat expansion is beneficial, there is also a possibility that these species may be exposed to activity that may harm them. Alternative 1 would not include a brackish water pond, but will include 5 acres of seawater features, which is 74 percent less than the 19 acres of seawater features in the proposed project. While this would reduce beneficial impacts, it would also decrease exposure to potentially harmful activity. Alternative 2 does not include the brackish water pond features, but would include drainage retention basins that would attract avian fauna and expose them to chemicals used to maintain golf course landscaping. While Alternative 3 would result in no increase in potentially harmful activity, it would also not provide additional habitat for avian fauna. Further discussion on the terrestrial environment is contained in Section 3.7.

Groundwater

Groundwater at the project site occurs as a thin basal brackish water lens. It is influenced by tides and varies in flow direction and salt content. The existing Honokōhau Harbor acts as a drainage point for local groundwater. Any impact to groundwater flow from the proposed harbor is likely to be localized. The proposed marina basin will not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance.

There will be differences in the flow to the marina entrance between the proposed project and Alternative 1. Alternative 1, being smaller in size, will have less impact on groundwater flow than the proposed marina. Alternative 2 will have a similar impact to groundwater quality as the proposed project. Alternative 2 may also impact water quality by contributing nutrients and biocides to the groundwater from the golf course. Alternative 3 would result in no change in existing groundwater conditions. Further discussion on groundwater is contained in Section 3.8.1.

Surface Water

There are no significant natural freshwater streams or ponds at the site, but there are brackish anchialine pools. Surface water at the project site will be influenced by rainfall. Runoff typically percolates rapidly through the permeable ground. The proposed project will include some impermeable surfaces, which together with building roofs, will change runoff and seepage patterns.

Alternative 1 is a lower density project that is expected to have proportionally less impact on surface water and runoff patterns and less potential impact on water quality than the proposed project. Alternative 2 would have more impact on surface water quality than the proposed project due to fertilizers and biocides carried by runoff from the golf course. Alternative 3 would result in no change to surface water conditions. Further discussion on surface water is contained in Section 3.8.2.

Nearshore Environment and Coastal Waters

The potential adverse impacts to the marine environment from the proposed project are due to the construction of an 800-slip marina and the resulting inflow of higher salinity seawater and inadequate water circulation, both of which are anticipated to impair water quality to the extent of falling below applicable standards. One possible mitigation measure is to significantly reduce the size of the marina expansion.

The reduced marina size (from 45 to 25 acres) and reduced lagoon acreage in Alternative 1 are expected to result in a proportionate reduction in seawater discharging into the new harbor and increased water circulation. Alternative 2 includes the same marina basin size and is therefore subject to the same factors that are expected to adversely affect water quality.

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water quality in the proposed harbor depends on several components. These include salinity, nutrients, and sediments that come from the ocean, rainfall runoff, water features with marine animals, and dust. The smaller project offered as Alternative 1 is expected to produce a reduced amount of pollutants and reduce the risk of adverse impact upon water quality.

It is notable that the 45-acre marina basin planned in the proposed project and Alternative 2 only becomes viable from a water quality impact standpoint if the additional brackish groundwater inflow into the new marina exceeds 60 mgd. The resulting flushing from such inflow would be expected to better maintain water quality. However, it is unclear whether 60 mgd of brackish groundwater would be available. As proposed in Alternative 1, reduction of the volume of the new marina basin by 45 percent will significantly improve the flushing and water quality because the lower volume can be flushed by the available groundwater flow.

In addition, there could be higher rainfall runoff from the Alternative 2 golf course into the harbor, because the grassed golf course will be less porous than the natural surface. The golf course will also require relatively high levels of fertilizer, biocides, and irrigation, all of which could contribute to adverse water quality impacts.

Further discussion on nearshore environment and coastal waters is contained in Section 3.9.1.

Anchialine Pools

Anchialine pools are located north of Honokōhau Harbor, and south of the harbor on the project site. The marine life in these pools is sensitive to groundwater quality, and changes due to construction and operation of the project could degrade the viability of the pool ecosystem. In the southern complex, 3 anchialine pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction in the proposed project and Alternatives 1 and 2.

Predicting the extent of change in groundwater flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is therefore extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Due to the uncertainty of changes in groundwater flow and quality due to marina construction, the variability in impacts between the proposed project and Alternatives 1 and 2 is unknown at this time. Alternative 3 would result in no change in groundwater flow. While this would eliminate the potential for adverse impacts, Alternative 3 would also continue the pattern of existing degradation related to human activity and the introduction of alien species. Further discussion on anchialine pools is contained in Section 3.9.2.

Marine Fishing Impacts

The proposed marina will increase the number of boats in the area and it is reasonable to assume that a portion of these new boats will engage in fishing activities. The increase in boats in the area would be primarily related to the marlin and tuna / pelagic fishery, coral reefs due to extractive fisheries, and SCUBA activities. The pressure on fish and invertebrate stocks is expected to increase with or without the marina. Harbor expansion provides the opportunity to address existing conditions to consolidate, focus, and fund management and enforcement activities at one location.

Compared to the proposed project, Alternative 1 would result in a 21 percent decrease in boat traffic, thereby lessening the potential for marine fishing impacts. The level of impacts in Alternative 2 would be similar to that of the proposed project. Alternative 3 would result in no change in existing marine fishing conditions, and no opportunity to address already existing pressure on fish and invertebrate stocks. Further discussion on marine fishing impacts is contained in Section 3.9.3.

Cultural and Archaeological Resources

The proposed project will integrate cultural and archaeological resources in the overall development. Archaeological sites recommended for preservation will be preserved, and cultural practices will be encouraged. Kona Kai Ola includes a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. Proposed is a 400-foot shoreline setback that would serve as a buffer between the ocean and developed areas. This coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use.

Alternative 1 would contain all of the cultural archaeological features and the shoreline setback area would be 400 feet in the northern portion of the site and increase to 600 feet in the southern portion. Alternative 2 would preserve cultural and archaeological resources, but does not include a 400-foot shoreline setback. Alternative 3 would result in no change to existing cultural and archaeological resources and no addition of cultural and community facilities and activities. Further discussion on cultural and archaeological resources is contained in, respectively, Sections 4.1 and 4.2.

Noise

Project-generated noise is due to construction equipment and blasting, boats, marina activities, vehicle traffic, and the Kealakehe Wastewater Treatment Plant operations. Alternative 1 would generate less noise impacts due to reduced construction activities, fewer boats, less traffic and less on-site activity. Alternative 2 would also generate less noise due to reduced traffic and less on-site activity, but noise related to the excavation of the marina basin and an increase in the number of boats would be similar to that of the proposed project. Further discussion on noise impacts is presented in Section 4.4.

Socioeconomic Impacts

The proposed project will generate an increase in de facto population of an estimated 5,321 persons due to the increase in hotel and time-share units. The estimated de facto population increase in Alternative 1 is 37 percent less, at 3,363 persons, than the proposed project. The de facto population increase in Alternative 2 is similar to Alternative 1.

Employment in the commercial components will nearly double in Alternative 1, from a stabilized level of 1,429 full-time equivalent (FTE) positions in the proposed project to 2,740 in the Alternative 1.

Under Alternative 1, the total operating economic activity at Kona Kai Ola will increase due to the added commercial space more than off-setting the fewer visitor units, moving upward from $557.6 million per year to circa $814.3 million annually. The total base economic impact resulting from development and operation of Alternative 1 will similarly be higher by between 35 and 45 percent than that of the proposed project.

Alternative 1, which has a reduced marina size of 25 acres, and fewer hotel and time-share units, would have a meaningful market standing, create significant economic opportunities, and provide a net benefit to State and County revenues. From a market perspective, a smaller Kona Kai Ola would still be the only mixed use community in the Keahole to Kailua-Kona Corridor offering competitive hotel and time-share product.

The estimated absorption periods for marketable components of Alternative 1 are generally shorter than those for the same components in the proposed project. Marina slips under Alternative 1 are estimated to be absorbed within 2 years after groundbreaking, as compared with 9 years for absorption of slips in the proposed project. Hotel rooms under Alternative 1 are estimated to be absorbed within 4 years after groundbreaking, as compared with 7 years under the proposed project. Time-share units would be absorbed within 10 years under Alternative 1, while 15 years are projected under the proposed project. Due to the planned increase in commercial facilities under Alternative 1, the absorption period of commercial space is estimated at 14 years, as compared with 8 years for absorption of such facilities under the proposed project.

The State and County will still both receive a net benefit (tax receipts relative to public expenditures) annually on a stabilized basis under the Alternative 1. The County net benefits will be some $12.2 million per year under the Alternative 1 versus $14.9 million under the proposed project. The State net benefits will increase under the Alternative 1 to about $37.5 million annually, up substantially from the $11.4 million in the proposed project.

Due to the lower de facto population at build-out, the effective stabilized public costs for both the State and County will decline meaningfully under the Alternative 1, dropping from $7.7 million annually for the County and $36.5 million for the State, to $4.9 million and $23 million per year, respectively.

Alternative 3 would result in no increase in de facto population and improvement to economic conditions. Further discussion on social and economic impacts are contained in, respectively, Sections 4.5 and 4.6.

Vehicular Traffic

The proposed project will impact the nearby road network that currently is congested during peak traffic times. The proposed project includes roadway improvements that would reduce the impact and improve roadway conditions for the regional community.

Alternative 1 includes the same roadway system improvements as the proposed project, yet would reduce vehicular traffic by 35 percent when compared to the proposed project. Alternative 2 would have similar traffic conditions and roadway improvements as Alternative 1. Alternative 3 would result in no increase in traffic and no roadway improvements.

Marina Traffic Study

The increase in boat traffic due to the proposed 800-slip marina would cause entrance channel congestion during varying combinations of existing and new marina peak traffic flow. Worst case conditions of active sport fishing weekend and summer holiday recreational traffic result in traffic volumes exceeding capacity over a short afternoon period. Mitigation to address boat traffic in the proposed project include widening the entrance channel, traffic control, implementation of a permanent traffic control tower, or limiting vessel size.

Alternative 1 would result in a 21 percent reduction in boat traffic congestion under average existing conditions and ten percent reduction during peak existing conditions. The reduction to 400 slips also reduces the impacts of congestion at the entrance channel, thereby reducing the need for any modifications to the entrance channel.

Alternative 2 would have the same level of boat traffic as the proposed project. Alternative 3 would not meet the demand for additional boat slips and would not generate additional boat traffic. Further discussion on marina traffic is contained in Section 4.8.

Police, Fire and Medical Services

The proposed project will impact police, fire and medical services due to an increase in de facto population and increased on-site activity. Alternatives 1 and 2 would have similar levels of impact as the proposed project due to increased on-site activity. Further discussion on police, fire and medical services are contained, respectively, in Sections 4.10.1, 4.10.2 and 4.10.3.

Drainage and Storm Water Facilities

The proposed project will increase drainage flows, quantities, velocities, erosion, and sediment runoff.

Alternative 1 involves a reduction of the project density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces associated with hotel and time-share development and to the creation of more open space. However, roadway areas will increase by about 30 percent in Alternative 1. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings. The golf course in Alternative 2 may also change drainage characteristics from those of the proposed project and may not reduce impacts. Alternative 3 would result in no change in existing conditions and no improvements to drainage infrastructure. Further discussion on drainage and storm water facilities is contained in Section 4.10.5

Wastewater Facilities

The proposed development is located within the service area of the Kealakehe WWTP and a sewer system will be installed that connects to the WWTP. The sewer system will be comprised of a network of gravity sewers, force mains, and pumping stations which collect and convey wastewater to the existing Kealakehe WWTP. Project improvements will incorporate the usage of recycled / R1 water. Improvements implemented by the proposed project will also accommodate the needs of the regional service population.

Alternative 1 would generate approximately 10 percent less wastewater flow than the proposed project. Wastewater flow in Alternative 2 is undetermined. Alternative 3 would result in no additional flow, as well as no improvements that will benefit the regional community. Further discussion on wastewater facilities is contained in Section 4.10.6.

Potable Water Facilities

The proposed project average daily water demand is estimated at 1.76 million gallons per day. Existing County sources are not adequate to meet this demand and source development is required. The developer is working with DLNR and two wells have been identified that will produce a sustainable yield that will serve the project. These wells will also serve water needs beyond the project.

Alternative 1 would result in net decrease of about five percent of potable water demand. Alternative 2 may have a lower water demand than the proposed project as long as potable water is not used for irrigation. Alternative 3 would result in no additional flow, as well as no source development that will benefit the regional community. Further discussion on potable water facilities is contained in Section 4.10.8.

Energy and Communications

Regarding Alternative 1, preliminary estimates for electrical, telecommunications, and cable resulted in a net demand load that remains similar to the proposed project. Further discussion on energy and communications is contained in Section 4.10.9.1.

The proposed project will increase the demand for electrical energy and telecommunications. The demand would be reduced in Alternative 1 because the number of boat slips and units would decrease. Similarly, Alternative 2 would have fewer units than the proposed project and therefore reduce energy demands. Further reduction in energy demand for either alternative could be achieved by using seawater air conditioning (SWAC) and other energy reduction measures, as planned by the developer. Further discussion on energy and telecommunications is contained in Section 4.10.9.2.

Water Features and Lagoons

The proposed project includes a brackishwater pond, lagoons, and marine life exhibits supplied by clean seawater. The water features in Alternative 1 would significantly decrease by 74 percent from 19 acres in the proposed project to five acres in Alternative 1. This decrease in water features would result in a corresponding decrease in water source requirements and seawater discharge. Alternative 2 does not include the seawater features. Alternative 3 would result in no additional demand for water source requirements and seawater discharge.

2.2.2 Conformance with Public Plans and Policies

State of Hawai‘i

Chapter 343, Hawai‘i Revised Statutes

Compliance with this chapter is effected, as described in Section 5.1.1 in regard to the proposed project and the alternatives discussed.

- State Land Use Law, Chapter 205, Hawai‘i Revised Statutes

  The discussion in Section 5.1.2 is directly applicable to Alternative 1, the proposed project. Alternative 1 will involve a setback of 400 feet that increases to 600 feet along the southern portion of the project site’s shoreline area. Alternative 2 does not provide for such a setback, but may still require approvals from DLNR for cultural, recreational, and community uses and structures within the Conservation district.

- Coastal Zone Management Program, Chapter 205A, Hawai‘i Revised Statutes

  Recreational Resources:

  In addition to the discussion of consistency with the associated objective and policies, as described in Section 5.1.3, the reduction from the proposed project’s 800-slip marina to a 400-slip marina under Alternative 1 will still expand the region’s boating opportunities and support facilities. The existing harbor entrance will still be utilized under this alternative; however, potential risks relating to boat traffic and congestion in the marina entrance area will be reduced significantly. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities, and marine science center remain important recreational components under Alternative 1.

Alternative 2 includes a golf course component, which would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Alternative 2, like the proposed project, will expand the region's boating opportunities and support facilities through its 800-slip marina. However, the potential adverse impacts of increased boat traffic from the size of the marina are significant enough to offset the benefits of increased boating opportunities.

Coastal Ecosystems:

The discussion in Section 5.1.3 is directly applicable to Alternative 1.

Alternative 1 not only reduces the number of slips proposed by 50 percent, but it also reduces the size of the marina from 45 acres to 25 acres. The 25-acre marina will increase the body of water within the existing harbor, but to a significantly lesser extent than the proposed project's estimated increase, which is also applicable to the 45-acre size that is proposed for the marina under Alternative 2.

The findings of the Harbor Water Quality Modeling Study conclude that a reduction in the size of the harbor expansion is an alternative that will mitigate the risk of significant impacts upon water quality within the marina and existing harbor. Accordingly, the reduction in both the number of slips and the size of the marina basin under Alternative 1, in combination with proper facilities design, public education, and enforcement of harbor rules and regulations, would result in fewer long-term impacts to water quality and coastal ecosystems. Short-term (construction-related) impacts would likely remain the same although the reduction in the total acreage of excavation is expected to result in a shorter duration of such impacts.

In addition to its 800-slip marina and potential adverse impacts upon water quality and the marine environment, Alternative 2 includes a golf course component, which has the potential to impact coastal ecosystems by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Economic Uses

Although reduced in the number of slips, the smaller marina under Alternative 1 will nevertheless serve public demand for more boating facilities in West Hawai‘i and is consistent with the objective and policies and discussion set forth in Section 5.1.3. The economic impacts of Alternative 2, while comparable to those of the proposed project's marina development, are notably marginal as to the golf course component, based on the marketability analysis that indicates a condition of saturation within the region.

Coastal Hazards

The discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Tsunami risks mainly affect the large shoreline setback area that is proposed for the project and Alternative 1. Alternative 2 projects a transient accommodation site that is partially within the tsunami hazard zone and thus carries a higher hazard risk. However, the essential requirement for these alternatives, as well as the proposed project, is a well-prepared and properly implemented evacuation plan.

Beach Protection

Discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Alternative 1 and, to a lesser extent, Alternative 2, will retain the shoreline area in its natural condition.

Similar to the proposed project, Alternative 1 provides for a shoreline setback of considerable width within which no structure, except for possible culturally-related structures, would be allowed. Alternatives 1 and 2 will thus be designed to avoid erosion of structures and minimize interference with natural shoreline processes.

Marine Resources

The discussion in Section 5.1.3 is also applicable to Alternative 1 which is described to be an alternative that is specifically projected to mitigate anticipated adverse impacts on water quality and the marine environment that might otherwise result from the original harbor design and scale, which is also incorporated in Alternative 2 . The reduced marina size under Alternative 1 is projected to meet water quality standards and enable greater compliance with the objective and policies addressed in this section.

Alternative 2 includes a golf course component and thus the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Hawai'i State Plans, Chapter 226, Hawai'i Revised Statutes

Section 226-4 (State goals), 5 (Objectives and policies for population, and 6 (Objective and policies for economy in general):

The discussion in Section 5.1.4 is applicable to Alternatives 1 and 2, in addition to the proposed project. These development concepts generally conform to the goals, objectives, and policies set forth in these sections because they will provide some degree of economic viability, stability, and sustainability for future generations. Kona Kai Ola will convert essentially vacant land into a mixed-use development with a distinctive marina and boating element, providing a wide range of recreational, business, and employment opportunities to the community.

Section 226-8 Objective and policies for the economy – the visitor industry:

Alternatives 1 and 2 will be consistent with the State's economic objective and policies relating to the tourism industry for the same reasons that are discussed in regard to the proposed project in Section 5.1.4. They will incorporate JDI's commitment to sustainability principles in the planning and design of the development concepts in Alternatives 1 and 2. Although the total hotel and time-share unit count is reduced to approximately 1,500 in Alternatives 1 and 2, the transient accommodations component of these alternatives will still further the State's objective and policies for increased visitor industry employment opportunities and training, foster better visitor understanding of Hawai'i's cultural values, and contribute to the synergism of this mixed-use project concept that addresses the needs of the neighboring community, as well as the visitor industry.

Section 226-11 Objectives and policies for the physical environment: land-based, shoreline and marine resources:

Alternative 1 is expected to involve less potential adverse impacts upon these environmental resources than the proposed project. Likewise, and Alternative 2 would have less adverse impact because of its reduction in the size of the marina and in the total hotel and time-share unit count. Alternative 1 carries less potential risk to water quality and related impacts upon the marine environment and anchialine pool ecosystems. Although approximately three anchialine pools are expected to be destroyed, the great majority of pools will be preserved within and outside of the proposed 400-foot shoreline setback.

The golf course component in Alternative 2 has the potential to impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the marina basin and nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools by introducing the chemicals into the pond systems.

Section 226-12 Objective and policies for the physical environment: scenic, natural beauty, and historic resources:

The discussion in Section 5.1.4 is directly applicable to Alternative 1 and describes the compliance with the objective and policies addressed.

The golf course component of Alternative 2 would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area.

Just as with the proposed project, Alternatives 1 and 2 would also be designed to blend with the natural terrain and to honor and protect the cultural history, resources, and practices of these lands.

Section 226-13 Objectives and policies for the physical environment: land, air and water quality:

As stated above, because of the reduction in both the number of slips and the size of the marina basin, with proper facilities design, public education and enforcement of harbor rules and regulations, Alternative 1 is anticipated to cause fewer long-term impacts to water quality than either the proposed project or Alternative 2. Based on the findings of the Harbor Water Quality Modeling Study, water quality resulting from a reduced marina basin size as proposed under Alternative 1 is expected to be similar to existing conditions.

As previously noted, Alternative 2 has the potential to adversely impact water quality by increasing the nutrient loading in surface runoff and groundwater by introducing pesticides, herbicides and other chemicals common in golf course development and maintenance into the marina basin and nearshore waters surrounding the project site.

Section 226-14 Objectives and policies for facility systems - general:

Alternatives 1 and 2 will conform to the objective and policies of this section on the grounds that are discussed in regard to the proposed project in Section 5.1.4. The master-planning and phasing of the project concepts under these alternatives will be coordinated with associated public and private infrastructural planning and related private and public infrastructural financing. The cost of the marina construction and project-related infrastructure is to be borne by the developer, resulting in considerable savings for the public. In addition, the projected lease revenue from these public lands will provide additional public benefits by establishing a revenue stream for capital improvements and maintenance of a range of State facilities.

Section 226-15 Objectives and policies for facility systems - solid and liquid wastes:

In addition to the developer's commitment to sustainable development design, the project will involve upgrades to the County of Hawai'i's Kealakehe Wastewater Treatment Plant to meet current needs, as well as the project's future needs. This commitment is applicable to Alternatives 1 and 2, as well as the proposed project that is discussed in Section 5.1.4.

Section 226-16 Objectives and policies for facility systems – water:

The discussion of water conservation methods and the need to secure additional potable water sources in Section 5.1.4 is also applicable to Alternative 1 and demonstrates conformity to the objective and policies for water facilities. Alternative 2 involves greater irrigation demands in regard to its golf course component and greater potable water demands for human consumption than those for Alternative 1. Alternative 2 is expected to face more serious challenges in securing adequate and reliable sources of water.

Section 229-17 Objectives and policies for facility systems – transportation:

Alternatives 1 and 2 will conform to this objective and policies because they will present water transportation opportunities, including the possible use of transit water shuttles to Kailua-Kona, as described in regard to the proposed project in Section 5.1.4.

Section 226-18 Objectives and policies for facility systems – energy:

Alternatives 1 and 2 conform to these objective and policies through the use of energy efficient design and technology and commitment to the use and production of renewable energy to serve the project's needs. Solar energy production, solar hot water heating, and the use of deep cold seawater for cooling systems are currently identified as means of saving substantial electrical energy costs for the community and the developer.

Section 226-23 Objectives and policies for socio-cultural advancement – leisure:

Alternative 1 conforms to this objective and related policies for the reasons offered in Section 5.1.4 in regard to the proposed project. Alternative 1 will be of greater conformity with the policy regarding access to significant natural and cultural resources in light of the 400-600 foot shoreline setback that has been designed for this alternative.

Although it does not propose the considerable shoreline setback that is planned for Alternative 1, Alternative 2 is consistent with this objective and related policies in incorporating opportunities for shoreline-oriented activities, such as the walking trails. In addition, the golf course component adds a more passive recreation alternative to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Section 226-25 Objectives and policies for socio-cultural advancement-culture:

The discussion in Section 5.1.4 is relevant to Alternatives 1 and 2 and demonstrate their conformity the objective and policies of this section.

Both alternatives involve the preservation and protection of cultural features that have been identified by the Cultural Impact Assessment and archaeological studies for the project area. Both provide for public shoreline access, and both will continue the policy of close consultation with the local Hawaiian community and cultural and lineal descendants in the planning of cultural resource preservation and protection.

Section 226-103 Economic priority guidelines:

Alternatives 1 and 2 conform to these guidelines for the same reasons that are set forth in Section 5.1.4. They involve private investment in a public project that will create economic diversification through a mix of marina, industrial, commercial, visitor, and cultural facilities. This presents a wide range of entrepreneurial opportunities, long-term employment opportunities, and job training opportunities.

Section 226-104 Population growth and land resources priority guidelines:

As described in Section 5.1.4, the policy support for the proposed project also extends to the similar development concepts considered in Alternatives 1 and 2. Those alternatives conform to the guidelines of this section because they involve an urban development under parameters and within geographical bounds that are supported by the County's General Plan, a preliminary form of the Kona Community Development Plan, the County's Keahole to Kailua Regional Development Plan, and the reality of being located along the primary commercial/industrial corridor between Keahole Airport and Kailua-Kona. As with the proposed project, the development concepts of Alternatives 1 and 2 are essentially alternatives for the implementation and "in-filling" of the urban expansion area in North Kona.

DHHL Hawai‘i Island Plan

This 2002 plan projects DHHL's Honokōhau makai lands for commercial use. As compared to the proposed project and Alternative 2, Alternative 1 presents an expanded commercial component that provides greater compliance with the plan, while addressing certain beneficiaries' concerns about the scale of the marina originally required in the Project. Alternative 2 also conforms to the recommended commercial uses in the makai lands but to a lesser degree than Alternative 1 because of its more limited commercial component. Like the proposed project, its marina size and number of slips raise environmental issues, as more specifically discussed in Part 3, and community concerns.

County of Hawai‘i General Plan

HCGP Section 4 – Environmental Quality Goals, Policies and Courses of Action:

Alternative 1 is consistent with this section. It presents a reduction in both the number of slips and the size of the marina basin that, in combination with proper facilities design, public education and enforcement of harbor rules and regulations, would result in very few long term impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions.

Alternative 2 is the least consistent with this section. In addition to the potential significant impacts of its 800 slip marina basin, its golf course component has the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides and other chemicals common in golf course use and management into the nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools beyond their current conditions by introducing such substances into the pool systems.

HCGP Section 7 – Natural Beauty Goals and Policies:

Alternative 2 conforms to some degree with this section. Its golf course component would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area, as demonstrated in other makai golf courses within the region.

HCGP Section 8 – Natural Resources and Shoreline:

Alternative 1 is most consistent with the goals and policies of this section. It would require considerably less marina excavation than the proposed project and Alternative 2 and would reduce the potential risk of long-term adverse impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions with the degree of reduction in marina basin size that is proposed under Alternative 1. This reduction is also expected to reduce potential impacts upon anchialine pools and their ecosytems, as well as shoreline and marine resources that are affected by water quality. Alternative 1 also retains the shoreline preservation and protection concepts that are proposed in and described for the Project.

HCGP Section 10 – Public Facilities Goals and Policies:

The discussion in Section 5.2.1. in relation to the proposed project is applicable to Alternatives 1 and 2. Improvements to public facilities are are integral to the Kona Kai Ola development. The provision of additional boat slips and numerous road improvements, including a makai extension of Kuakini Highway south to Kailua-Kona are incorporated into plans for the project's development. In light of these elements, Alternatives 1 and 2 are consistent with the goals and policies of this section.

HCGP Section 11 – Public Utility Goals, Policies:

As with the proposed project, Alternatives 1 and 2 are consistent with the goals and policies of this section, based on the relevant grounds set forth in Section 5.2.1. The developer is committed to design, fund, and develop environmentally sensitive and energy efficient utility systems to the extent possible, as described previously in Part 5. Its master planning provides for the coordinated development of such systems with the objective of achieving significant savings for the public. As previously-mentioned example, the project development involves the upgrading of the Kealakehe Wastewater Treatment Plant.

HCGP Section 12 – Recreation:

Alternative 1 is consistent with the goals, policies, and courses of action for North Kona in this section.

Although the number of slips is reduced under Alternative 1, the region's boating opportunities and support facilities will still be expanded. The existing marina entrance would still be utilized under this alternative. However, concerns relating to increased activity leading to increased congestion in the marina entrance area would be mitigated to a certain extent. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities and marine science center remain important components of Alternative 1.

The golf course component of Alternative 2 would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola. Alternative 2 is also considered to be consistent with this section.

HCGP Section 13 and 13.2 – Transportation:

The reduced marina component under Alternative 1 will still provide transportation opportunities and provide for possible use of transit water shuttles to Kailua-Kona, although to a lesser degree than under the proposed project and Alternative 2 . However, in each scenario, internal people-movers are planned, and numerous roadway improvements are planned for coordination with public agencies, including but not limited to the construction of the Kuakini Highway extension between Honokōhau and Kailua-Kona. Accordingly, both Alternatives 1 and 2 are consistent with the goals, policies, and courses of action for North Kona under these sections of the General Plan.

HCGP Section 14.3 – Commercial Development:

For the reasons presented in the discussion under Section 226-104 of the State Plan, the planned commercial component under Alternatives 1 and 2 are consistent with this section.

HCGP Section 14.8 – Open Space:

Alternatives 1 and 2 are consistent with the goals and policies of this section. Alternative 1 provides a considerable (400-600 foot) shoreline setback along the entire ocean frontage of the project site as a means of protecting the area's scenic and open space resources, as well as natural and cultural resources. Although it does not incorporate the shoreline setback planned in Alternative 1, Alternative 2 provides a golf course component would contribute to the amount of open space that is currently proposed and allow additional view corridors to be created.

Community Development Plans

Community development plans are being formulated for different regions in the County in order to supplement the County's General Plan. The Kona Kai Ola project is located in the Kona Community Development Plan (CDP) area. Maps associated with the preliminary work phases

of the Kona CDP include the Kona Kai Ola project site within the "Preferred Urban Growth" boundary of the North Kona district. The Kona CDP process is guided by a Steering Committee composed of a broad cross-section of the community. The Steering Committee will eventually complete its work and recommend the CDP's adoption.

After the DEIS was published, the Kona CDP has progressed to the development of plans for the major urban growth corridor north of Kailua-Kona. The Kona CDP has produced a draft plan showing a transit oriented development that includes a midlevel public transit corridor along the mauka residential elevation, and a makai transit corridor that runs along a proposed new frontage road just makai and parallel to Queen Kaahumanu Highway. The development plan for Alternative 1 includes the Kuakini Highway as part of this proposed frontage road and transit line from Kailua Kona to the Kealakehe area, along with a transit stop at Kona Kai Ola. The Alternative 1 plan also includes a road that could be extended to be part of the proposed frontage road should it be approved and implemented. In addition, the Kona CDP has continued to emphasize the principles of smart growth planning with mixed use urban areas where people can live, work, play and learn in the same region. Kona Kai Ola has been specifically designed to be consistent with this policy in order to provide a stable employment base close to where people live in the mauka residential areas already planned for DHHL and HHFDC lands.

It should be noted that currently and over the years, the 1990 Keāhole to Kailua Development Plan (K-to-K Plan) guides land use actions by the public and private sectors. It is intended to carry out the General Plan goals and policies related to the development of the portion of North Kona area, including the Kona Kai Ola site. The "Preferred Growth Plan" of the Keāhole to Kailua Development Plan identifies the project site as a new regional urban center to include commercial, civic, and financial business related uses, an expanded "Harbor Complex," a shoreline road, and a shoreline park. The proposed project and the development concepts in Alternatives 1 and 2 are therefore consistent with the recommendations in the Keāhole to Kailua Development Plan.

Hawai'i County Zoning

As shown on Figure AA, the project site is zoned "Open". Under Section 25-5-160 of the Hawai'i County Code, "The O (Open) district applies to areas that contribute to the general welfare, the full enjoyment, or the economic well-being of open land type use which has been established, or is proposed. The object of this district is to encourage development around it such as a golf course and park, and to protect investments which have been or shall be made in reliance upon the retention of such open type use, to buffer an otherwise incompatible land use or district, to preserve a valuable scenic vista or an area of special historical significance, or to protect and preserve submerged land, fishing ponds, and lakes (natural or artificial tide lands)".

Some of the proposed uses at Kona Kai Ola are permitted uses in the Open zone such as:

- Heiau, historical areas, structures, and monuments;
- Natural features, phenomena, and vistas as tourist attractions;
- Private recreational uses involving no aboveground structure except dressing rooms and comfort stations;

- Public parks;
- Public uses and structures, as permitted under Section 25-4-11.

In addition to those uses permitted outright, the following uses are permitted after issuance of a use permit:

- Yacht harbors and boating facilities; provided that the use, in its entirety, is compatible with the stated purpose of the O district.
- Uses considered directly accessory to the uses permitted in this section shall also be permitted in the O district.

The proposed time-share and hotel units and commercial uses would not be consistent with the zoning designation of "Open". Project implementation therefore requires rezoning of portions of the project to the appropriate zoning category or use permits for certain uses.

Special Management Area

As shown in Figure AB, the entire project area up to the highway is within the coastal zone management zone known as the Special Management Area ("SMA"). At the County level, implementation of the CZM Program is through the review and administering of the SMA permit regulations. Kona Kai Ola complies with and implements the objectives and policies of the Coastal Zone Management (CZM) Program, and a full discussion is provided in Section 5.1.3. The development concepts in the proposed project and Alternatives 1 and 2 will be subject to applicable SMA rules and regulations.

Benjamin Duke
75-5919 Alii Dr., Apt. U2
Kailua Kona, HI 96740

February 2, 2007

Mr. Scott Condra
Jacoby Development, Inc.
171 17th Street, NW Suite 1550
Atlanta, GA 30363

Subject: DEIS- Kona Kai Ola, Kealakehe, North Kona District, Island of Hawaii

Dear Mr. Condra,

I moved to Kona last and quickly noticed a tension between all of the development I was seeing and the destruction of native habitats and species I was hearing and reading about. Hawaii obviously has stepped natural legacy. I believe Kona Kai Ola is at odds with this legacy.

I have committed myself to trying to preserve the Hawaiian landscape and its ecosystems. I have participated in a few conservation activities at Kaloko-Honokohau National Park and I have come to see that area as a natural treasure. Kona Kai is a threat to that treasure in many ways.

The Kona Kai Ola development should not go on because it will destroy 21 anchialine ponds. The anchialine ponds of the Kona coast are rare habitats that include endangered species (Hawaiian Damselfly and anchialine pool shrimp). Also, you're planning to build on cultural significant land that is important to the legacy of Native Hawaiians. This land should be donated and protected as National Park land.

Coastal development is very detrimental to the water quality of the ocean and the organisms that reside in coast areas. The run-off from the construction will be very destructive to the habitat of marine mammals such spinner dolphins and monk seals. Further, sea turtles (both the Hawaiian Green Sea Turtle and the Hawksbill turtle) will be negatively affected by the run-off during and after construction and the increased pollution. Further, increased boating activity will be a threat to all of these animals that call the harbor area their home.

This development will be too destructive to the environment to make sense. Please, do not go through with your plan. The Big Island does not need any more timeshares, hotels, traffic, or rich boat owners. Rich out-of-towners and tourists seem like the population you are trying to serve, not the local people of Kona. Please, reconsider and build on an area that is not so environmentally and culturally sensitive.

Sincerely,

Benjamin Duke
Cc: DLNR, Oceanit Center, OEQC, and political representatives of Hawaii

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July 23, 2007

Benjamin Duke
75-5919 Alii Drive, Apt. U2
Kailua-Kona, HI 96740

Dear Mr. Duke:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments based on a paragraph designation.

Paragraph 3

In response to the Draft Environmental Impact Statement (DEIS) comments and to further study the pools south of the entrance channel of Honokohau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design, in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2 of the Environmental Impact Statement (EIS) and is summarized in EIS Sections 3.9.2.1 and 3.9.2.2. In addition, further comment on the groundwater hydrology effects on anchialine pools was prepared by Waimea Water Services and is contained in Appendix G-3 of the EIS.

The DEIS identified 22 anchialine pools. Further studies determined that three of these pools are actually part of an estuary complex with direct connection to the ocean. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of 20 m^2 would be eliminated due to the harbor construction.

While the second survey confirmed the presence of direct human use and disturbance, such as trash receptacles and toilet facilities, it found that the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickelweed and mangrove.

The additional studies indicate that the remaining pools may not increase in salinity to levels unhealthy for anchialine pool fauna. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Hence, the additional studies found that changes in groundwater quality may, or may not, impact biological communities in the anchialine and estuarine environment. In either case, the developer is committed to practicing good stewardship over the pools to be preserved and eliminating or reducing alien species to the extent practicable. The developer recognizes it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Mitigation measures to facilitate the long term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on these environments can be measured.

The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment, and possible new pools. These measures are described in detail in EIS Section 3.9.2, Anchialine Pools.

Every effort will also be made to protect, preserve, and improve the anchialine pools to the south of the harbor. Two additional studies were conducted in response to DEIS comments, including your comments, and these additional studies are summarized in EIS Section 3.9.2, and presented in Appendices G-3 and H-2.

These additional studies indicated that with the construction of the new harbor basin, the anchialine pools makai of the proposed basin may not necessarily be negatively impacted by the construction of the proposed project.

In addition, these studies determined that there are mechanisms to mitigate potential impacts. Mitigation measures to facilitate the long term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. As a mitigation measure, bioretention, which is a Best Management Practice (BMP), is a highly appropriate application for the proposed development to prevent any nonpoint source pollution of groundwater. Another mitigation measure that may be included in the management plan is salinity adjustment of the anchialine pools to maintain a healthy habitat for the anchialine ecosystem by surcharging man-made anchialine pools created adjacent to, or, in the vicinity of natural pools with low salinity well water.

Paragraph 4

A three dimensional mathematical model was utilized to determine water quality in the harbor and the nearshore after development. Model calibration was done with existing data. The results of the modeling are included as Appendix U in the EIS.

The model showed that with a 45-acre basin the water quality will be impacted from the expansion. Alternatives to the 45-acre basin were also simulated in the model. Results of the analysis showed that water quality in the harbor was maintained at current levels with a 25-acre expansion and with existing brackish groundwater flow into the harbor.

Comparison between impacts related to the proposed project concept and impacts related to Alternative 1 (25-acre basin) indicates that a reduction in the acreage and number of slips in the marina, as well as the reduction in hotel and timeshare units, would generate less environmental, social and economic impacts. Although positive economic impacts would be reduced, Alternative 1 can be considered as a preferable alternative because of reduced environmental impacts. However, while it can be concluded that the 25-acre marina in Alternative 1 would be the preferred size, the DLNR agreement establishes the size of the marina at 45 acres and 800 slips. An amendment to the DLNR agreement is required in order to allow Alternative 1 to proceed. Hence, selection of Alternative 1 is an unresolved issue at this time.

Grading and other earth moving will be conducted with precautions to prevent runoff reaching the harbor water. Grading permits from the County as well as NPDES permits from the Department of Health will be obtained for construction. All approved best management practices and water quality monitoring will be conducted during construction to monitor impacts.

A complete marine acoustics study was completed in response to comments received on the DEIS to assess noise impacts on marine life. The report is included in Appendix T-2. The model results showed that the noise levels in the developed scenario did not exceed the Level A impacts to marine mammals. Level B impacts to marine mammals and sea turtles generally occur within a range of ten meters. Although noise impacts may occur during blasting the new marina, these impacts could be greatly minimized by using good blasting practices. These are addressed in detail in the EIS.

Paragraph 5

The development of Kona Kai Ola is broader than providing a resort for tourists. The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, Jacoby Development, Inc. will protect natural resources through the various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities, such as parks, other recreational facilities, and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community.

The developer continues to work with public agencies in developing new water sources, and the success of these efforts will not only benefit Kona Kai Ola, but also, the adjacent communities that are also subject to an insufficient water supply.

The anticipated infrastructure improvements to the wastewater treatment plant are anticipated to actually improve the health and safety of the community by bringing an older facility up to higher operational standards. All structures will be built to current building and safety codes, while access to the shore and around the site will be improved.

The roadway system will also be improved beyond mitigation for project-related impacts. In Phase 1 of the project, JDI will not only provide access to the commercial parcel, but also address regional traffic issues through the improvements of the roadway system. JDI plans to improve the intersection of the Queen Ka'ahumanu Highway and the Kealakehe WWTP Access Road. The Kealakehe WWTP Access Road is planned to be realigned and widened to an 80-foot road right-of-way (ROW) that will serve the Commercial Parcel No. 1, and eventually intersect with the proposed Kuakini Highway Extension to the west. Such improvements will ensure that the project minimizes its own impacts while improving existing conditions. Further, with development of Kona Kai Ola, the Kuakini Highway extension road is anticipated to be built on a more accelerated schedule than it would occur without the Kona Kai Ola project.

The EIS has been revised to include information from these additional studies, and Attachment 1 contains Section 3.9.2, Anchialine Pools.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

The conditions with the project constructed were found to be phosphorous limited. Several simulations were performed including and excluding the inflow from the marine exhibits which provides an additional nitrogen load and also varying the location of this inflow. It was found that the inflow from the marine exhibits can have a beneficial effect on flushing, especially when positioned within the existing harbor basin. However, its effect is significantly less than the effect due to the brackish groundwater inflow. When the exhibit inflow is excluded or positioned at the east end of the new marina, its effect is small in terms of flushing due to its high salinity. From a water quality perspective, since the loads from the exhibit inflow consist primarily of nitrogen, it does not cause increased algae growth. However, this exhibit inflow does raise the concentrations of ammonia and nitrate in the system.

Simulation results indicate that under the conditions when the post-expansion system receives an additional brackish inflow into the new 25-acre marina on the order of 30 mgd or more, water quality within the harbor system and in the surrounding waters remained similar to existing conditions. These conditions are expected to occur based on the findings reported by Waimea Water Services (2007), which states that the proposed marina would exhibit the same or similar flushing action as the existing marina.

An additional mitigation measure proposed by Waimea Water Services (2007), if sufficient inflow is not intercepted, consists of drilling holes in the bottom of the new marina to enhance this inflow and facilitate flushing within the proposed system.

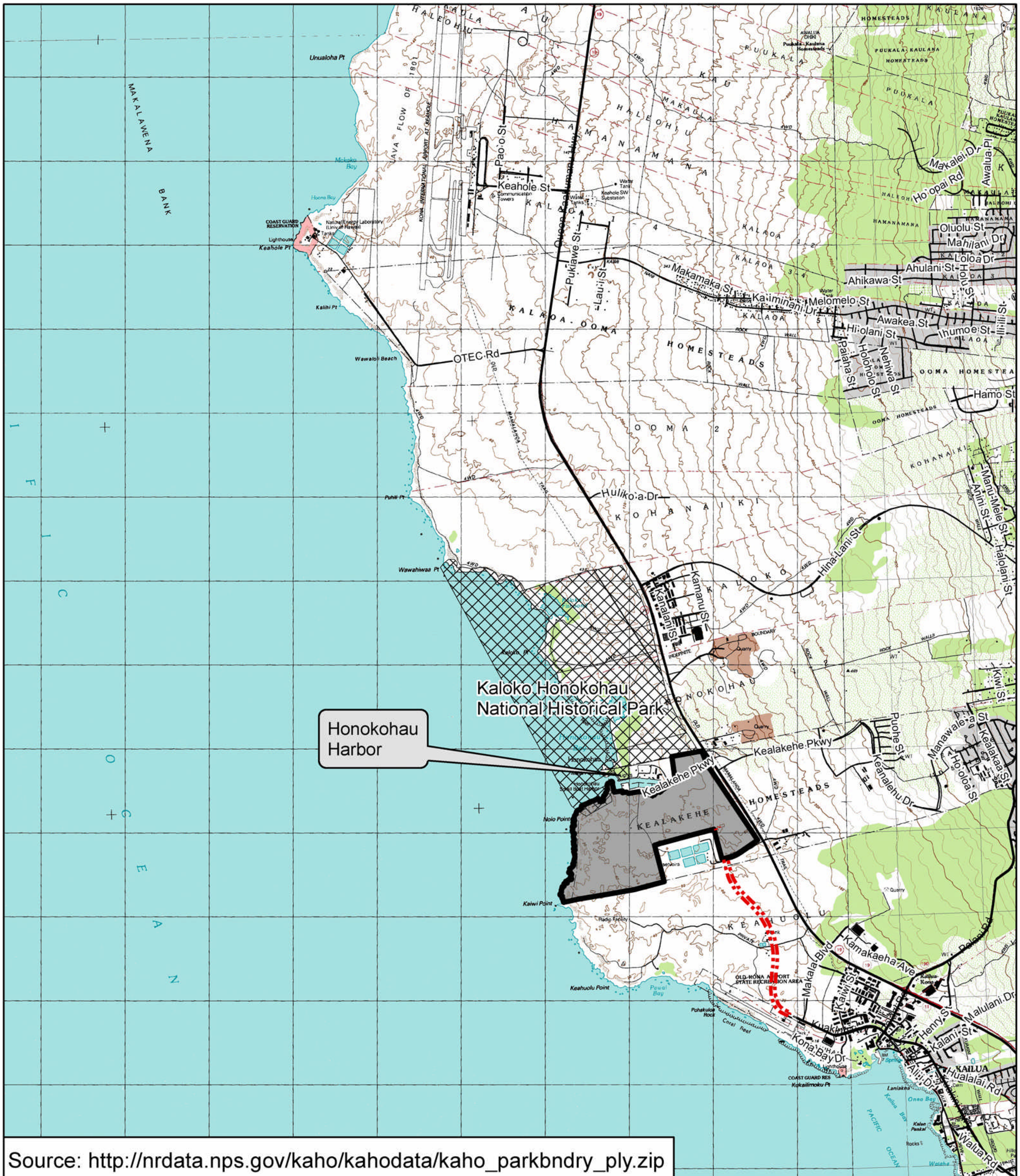
~~3.9.3~~3.9.2 Anchialine ~~Ponds~~ Pools

Two studies on anchialine pools were conducted in this EIS process. The anchialine ~~ponds~~ pools water quality studies and ~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute and is~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute in October 2006 and are included as Appendix ~~G~~H-1. That survey included pools located both north and south of Honokōhau Harbor. In response to DEIS comments and to further study the pools south of entrance channel of Honokōhau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2.

~~3.9.3.1~~3.9.2.1 Existing Conditions

Anchialine ~~ponds~~ pools exist in inland lava depressions near the ocean. Two anchialine ~~pond~~ pool complexes are located immediately to the north and south of the Honokōhau Harbor entrance channel. The complex to the north is located wholly within the designated boundaries of the Kaloko-Honokōhau National Historical Park as shown in Figure Q~~O~~. Many of the ~~ponds~~ pools in the southern complex are within the park administrative boundary as well. ~~Ponds~~ Pools in the northern complex show little evidence of anthropogenic impacts. Many contain typical vegetation and crustacean species in high abundance.

Figure R locates anchialine pools near the harbor entrance and pools~~Ponds~~ in the southern complex are depicted in Figure S.



Source: http://nrdata.nps.gov/kaho/kahodata/kaho_parkbndry_ply.zip

Figure Q: National Historical Park Service Legislative Boundary Map

Legend

- Project Site
- Proposed Parkway
- National Park Boundary

N W E S

0 2,500 5,000 Feet

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JACOBY DEVELOPMENT, INC.

Source: Oceanic Institute

Figure R: Anchialine Pool Locations

N
W E
S

0 2,000 4,000 Feet

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JACOBY DEVELOPMENT, INC.

Source: Aquatic Resources Management And Design

Figure S: Anchialine Pool Locations in Southern Complex

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JACOBY DEVELOPMENT, INC.

The 2006 study identified 22 pools in the southern complex. The 2007 study found that three of the 22 pools are part of an estuary complex with direct connection to the ocean. While there were several signs of direct human use and disturbance, such as trash receptacles and toilet facilities, the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickleweed and mangrove. ~~are moderately to heavily impacted, with many containing exotic fish that exclude the anchialine crustaceans. The ponds also show evidence of human impact, including discarded bottles, cans, wrappers, diapers, toilet paper, etc. Water quality conditions within the ponds generally reflect the conditions of the underlying groundwater.~~

~~Figure P locates anchialine ponds near the harbor entrance. The study conducted as a part of this EIS show that the anchialine ponds south of the harbor entrance are moderately to heavily impacted by human activities and introduced fish populations. The study found that the nitrogen phosphorus concentrations in these ponds are significantly higher compared to the ponds north of the harbor entrance. The sources of these additional nutrients are not known. Continuous influx of nutrients will eventually degrade the water quality to levels that could alter the pond ecology.~~

Biota surveys in the two pond systems clearly indicate that counts of typical pond denizens show a remarkable difference between the northern and southern ~~ponds~~ pools. In the northern ~~ponds~~ pools the number of *Halocaridina rubra* ranged from a low of 20–25 to too numerous to count. The biota rich pond bottoms appeared red due to the *Halocaridina rubra* numbers. The only other species visible was the predatory shrimp *Metabetaeus lohena*. In contrast, only four out of the 22 ~~ponds~~ pools examined in the southern pond complex showed a decreased presence of *Halocaridina rubra* (6 to 200) individuals in the pond, and three ~~ponds~~ pools contained *Metabetaeus lohena*. Eight of the ~~ponds~~ pools contained numbers of introduced minnows which is an apparent predator of *Halocaridina rubra* and *Metabetaeus lohena*.

The 2007 study found three of the pools identified in the 2006 study were part of an estuary complex with direct connection to the ocean, and that the southern complex contained 19 anchialine pools. The study further found that a majority of the southern pools are degraded biologically and physically, primarily due to the effects of introduced fish and plant species. Six pools are currently devoid of alien fish, but they face a high level of threat due to the proximity of pools that have these species. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction.

The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 ppt. and that the anchialine biology would then perish. There is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and final determination of anchialine salinity following the harbor construction. The assessment that all anchialine pools will be barren with the construction of the harbor may be premature. *Halocaridina rubra* (opae ula) are routinely drawn from high salinity wells at 30-32 ppt.

Within the 19 pools, native and non-native fauna included 14 species comprised of 5 fish, 2 mollusca, and 6 crustacea. Algae within the pools primarily consisted of a mixed assemblage of diatoms and cyanobacteria, with several pools dominated by matted filamentous *Cladophora*, sp. The darker cave/overhang pools and high tide pools had epilithic *Hildenbrandia* sp. covering the rock substrate. Riparian vegetation was dominated by introduced species consisting of Pickleweed (*Batis maritima*), Mangrove (*Rhyzophora mangle*), and Christmasberry (*Shinus terebenthifolius*). Only two species of native plants Akulikuli (*Sesuvium portulacastrum*) and Makaloa (*Cyperus laevigatus*) existed near the pools and comprised only few small patches and a single tuft (respectively).

Most of the hypogeal anchialine shrimp have adapted to the presence of minnows by foraging in the pools at night. During daylight hours, only the adult shrimp appear to coexist at low population levels with the smaller *P. reticulata*, but the larger *G. affinis* and *Oreochromis* prevent the daytime appearance of hypogeal shrimp due to predation.

The average salinity in Kealakehe pools is relatively high at 13.5 ppt compared to most other pools along the West Hawai‘i coastline, having an average of approximately 7 ppt. This high salinity appears to be characteristic of this region, and is similar to the average of most pools within the adjacent ahupua’a of Honokōhau and Kaloko. The levels of nitrate-nitrogen levels are relatively high compared to other undeveloped areas, but fall in the range of some developed landscapes. Other water quality parameters, including pH and temperature, fall into normal ranges for anchialine pools.

This relatively high salinity is the likely reason aquatic insects were not found in any pools at Kealakehe. Though the rare damselfly *Megalagrion xanthomelas* has been observed and collected from Kaloko, a statewide assessment of its range has not found it to occur in water with salinity greater than 3ppt. However, there has been an unsubstantiated occurrence of the nymph in a pool of up to 8ppt (Polhemus, 1995).

Another species of concern is the hypogeal decapod shrimp *Metabetaeus lohena.* These shrimp are sometimes predatory on *H. rubra* but are more often opportunistic omnivores similar to *H. rubra.* Predusk and nocturnal sampling at high tide is clearly the optimal method to determine habitat range and population densities for this species. These shrimp were found in 13 of the 19 pools, 7 of which had *M. lohena* only at night. The occurrences of *H. rubra* were found in 16 of 19 sampled pools, 8 of which had ‘Ōpae‘ula observed only at night. Consequently, despite having numerous degraded anchialine resources at Kealakehe, there are opportunities for many of the pools to be restored and enhanced to a level where large populations of anchialine shrimp and other native species may return to inhabit the pools as they likely have in the past.

~~As mentioned earlier, the southern ponds also had elevated concentrations of nutrients indicating water quality degradation. These factors indicate that if no restoration or maintenance activities are instituted to reserve these ponds, these ecosystems will degrade beyond recovery.~~

~~3.9.3.2~~3.9.2.2 Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

The anchialine ~~ponds~~ pools that are located north of the existing harbor are not likely to be impacted because no development activities are proposed north of the existing harbor. It is highly unlikely that existing groundwater flows to the Kaloko-Honokōhau pond system to the north of the existing harbor will be impacted by the proposed marina to the south.

Of the 19 pools in the southern complex, three would be eliminated due to harbor construction. Regarding the remaining pools, the DEIS noted that t~~T~~he change in the local groundwater flow pattern in the vicinity of the proposed marina ~~will~~ would impact the anchialine ~~ponds~~ pools that are located between the proposed marina and the shoreline south of the harbor entrance. The 2006 study (Appendix H-1) noted that t~~T~~he salinity of the anchialine ~~ponds~~ pools ~~will~~ would increase due to reduction of brackish groundwater, and that ~~. Some ponds will be excavated to make the new harbor basin. T~~those ~~ponds~~ pools that are not excavated will revert to full salinity, causing the loss of their habitat. ~~and associated aquatic flora and fauna. However, current investigations indicate that these ponds are already enriched by nutrients and the density of associated aquatic fauna is very low. In addition, trash from visitors, and introduction of minnows has already degraded the pond ecology.~~ Even without the potential impacts from the proposed marina construction, the pond ecology might change irreversibly from the nutrient input, human indifference and expansion of non native fauna species.

Further studies conducted in response to DEIS comments (Appendix H-2, and Appendix G-3) indicate that the remaining pools may not increase in salinity to levels unhealthy for *H. rubra* and *M. lohena* and other anchialine pool fauna. In addition, these studies determined that there are realistic mechanisms employed elsewhere that would mitigate changes due to groundwater changes. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore.

Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented. The mitigation plan will be based on the following objectives:

Objective 1 To preserve, maintain, and foster the long-term health and native ecological integrity of anchialine pools at Kealakehe.

Objective 2 To protect and promote cultural practices and traditions surrounding anchialine resources at Kealakehe.

Objective 3 To provide education, interpretation, and interactive opportunities for the community to learn about and appreciate the anchialine resources.

Objective 4 To acquire a pond manager to implement the program, conduct monitoring, research, and reporting, and provide education to the community about anchialine and estuarine resources.

Mitigation measures to facilitate the long-term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on the environment can be measured. The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment and possible new pools.

As a mitigation measure, bioretention, which is a Best Management Practice (BMP) is a feasible application for the proposed development. There is a probability that nutrients and other potential pollutants will runoff landscaping and impermeable surfaces such as roadways and parking lots during medium or high rainfall events. Some of these pollutants could enter the groundwater table and into anchialine pools and ultimately the ocean. As an alternative to directing runoff into the ground through drywells, storm water should be directed into bioretention areas such as constructed surface or subsurface wetlands, vegetated filter strips, grass swales, and planted buffer areas. Storm water held and moved through these living filter systems are essentially stripped of most potential pollutants, and allowed to slowly infiltrate back to the groundwater table.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Another mitigation measure that may be included in the management plan is salinity adjustment. In the 2006 assessment regarding the impact to the southern pools from the proposed construction of the harbor, it was stated that this construction would cause the salinity in the anchialine pools to become equivalent to the ocean at 35ppt. It was then concluded that the anchialine biology would perish.

However, there is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and a final determination of anchialine salinity following the harbor construction. The dynamics of groundwater movement through a porous lava medium both seaward and laterally along the coastline is an inexact science. This is compounded by the variations in water density, including stratification of salinity within the proposed harbor and capillary movement of low-density surface water through the substrata.

The assessment that all anchialine pools will be barren with the construction of the harbor may therefore be premature. *H. rubra* are routinely drawn from high salinity wells at 30 – 32 ppt and survive in this salinity for years. Further, high populations *H. rubra* and *M. lohena* have thrived and reproduced in pool salinities of 27ppt. If the pools do become full strength seawater at 35ppt, there exists uncertainty on the long-term effects to anchialine organisms, since there are no long-term studies or examples of native anchialine ecosystems at 35ppt. Native anchialine pool vegetation also has relatively high salinity tolerance.

If the salinity were expected to rise to 35 ppt, possible mitigation in the management plan will include methods to surcharge man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water. If sufficient volume is used, it is theoretically possible to lower salinity in adjacent natural anchialine pools. This surcharge method has been successfully used to raise salinity in anchialine pools and cause the salinity rise in adjacent pools of at least up to 10 meters away. Surcharging with low salinity should work as well or better since the lower density water will essentially float atop the higher salinity water at the surface layer, and move throughout the complex of natural pools. Surcharging may also be a viable mitigation to dilute and more rapidly disperse any pollutants that may be detected in the pools.

Another mitigation measure includes the creation of new anchialine pools. There is significant opportunity to create new anchialine pools and greatly expand the native habitat and resource. It has been demonstrated at several projects in West Hawai'i that anchialine pools can be created and will be colonized with a full compliment of anchialine species endemic to the area. Anchialine pools are considered focal points of higher productivity relative to the subterranean groundwater habitat around them. Their productivity promotes an increase in population levels of anchialine species within the pools themselves and throughout the subterranean habitat surrounding them.

~~No realistic mechanisms are envisioned for re-injecting fresh water into these systems to maintain their ecological balance as an anchialine system. These ponds will be changed from a brackish water system to a marine system. But, those ponds in the area of the shoreline park and cultural park will be cleaned of vegetation and protected from other physical alteration. A buffer zone around these newly established marine ponds will be protected as well.~~

~~The anchialine pond shrimp (*Metabetaeus lohena)* and the orangeback damsel fly (*Megalagrion xanthomelas)* are listed as candidate endangered species in the Federal Register and were both recorded in surveys of these anchialine ponds done in 2004 by US Geological Survey Biological Resources Division and the NPS Inventory and Monitoring Program. Low numbers of *Metabetaeus lohena* were encountered in three of the 22 ponds surveyed in the southern pond complex. *Megalagrion xanthomelas* was not encountered in any of the southern pond complex ponds during the recent study. The low density of *Metabetaeus lohena* and the observed absence of *Megalagrion xanthomelas* may be due to the impacts from high nutrient input and general degradation of the ponds.~~

~~An attempt should be made to move as much of the existing population of *Metabetaeus lohena* from these anchialine ponds before they become too saline, to possible newly excavated ponds that may be developed off-site. These shrimp should not be introduced into existing populated ponds to avoid any potential pathogenic impacts to the healthy ponds.~~

~~Public education on the unique ecology of the anchialine ponds and the need for preserving their ecology will reduce future human impacts in other healthy ponds.~~

~~Further recommended mitigation includes restoration to degraded anchialine ponds off the project site, preferably those located at the adjacent Kaloko-Honokōhau National Historical Park.~~

Bree Rivera
February 1, 2007

Harbor Development Opinion

My opinion? My thoughts, my ideas? Like most other local residents of Kealakehe Hawaii, I am disturbed and angry with this harbor development plan they plan to put on the Honokahau Harbor. There are many reasons to why we're mad about the situation. First of all, it's not a racist, discrimination act, and it's not that we don't want "haoles" to come to this island. It's just that with putting another timeshare, resort where natural beauty lies is just going to make this island the same as Oahu. The beauty about the Big Island is that there still is natural beauty and grace to it. It's not all built up and man made. The Big Island is also most known to be the most relaxing island, but with adding on more timeshare, that means more people, more traffic and more crime. The island is small enough as it is. With all the people in Oahu and Maui, the Big Island is the next best place. Real estate is going up the wall, and people are even moving in on the street. The traffic from Kailua Kona to Waimea and Kailua Kona to Kealakekua is already packed bumper to bumper. More people, more traffic, more late to work!

Another major reason this Harbor development plan is a rubbish idea is the effect on the marine environment. Aside from all the land drama resulting from this, the animals and plants in the oceans are going to be greatly affected by this also. By installing more homes and more buildings on the coast, that means more rubbish and pollution in the waters. Much of the pollution from Kailua Kona alone has already taken affect in reefs coast wide. Did they even research the population decrease with Hawaiian Green Sea Turtles? Do they understand that if more pollution and more people come to the Honokahau Bay, (their home) that the turtles will eventually migrate and the coast will be completely empty with no more turtles? This whole idea is a joke. There are so many reasons why we shouldn't go through with this idea. If we want to maintain the Big Island's beauty then we have to actually stand up and fight when (I'm sorry) people from the mainland come and try to take what beauty we have left.

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innovation through engineering & scientific excellence

July 23, 2007

Bree Rivera
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Ocean View, HI 96737

Dear Mr. Rivera:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are given below.

Comment: *The development will impact natural beauty of the Big Island; The traffic from Kailua Kona to Waimea and Waimea to Kealakekua is packed; Impacts on Marine environment; and water pollution.*

Responses: Smart growth recognizes connections between development and quality of life, and natural beauty. It leverages new growth to improve the community. Smart growth principles that are applicable to Kona Kai Ola are as follows: preserve open space, farmland, natural beauty and critical environmental areas. Kona Kai Ola will be designed to protect and preserve the area's scenic and open space resources. Consistent with the project's sustainability goals, 40 percent of the project site will be retained in open space. Further, Kona Kai Ola includes a 400-foot buffer zone along the shoreline that will be preserved as open space. Improvements within this buffer zone will be limited to lateral shoreline public trails, mauka-makai access trails from the project site, and cultural or environmental-related improvements related to existing features within the buffer zone. No buildings or structures shall be built within the 400-foot shoreline setback area, with the possible exception of structures that are directly related to native Hawaiian cultural resources in the buffer zone and that are requested by Jacoby Development, Inc. (JDI) cultural advisors.

To mitigate traffic impacts, Kona Kai Ola will include various signalization improvements, and roadway improvements will be implemented. To connect Kona Kai Ola with the neighboring communities, Kona International Airport and Kailua-Kona Village, the project proposes to sponsor a regularly scheduled shuttle service, so that people could utilize Kona Kai Ola without having to use a car for access. Further, the project includes the construction and realignment of Kealakehe Parkway makai of Queen Ka'ahumanu Highway and through the lands of Queen Lili'uokalani Trust connecting with Kuakini Highway in Kailua-Kona. Another measure to enhance road connectivity in the ahupua'a is the improvement of the intersection of Kealakehe Parkway and Queen Ka'ahumanu Highway. These improvements will serve the project as well as the regional community.

Such improvements will be privately-funded and ensure that the project minimizes its own impacts while improving existing conditions. Further, with development of Kona Kai Ola, the Kuakini Highway extension road is anticipated to be built on a more accelerated schedule than it would occur without the Kona Kai Ola project.

Pollution from contaminants from boats and potential possibility of oil spills is a concern in all of Hawaii, not just for Honokohau Harbor. This issue has been addressed in the Environmental Impact Statement (EIS) in Section 3.9.1.3, including a list of mitigation actions. These include boater education, enforcement of good housekeeping practices on boats and docks, and environmentally sensitive hull cleaning practices.

The developer continues to work with public agencies in developing new water sources, and the success of these efforts will not only benefit Kona Kai Ola, but also, adjacent communities that are also subject to an insufficient water supply.

The EIS finds that, while impacts on marine resources are already occurring, the proposed project provides opportunities to address existing impacts and mitigate future impacts. A water quality model evaluation was conducted to predict impacts of alternative developments on the quality of water that exits the harbor. Results are included in Appendix U. These show that the changes in water quality are not significant and also that the less dense water that exists the harbor will stay in the upper layer and not significantly impact coral reefs and benthic marine life.

The EIS has been revised, and Attachment 1 contains Section 3.9.1.3, Zone of Mixing.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

A detailed analysis of the change in flow velocities through the harbor entrance is described within the 3D model shown in Appendix U. It was found that tidally averaged velocities through the harbor entrance may increase by 3-4 cm/s post-expansion. This is due to the increased tidal prism, the addition of the exhibit water, and the increased flow of brackish groundwater into the system.

3.9.1.2 Methodologies and Studies

Three studies were conducted to evaluate project impacts on nearshore and coastal waters. Oceanit completed a Zone of Mixing study that was presented in the DEIS and is contained in Appendix ~~H~~I. This study was tasked with determining the mixing and dispersion of flows emerging from the harbor into the adjacent shallow nearshore waters. To accomplish this, data from previous studies were reviewed and field research was conducted to measure stratification and currents adjacent to the harbor entrance and out into the ocean. A “Zone of Mixing” area was determined outside of which there is no discernable influence to water quality from the existing harbor effluent. This information was used to assess impact from modifications to groundwater inflow from marina expansion, and the seawater effluent flow from the marine water features.

~~The model analysis for mixing and water flow through the existing harbor and the proposed marina included existing water exchange between harbor and ocean and the future water exchange resulting from the expanded marina area and the discharge from the marine water features. The model results include three dimensional water flow patterns as well as water quality distribution details.~~

A Wave Penetration Study was prepared by Moffat and Nichol to determine wave characteristics within the existing harbor and the proposed expansion basin. This study was presented in the DEIS and is contained in Appendix J.

In response to DEIS comments, a Harbor Water Quality Modeling Study was prepared by Moffat and Nichol and is presented in Appendix U of this FEIS.

3.9.1.3 Zone of Mixing ~~Anticipated Impacts and Recommended Mitigation~~

~~Oceanit completed a Zone of Mixing study that is contained in Appendix H. This study was tasked with determining the mixing and dispersion of flows emerging from the harbor into the adjacent shallow nearshore waters. To accomplish this, data from previous studies were reviewed and field research was conducted to measure stratification and currents adjacent to the harbor entrance and out into the ocean. A “Zone of Mixing” area was determined outside of which there is no discernable influence to water quality from the existing harbor effluent. This information was used to assess impact from modifications to groundwater inflow from marina expansion, and the seawater effluent flow from the marine water features.~~

The model analysis for mixing and water flow through the existing harbor and the proposed marina included existing water exchange between harbor and ocean and the future water exchange resulting from the expanded marina area and the discharge from the marine water features. The model results include three-dimensional water flow patterns as well as water quality distribution details.

The three-dimensional model was extended outside of the harbor entrance in order to examine relative changes from baseline conditions. Due to the lack of available data regarding specific brackish discharge events along the coastline, the model is not calibrated outside of the harbor entrance, and any changes predicted in this region are only referred to in terms of relative changes (in relation to model predicted existing conditions). This analysis is shown in Appendix I. It was found that the significance of the additional brackish groundwater inflow into Kona Kai Ola Marina also has an effect on the surrounding surface waters of Honokōhau Bay. The concentrations of nutrients in low flow scenarios are less than existing conditions due to the lack of additional nutrients to the system. However, with higher brackish inflow, the relative growth of algae is more contained while nutrient concentrations relatively increase. Relative nitrogen concentrations in the bottom layers can be maintained in scenarios without additional exhibit flow included, however with the additional saline flow, there is more of a nitrogen load in the bottom layers.

Anticipated Impacts and Mitigation Measures

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water for the water features will be pumped from 100 to 300 foot depth. The total amount of water supplied to the water features will be 75 million gallons per day. The rate of pumping is designed to achieve an approximate 4 hour residence time within the ponds (pers. comm. Cloward H2O, 2007) and to prevent build up of pollutants from users and marine animals. ~~The water for the water features will be pumped from 100 to 300 foot depth. The total amount of water supplied to the water features will be 75 million gallons per day. The rate of pumping is designed to achieve rapid turnover of water within the ponds and to prevent build up of pollutants from marine animals and users. Currently, the nutrient concentrations at the existing marina entrance are very high (1,200ug/l of total dissolved nitrogen (TDN) and 83 ug/l of total dissolved phosphorus (TDP)). The intake water for the features has low levels of nutrients (185 ug/l TDN and 5.6 ug of TDP).~~

The anticipated impacts and mitigation measures discussed below assume construction of an 800-slip harbor. One possible mitigation measure would be to reduce the size of the harbor expansion. Any modification of the final design size of the marina would require modification of contract language with the DLNR. In that Alternative 1 would include a smaller marina and smaller seawater lagoons, the latter of which would represent a 74 percent decrease from 19 acres in the proposed project to five acres in Alternative 1, there would be a proportionate reduction in seawater discharging into the new harbor.

The intake water for the features has low levels of nutrients (185 µg/l TDN and 5.6 µg of TDP). This amount will be modified by the generation of nutrients by marine animals. This quantity was modeled via calculations performed by ClowardH2O (pers. comm., 2007). Through modeling, this level of nutrient input was found to have an effect on both ammonia and nitrate concentrations outside of the harbor. However, the modeled input did not contribute significantly to eutrophication potential due to the limiting nature of phosphorous within the system. These processes and sensitivity tests are described at length in Appendix U.

Although the total amount of nutrients that will be generated per day will increase from the nutrient output of marine animals and users, the concentration of the nutrients will be lower due to the large amount of water available for mixing within the basin. The overall impact will be a reduction of nutrient concentration in the outflowing water.

The boats used in the marina will be small, and spills could occur from boats or while fuelling. These amounts in a majority of cases will be relatively small. The entrance to the marina is relatively narrow and in case of a fuel spill, the traffic will be stopped and a containment boom will be installed to contain the spill within the basin.

Adequate numbers of containment booms, absorption units and oil removal facilities will be at the fueling station and also provided to an identified emergency response station. Personnel will be trained to respond in case of a spill. In addition, the local fire station, police and civil defense and other agencies will be informed in case of a larger spill.

The proposed new marina would significantly increase the size of the water body, but would utilize the existing marina entrance for access to the ocean. This will increase the tidal prism in addition to the extra anticipated inflows to the new marina. It would be expected to intercept additional groundwater, adding these flows to the existing harbor outflow in addition to being the outfall location for the exhibit flows. Model results presented in Appendix U show that the increase in depth-averaged velocities through the harbor entrance can be as great as 4 cm/s under typical conditions,

The proposed marina basin will therefore not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance. There will be an expanded zone of mixing between the brackish effluent and the surrounding ocean waters due to the concentration of flows at the harbor mouth. The addition of effluent water from the marine water features will result in an additional increase outflow across the marina entrance from 30 mgd to an expected value of greater than 135 mgd after development of the marine water features. ~~to the south will intercept additional groundwater, adding these flows to the existing harbor outflow. The proposed marina will therefore not result in any significant increase in groundwater flow to the coastline, but rather a concentration of the existing flows to the harbor entrance. There will be an expanded zone of mixing between the brackish effluent and the surrounding ocean waters due to the concentration of flows at the harbor mouth. The addition of effluent water from the marine water features will result in an additional increase outflow across the marina entrance from 4 mgd at present to 79 mgd after development of the marine water features. The effluent from the marine water features will contain low amounts of nutrients because of the high flow through. The large amount of water will dilute any pollutants that enter the harbor basin from groundwater or surface water. This will improve the water quality and will be a positive impact on the nearshore environment.~~

Despite its proximity to the WWTP, sewers do not service the existing adjacent State harbor or surrounding private structures. All sewage from existing facilities is treated in on-site septic systems with resulting effluent flowing to groundwater that almost certainly flows directly to the existing harbor. Under post-development conditions all of these flows would be connected to the Kona Kai Ola sewage system resulting in a positive impact by eliminating this existing pollutant load into the harbor. Sewage from facilities at the existing marina will be connected to the Kona Kai Ola sewage system. Sumps, connection lines and pumping facilities will be constructed to move the sewage from the present septic tank systems directly to the larger collection system. The work needed for this conversion will be included in the sewage infrastructure design and construction.

~~Hydrogeological studies have concluded that the expansion of the marina does not increase the groundwater flux through the harbor mouth into the ocean significantly. The groundwater from the brackish aquifer already converges to the existing harbor and does not show flow across the planned marina basin area into the ocean.~~

~~It is estimated that the average groundwater discharge is 3 to 4 million gallons per day (mgd). The salinity of the water that discharges from the brackish aquifer is about 12 percent of seawater or about 4.3 parts per thousand (ppt). In addition, 52,000 gallons per minute of surface seawater (36 ppt) will be pumped from the nearshore area for use in the marine lagoon features. This amounts to approximately 75 mgd. This water eventually is discharged into the harbor basin and into the ocean. This water is not expected to reach the existing marina basin because the proposed basin connects to the existing one very close to the common entrance. Therefore the impacts to the existing marina environment from the additional discharge are expected to be negligible.~~

At present, the salinity of the water column remains entirely saline in the bottom layers with more brackish influences near the surface (about 30 ppt). Model results displayed in detail within Appendix U show that salinity differences near the harbor entrance are completely confined to the surface layers and are at maximum about 0.5 ppt less than the current conditions of about 30 ppt (surface). Salinity at the marina entrance, at 10 foot depth is not affected by the brackish water discharge. The benthic flora and fauna close to the marina entrance and at less than 10 feet water depth face variations of salinity from 34.5 ppt to 36.0 ppt.

~~At present the depth averaged salinity of the water exiting the existing basin is about 33.5 ppt close to the marina entrance. The brackish water stays at the surface and shows its influence for distance of about 2,000 feet. Salinity at the marina entrance, at 10 foot depth is not affected by the brackish water discharge. The benthic flora and fauna close to the marina entrance and at less than 10 feet water depth face variations of salinity from 34.5 ppt to 36.0 ppt.~~

~~A straight forward mass balance calculation shows the following changes to the existing flow and salinity. The average outflow from the harbor will increase from 4 mgd to 79 mgd. The salinity of the water will change from an average of 33.5 ppt to about 34.4 ppt. The water will still be less dense, and the depth of impact will be limited to the surface 3 to 4 feet. The benthic flora and fauna will face a smaller variation in salinity that will discourage opportunistic biota dominance and lead to a healthier and more diverse benthic community. This is a positive impact on the benthic environment. The increase in the outflow will cause a very slight increase in water velocities, but this is well below the existing velocity variations in the entrance channel vicinity.~~

Construction of a new marina basin will have ~~short~~ short-term negative impacts on coastal marine resources. Direct construction impacts are likely to be small. Marina construction will be accomplished with a berm separating the construction area from adjacent marine waters, minimizing the discharge of sediment from excavation and dredging. Excess sediment remaining in excavated marina will be removed before the land bridge is removed in order to minimize any temporary sediment plume. When the final land bridge is removed, a temporary sediment plume is anticipated. Silt curtains will be used to ~~minimize the~~prevent suspended sediment entering ocean waters.

Although the runoff at the site is small due to the dry climate and the high porosity of the land, during high rainfall, some runoff might reach the harbor basin as overland sheet flow. The new marina will serve as a collection point for materials utilized or generated at the development site, either through direct runoff or by interception of groundwater flow. There is the potential that fertilizers, pesticides, petroleum products, road wastes, etc, could be discharged from the mouth of Honokōhau Harbor into the coastal marine environment. Structural Best Management Practices (BMPs) will be designed and installed to remove as much of pollutants as possible from the run off during such unusual conditions.

Small boat harbors have been found to be consistent sources of certain types of pollutants to the surrounding environment. These pollutants in general include:

- Heavy metals (zinc, copper, tin, lead) associated with bottom paint or sanding of painted surfaces during maintenance activities;
- Petroleum product release from fueling operations, and bilge discharges exacerbated by the large number of boats and range of operator skills;
- Trash and debris from boat operations and surrounding harbor activities;
- Sewage from intentional or accidental releases from on-board waste systems;
- Biological waste from fish cleaning;
- Waste streams from land-side boat washing and maintenance activities;

Most of the impacts can be minimized through the use of Best Management Practices (BMPs), which are a combination of activities, education and devices that help prevent or reduce water pollution. A “Clean Marina Program” similar to the International Blue Flag Marina Program or the Clean Marinas California Program will be implemented at the new marina and include key elements such as promoting and enforcing:

- Boater education signage, literature and programs
- Emergency and spill response plans
- Safe fuel, hazardous material, sewage and bilge water handling practices
- Use of sewage marina pump out, waste and oil recycling facilities
- Environmentally sensitive boat maintenance and cleaning practices
- Environmentally sensitive hull cleaning practices
- Good housekeeping practices on boats and docks
- Use of fish cleaning stations / receptacles and fish waste composting

- Enforcement of harbor rules and regulations

3.9.1.4 Wave Impacts to the Existing Honokōhau Harbor

The wave climate within the existing Honokōhau Harbor and the proposed marina was analyzed using a numerical model that is further discussed in Appendix J~~I~~. A wave measurement study was conducted to determine the wave response of the existing harbor to outside wave climate. A directional wave gage at a depth of sixty feet directly in front of the existing harbor entrance and a non directional wave gage inside the existing harbor basin were installed to measure wave climates simultaneously. The results of the wave measurements were provided for wave transformation model calibration.

Results of the wave climate analysis with and without the expansion were used to predict wave agitation impacts to the existing harbor. The model was operated for waves with a 9-second period and swells of 13-second period as the dominating waves for the offshore area.

Anticipated Impacts and Proposed Mitigation

Wave climate in the existing harbor from the proposed marina construction depended on the period of the incoming waves. There was a slight decrease in the wave height in the existing basin for outside waves of a 9-second period. For longer period swells, there was no significant change in the wave height in the basin.

For waves with a 9-second period, the wave height at the inner end of the outer basin attenuated to 40 percent of the incident wave. There was no additional wave attenuation due to the presence of the proposed marina. Within the existing harbor inner basin, the wave height attenuated to about 20 percent of the incident wave. The wave height in the inner harbor decreased by about 10 percent with the construction of the proposed marina.

For longer period swells, the wave height in the outer basin remained at 50 percent attenuation. In the inner basin, the wave height reduced to about 20 to 30 percent of the incident wave. There was no significant change in the wave height in the inner basin from marina construction.

The analysis shows that under short storm wave conditions, the proposed marina construction causes a positive impact by reducing the wave height by 10 percent in the existing marina. However, under swell conditions there is no change in wave agitation in the mooring area of the existing harbor with the proposed marina. Overall, the impact of construction of the proposed marina basin is positive since the existing harbor will experience less wave agitation. This may be due to the fact that the amount of wave energy entering through the harbor entrance remains the same, while additional water area and frictional surfaces (both sides and bottom) provide for greater wave dissipation after the expansion. No mitigation is ~~recommended~~ proposed due to the project's positive effect.

3.9.1.5 Harbor Water Quality

A three dimensional hydrodynamic and water quality model of Honokōhau Harbor and its surrounding waters was developed using the Delft3D modeling suite and is described in detail in Appendix U. The model was driven at its offshore boundaries by tidal predictions, and calibrated to reproduce available measurements of water levels, currents, salinity and temperature.

To whom it may concern

If extending the harbor, more boats will come which will cause more oil pollution and also will affect the native plants and animals that live in that area. Doing this will cause more traffic and will not help the community in any way, no benefits for the people of Hawaii. Besides, they money is coming from the people of Hawaii but it's not giving us any benefit, it's just a waste of our money. Using dynamite to build lagoons is wrong, and the power of the blast will affect many sea animals such as the Green Sea Turtles. The development of building of timeshares and such, people who are going to make such things don't know where the native plants are or the Heiau, if blowing them up they are destroying Hawaiian history that was their many centares ago. There are so many Hawaiian artifacts that surrounds the Hawaiian Islands. If they are destroyed, future generations won't know anything about Hawaiian Culture and I think that will be just sad. So stopping this harbor development will do all of us a favor. It will save the Hawaiian Culture and be better for the plants and animals of Hawaii.

What I think that should happen at the Harbor, instead of extending the harbor for more boats, they should try repopulate the Hawaiian native plants such as Ko'kio, Ma'o'hau'hele, Waimea, Akia, Hala and O'hi. This will be more important because many of these native plants are starting to become extinct, so the right thing to do is try repopulate them in much greater numbers and also the Hawaiian artifacts can teach us so many different things such how Hawaii started, who lived here and what types of tools they used and also their way of life. Many things in the past can teach us so much things and also be much more prepared for the future. Learn from our past mistakes and have a much better future.

Sincerely:

Dominic Chin

Dominic. F. Chinen

73-1061 KAIMINANI DR. 96740

July 23, 2007

Dominic F. Chinen
73-1081 Kaiminani Drive
Kailua-Kona, HI 96740

Dear Mr. Chinen:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are based on a paragraph designation.

Paragraph 1

Pollution from contaminants from boats and potential possibility of oil spills is a concern in all of Hawaii, not just for Honokohau Harbor. This issue has been addressed in the Environmental Impact Statement (EIS) in Section 3.9.1.3, including a list of mitigation actions. These include boater education, enforcement of good housekeeping practices on boats and docks, and environmentally sensitive hull cleaning practices.

The Fauna Impact Study, as summarized in EIS Section 7, found that it is not expected that the development of the proposed Kona Kai Ola property will have significant impacts on native avian or mammalian resources present within the North Kona District. Further, Kona Kai Ola will provide additional habitat for shorebirds and some visiting seabirds through the establishment of a brackish water pond area suitable for avian fauna, including stilts, coots and ducks. This is a positive impact and water features will constitute a managed ecosystem that will protect these species.

A flora study was conducted to assess impacts from this development on plants at the site. The report is included as Appendix E in the EIS. Out of the 42 plant species observed during the survey, only three species are endemic to Hawaii and nine species are indigenous to Hawaii and other Pacific Islands. The study concluded that the proposed development will not cause significant impacts on the plants in the area. A 400 foot wide strip of land extending back from the shoreline will be protected as there are native species dominating the area.

The development of Kona Kai Ola is broader than providing a resort for tourists. The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, Jacoby Development, Inc. (JDI) will protect natural resources through various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities, such as parks, other recreational facilities, and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community.

The developer continues to work with public agencies in developing new water sources and the success of these efforts will not only benefit Kona Kai Ola, but also, adjacent communities that are also subject to an insufficient water supply.

The anticipated infrastructure improvements to the wastewater treatment plant are anticipated to actually improve the health and safety of the community by bringing an older facility up to higher operational standards. All structures will be built to current building and safety codes, while access to the shore and around the site will be improved.

The roadway system will also be improved beyond mitigation for project-related impacts. In Phase 1 of the project, JDI will not only provide access to the commercial parcel, but also address regional traffic issues through the improvements of the roadway system. JDI plans to improve the intersection of the Queen Ka‘ahumanu Highway and the Kealakehe WWTP Access Road. The Kealakehe WWTP Access Road is planned to be realigned and widened to an 80-foot road right-of-way (ROW) that will serve the Commercial Parcel No. 1 and eventually intersect with the proposed Kuakini Highway Extension to the west. Such improvements will ensure that the project minimizes its own impacts while improving existing conditions. Further, with development of Kona Kai Ola, the Kuakini Highway extension road is anticipated to be built on a more accelerated schedule than it would occur without the Kona Kai Ola project.

An extensive archaeological investigation was conducted during the preparation of the Draft Environmental Impact Statement (DEIS). Numerous sites both in Department of Land and Natural Resources (DLNR) and Department of Hawaiian Home Lands (DHHL) land were identified and inventoried. The complete report is included in the EIS, appendices M-1 and M-2. The archeological study identified eleven sites as culturally significant based on the presence of burials or ritual architecture. Fifty four sites were mapped, photographed and documented. Forty seven sites were recommended through data recovery. Detailed data recovery plans will be prepared for the State Historic Preservation Division (SHPD) of DLNR for review and approval.

A complete marine acoustics study was completed in response to comments received on the DEIS to assess noise impacts on marine life. The report is included in Appendix T-2. The model results showed that the noise levels in the developed scenario did not exceed the Level A impacts to marine mammals. Level B impacts to marine mammals and sea turtles generally occur within a range of ten meters. Although noise impacts may occur during blasting the new marina, these impacts could be greatly minimized by using good blasting practices. These are addressed in detail in the EIS.

Paragraph 2

Kona Kai Ola development project originated from a development agreement between JDI and DLNR. According to the development agreement, repopulating the area with native plants in palace of harbor development is not an option.

The EIS has been revised to include information from these additional studies, and Attachment 1 contains Section 3.9.1.3, Zone of Mixing.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

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~~The model analysis for mixing and water flow through the existing harbor and the proposed marina included existing water exchange between harbor and ocean and the future water exchange resulting from the expanded marina area and the discharge from the marine water features. The model results include three dimensional water flow patterns as well as water quality distribution details.~~

A Wave Penetration Study was prepared by Moffat and Nichol to determine wave characteristics within the existing harbor and the proposed expansion basin. This study was presented in the DEIS and is contained in Appendix J.

In response to DEIS comments, a Harbor Water Quality Modeling Study was prepared by Moffat and Nichol and is presented in Appendix U of this FEIS.

3.9.1.3 Zone of Mixing ~~Anticipated Impacts and Recommended Mitigation~~

~~Oceanit completed a Zone of Mixing study that is contained in Appendix H. This study was tasked with determining the mixing and dispersion of flows emerging from the harbor into the adjacent shallow nearshore waters. To accomplish this, data from previous studies were reviewed and field research was conducted to measure stratification and currents adjacent to the harbor entrance and out into the ocean. A "Zone of Mixing" area was determined outside of which there is no discernable influence to water quality from the existing harbor effluent. This information was used to assess impact from modifications to groundwater inflow from marina expansion, and the seawater effluent flow from the marine water features.~~

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The three-dimensional model was extended outside of the harbor entrance in order to examine relative changes from baseline conditions. Due to the lack of available data regarding specific brackish discharge events along the coastline, the model is not calibrated outside of the harbor entrance, and any changes predicted in this region are only referred to in terms of relative changes (in relation to model predicted existing conditions). This analysis is shown in Appendix I. It was found that the significance of the additional brackish groundwater inflow into Kona Kai Ola Marina also has an effect on the surrounding surface waters of Honokōhau Bay. The concentrations of nutrients in low flow scenarios are less than existing conditions due to the lack of additional nutrients to the system. However, with higher brackish inflow, the relative growth of algae is more contained while nutrient concentrations relatively increase. Relative nitrogen concentrations in the bottom layers can be maintained in scenarios without additional exhibit flow included, however with the additional saline flow, there is more of a nitrogen load in the bottom layers.

Anticipated Impacts and Mitigation Measures

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water for the water features will be pumped from 100 to 300 foot depth. The total amount of water supplied to the water features will be 75 million gallons per day. The rate of pumping is designed to achieve an approximate 4 hour residence time within the ponds (pers. comm. Cloward H2O, 2007) and to prevent build up of pollutants from users and marine animals. ~~The water for the water features will be pumped from 100 to 300 foot depth. The total amount of water supplied to the water features will be 75 million gallons per day. The rate of pumping is designed to achieve rapid turnover of water within the ponds and to prevent build up of pollutants from marine animals and users. Currently, the nutrient concentrations at the existing marina entrance are very high (1,200ug/l of total dissolved nitrogen (TDN) and 83 ug/l of total dissolved phosphorus (TDP)). The intake water for the features has low levels of nutrients (185 ug/l TDN and 5.6 ug of TDP).~~

The anticipated impacts and mitigation measures discussed below assume construction of an 800-slip harbor. One possible mitigation measure would be to reduce the size of the harbor expansion. Any modification of the final design size of the marina would require modification of contract language with the DLNR. In that Alternative 1 would include a smaller marina and smaller seawater lagoons, the latter of which would represent a 74 percent decrease from 19 acres in the proposed project to five acres in Alternative 1, there would be a proportionate reduction in seawater discharging into the new harbor.

The intake water for the features has low levels of nutrients (185 µg/l TDN and 5.6 µg of TDP). This amount will be modified by the generation of nutrients by marine animals. This quantity was modeled via calculations performed by ClowardH2O (pers. comm., 2007). Through modeling, this level of nutrient input was found to have an effect on both ammonia and nitrate concentrations outside of the harbor. However, the modeled input did not contribute significantly to eutrophication potential due to the limiting nature of phosphorous within the system. These processes and sensitivity tests are described at length in Appendix U.

Although the total amount of nutrients that will be generated per day will increase from the nutrient output of marine animals and users, the concentration of the nutrients will be lower due to the large amount of water available for mixing within the basin. The overall impact will be a reduction of nutrient concentration in the outflowing water.

The boats used in the marina will be small, and spills could occur from boats or while fuelling. These amounts in a majority of cases will be relatively small. The entrance to the marina is relatively narrow and in case of a fuel spill, the traffic will be stopped and a containment boom will be installed to contain the spill within the basin.

Adequate numbers of containment booms, absorption units and oil removal facilities will be at the fueling station and also provided to an identified emergency response station. Personnel will be trained to respond in case of a spill. In addition, the local fire station, police and civil defense and other agencies will be informed in case of a larger spill.

The proposed new marina would significantly increase the size of the water body, but would utilize the existing marina entrance for access to the ocean. This will increase the tidal prism in addition to the extra anticipated inflows to the new marina. It would be expected to intercept additional groundwater, adding these flows to the existing harbor outflow in addition to being the outfall location for the exhibit flows. Model results presented in Appendix U show that the increase in depth-averaged velocities through the harbor entrance can be as great as 4 cm/s under typical conditions,

The proposed marina basin will therefore not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance. There will be an expanded zone of mixing between the brackish effluent and the surrounding ocean waters due to the concentration of flows at the harbor mouth. The addition of effluent water from the marine water features will result in an additional increase outflow across the marina entrance from 30 mgd to an expected value of greater than 135 mgd after development of the marine water features. ~~to the south will intercept additional groundwater, adding these flows to the existing harbor outflow. The proposed marina will therefore not result in any significant increase in groundwater flow to the coastline, but rather a concentration of the existing flows to the harbor entrance. There will be an expanded zone of mixing between the brackish effluent and the surrounding ocean waters due to the concentration of flows at the harbor mouth. The addition of effluent water from the marine water features will result in an additional increase outflow across the marina entrance from 4 mgd at present to 79 mgd after development of the marine water features. The effluent from the marine water features will contain low amounts of nutrients because of the high flow through. The large amount of water will dilute any pollutants that enter the harbor basin from groundwater or surface water. This will improve the water quality and will be a positive impact on the nearshore environment.~~

Despite its proximity to the WWTP, sewers do not service the existing adjacent State harbor or surrounding private structures. All sewage from existing facilities is treated in on-site septic systems with resulting effluent flowing to groundwater that almost certainly flows directly to the existing harbor. Under post-development conditions all of these flows would be connected to the Kona Kai Ola sewage system resulting in a positive impact by eliminating this existing pollutant load into the harbor. Sewage from facilities at the existing marina will be connected to the Kona Kai Ola sewage system. Sumps, connection lines and pumping facilities will be constructed to move the sewage from the present septic tank systems directly to the larger collection system. The work needed for this conversion will be included in the sewage infrastructure design and construction.

~~Hydrogeological studies have concluded that the expansion of the marina does not increase the groundwater flux through the harbor mouth into the ocean significantly. The groundwater from the brackish aquifer already converges to the existing harbor and does not show flow across the planned marina basin area into the ocean.~~

~~It is estimated that the average groundwater discharge is 3 to 4 million gallons per day (mgd). The salinity of the water that discharges from the brackish aquifer is about 12 percent of seawater or about 4.3 parts per thousand (ppt). In addition, 52,000 gallons per minute of surface seawater (36 ppt) will be pumped from the nearshore area for use in the marine lagoon features. This amounts to approximately 75 mgd. This water eventually is discharged into the harbor basin and into the ocean. This water is not expected to reach the existing marina basin because the proposed basin connects to the existing one very close to the common entrance. Therefore the impacts to the existing marina environment from the additional discharge are expected to be negligible.~~

At present, the salinity of the water column remains entirely saline in the bottom layers with more brackish influences near the surface (about 30 ppt). Model results displayed in detail within Appendix U show that salinity differences near the harbor entrance are completely confined to the surface layers and are at maximum about 0.5 ppt less than the current conditions of about 30 ppt (surface). Salinity at the marina entrance, at 10 foot depth is not affected by the brackish water discharge. The benthic flora and fauna close to the marina entrance and at less than 10 feet water depth face variations of salinity from 34.5 ppt to 36.0 ppt.

~~At present the depth averaged salinity of the water exiting the existing basin is about 33.5 ppt close to the marina entrance. The brackish water stays at the surface and shows its influence for distance of about 2,000 feet. Salinity at the marina entrance, at 10 foot depth is not affected by the brackish water discharge. The benthic flora and fauna close to the marina entrance and at less than 10 feet water depth face variations of salinity from 34.5 ppt to 36.0 ppt.~~

~~A straight forward mass balance calculation shows the following changes to the existing flow and salinity. The average outflow from the harbor will increase from 4 mgd to 79 mgd. The salinity of the water will change from an average of 33.5 ppt to about 34.4 ppt. The water will still be less dense, and the depth of impact will be limited to the surface 3 to 4 feet. The benthic flora and fauna will face a smaller variation in salinity that will discourage opportunistic biota dominance and lead to a healthier and more diverse benthic community. This is a positive impact on the benthic environment. The increase in the outflow will cause a very slight increase in water velocities, but this is well below the existing velocity variations in the entrance channel vicinity.~~

Construction of a new marina basin will have ~~short~~ short-term negative impacts on coastal marine resources. Direct construction impacts are likely to be small. Marina construction will be accomplished with a berm separating the construction area from adjacent marine waters, minimizing the discharge of sediment from excavation and dredging. Excess sediment remaining in excavated marina will be removed before the land bridge is removed in order to minimize any temporary sediment plume. When the final land bridge is removed, a temporary sediment plume is anticipated. Silt curtains will be used to ~~minimize the~~prevent suspended sediment entering ocean waters.

Although the runoff at the site is small due to the dry climate and the high porosity of the land, during high rainfall, some runoff might reach the harbor basin as overland sheet flow. The new marina will serve as a collection point for materials utilized or generated at the development site, either through direct runoff or by interception of groundwater flow. There is the potential that fertilizers, pesticides, petroleum products, road wastes, etc, could be discharged from the mouth of Honokōhau Harbor into the coastal marine environment. Structural Best Management Practices (BMPs) will be designed and installed to remove as much of pollutants as possible from the run off during such unusual conditions.

Small boat harbors have been found to be consistent sources of certain types of pollutants to the surrounding environment. These pollutants in general include:

- Heavy metals (zinc, copper, tin, lead) associated with bottom paint or sanding of painted surfaces during maintenance activities;
- Petroleum product release from fueling operations, and bilge discharges exacerbated by the large number of boats and range of operator skills;
- Trash and debris from boat operations and surrounding harbor activities;
- Sewage from intentional or accidental releases from on-board waste systems;
- Biological waste from fish cleaning;
- Waste streams from land-side boat washing and maintenance activities;

Most of the impacts can be minimized through the use of Best Management Practices (BMPs), which are a combination of activities, education and devices that help prevent or reduce water pollution. A "Clean Marina Program" similar to the International Blue Flag Marina Program or the Clean Marinas California Program will be implemented at the new marina and include key elements such as promoting and enforcing:

- Boater education signage, literature and programs
- Emergency and spill response plans
- Safe fuel, hazardous material, sewage and bilge water handling practices
- Use of sewage marina pump out, waste and oil recycling facilities
- Environmentally sensitive boat maintenance and cleaning practices
- Environmentally sensitive hull cleaning practices
- Good housekeeping practices on boats and docks
- Use of fish cleaning stations / receptacles and fish waste composting

- Enforcement of harbor rules and regulations

3.9.1.4 Wave Impacts to the Existing Honokōhau Harbor

The wave climate within the existing Honokōhau Harbor and the proposed marina was analyzed using a numerical model that is further discussed in Appendix J~~I~~. A wave measurement study was conducted to determine the wave response of the existing harbor to outside wave climate. A directional wave gage at a depth of sixty feet directly in front of the existing harbor entrance and a non directional wave gage inside the existing harbor basin were installed to measure wave climates simultaneously. The results of the wave measurements were provided for wave transformation model calibration.

Results of the wave climate analysis with and without the expansion were used to predict wave agitation impacts to the existing harbor. The model was operated for waves with a 9-second period and swells of 13-second period as the dominating waves for the offshore area.

Anticipated Impacts and Proposed Mitigation

Wave climate in the existing harbor from the proposed marina construction depended on the period of the incoming waves. There was a slight decrease in the wave height in the existing basin for outside waves of a 9-second period. For longer period swells, there was no significant change in the wave height in the basin.

For waves with a 9-second period, the wave height at the inner end of the outer basin attenuated to 40 percent of the incident wave. There was no additional wave attenuation due to the presence of the proposed marina. Within the existing harbor inner basin, the wave height attenuated to about 20 percent of the incident wave. The wave height in the inner harbor decreased by about 10 percent with the construction of the proposed marina.

For longer period swells, the wave height in the outer basin remained at 50 percent attenuation. In the inner basin, the wave height reduced to about 20 to 30 percent of the incident wave. There was no significant change in the wave height in the inner basin from marina construction.

The analysis shows that under short storm wave conditions, the proposed marina construction causes a positive impact by reducing the wave height by 10 percent in the existing marina. However, under swell conditions there is no change in wave agitation in the mooring area of the existing harbor with the proposed marina. Overall, the impact of construction of the proposed marina basin is positive since the existing harbor will experience less wave agitation. This may be due to the fact that the amount of wave energy entering through the harbor entrance remains the same, while additional water area and frictional surfaces (both sides and bottom) provide for greater wave dissipation after the expansion. No mitigation is ~~recommended~~ proposed due to the project’s positive effect.

3.9.1.5 Harbor Water Quality

A three dimensional hydrodynamic and water quality model of Honokōhau Harbor and its surrounding waters was developed using the Delft3D modeling suite and is described in detail in Appendix U. The model was driven at its offshore boundaries by tidal predictions, and calibrated to reproduce available measurements of water levels, currents, salinity and temperature.

Isaiah Chinen
1/22/06

Kona Kai Ola

[redacted]

I strongly recommend stopping the preparations on the new harbor. A huge reason that I think Hawaii residents would agree is because of the traffic. Evan now with Hawaii making an extra lane that had also made more traffic in the process of making the extra lane. With all the construction of the three hotels and all the lagoons. Another reason is that it is how is it going to affect the native plants and animals in that area. When a guess speaker came over she had gave me some important information. She had said that when Kaloko-Honokahau asked about all the endangered species there. The people who want to promote this harbor had said nothing about the animals. If this construction was to happen it would make huge noises, which would interrupt the turtles, dolphins, and other endangered species. This will cause the people who are surveying to get really strange data. How they are going to get all the workers is by bringing a numerous number of philipino's to work. But the problem is that Hawaii does not have enough homes to provide them with. I'll go back to when I said all the traffic with the development, well Evan when all the development is done with three hotels that had just killed many wild life it is also right in the heart of Kona. That is going to increase the traffic not by one times more but by three because of each individual hotel. I hope you had taken what I had said into consideration and help stop the development of the new harbor.

Isaiah Chinen

oceanit®
innovation through engineering & scientific excellence

July 23, 2007

Isaiah Chinen
c/o West Hawaii Explorations Academy
73-4460 Queen Kaahumanu Hwy, Ste. 105
Kailua-Kona, HI 96740

Dear Mr. Chinnen:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are given below.

In order to reduce traffic impacts from the development the developer will provide funds to improve and modify roadways, traffic signals, and other improvements. The roadway system will also be improved beyond mitigation for project-related impacts. In Phase 1 of the project, Jacoby Development, Inc. (JDI) will not only provide access to the commercial parcel, but also address regional traffic issues through the improvements of the roadway system. JDI plans to improve the intersection of the Queen Ka‘ahumanu Highway and the Kealakehe WWTP Access Road. The Kealakehe WWTP Access Road is planned to be realigned and widened to an 80-foot road right-of-way (ROW) that will serve the Commercial Parcel No. 1 and eventually intersect with the proposed Kuakini Highway Extension to the west. Such improvements will ensure that the project minimizes its own impacts while improving existing conditions. Further, with development of Kona Kai Ola, the Kuakini Highway extension road is anticipated to be built on a more accelerated schedule than would occur without the Kona Kai Ola project.

The Fauna Impact Study, as summarized in EIS Section 7, found that it is not expected that the development of the proposed Kona Kai Ola property will have significant impacts on native avian or mammalian resources present within the North Kona District. Further, Kona Kai Ola will provide additional habitat for shorebirds and some visiting seabirds through the establishment of a brackish water pond area suitable for avian fauna, including stilts, coots and ducks. This is a positive impact and water features will constitute a managed ecosystem that will protect these species.

A flora study was conducted to assess impacts from this development on plants at the site. The report is included as Appendix E in the EIS. Out of the 42 plant species observed during the survey, only three species are endemic to Hawaii and nine species are indigenous to Hawaii and other Pacific Islands. The study concluded that the proposed development will not cause significant impacts on the plants in the area. A 400-foot wide strip of land extending back form the shoreline will be protected as there are native species dominating the area.

A complete marine acoustics study was completed in response to comments received on the Draft Environmental Impact Study (DEIS) to assess noise impacts on marine life. The report is included in Appendix T-2. The model results showed that the noise levels in the developed scenario did not exceed the Level A impacts to marine mammals. Level B impacts to marine mammals and sea turtles generally occur within a range of ten meters. Although noise impacts may occur during blasting the new marina, these impacts could be greatly minimized by using good blasting practices. These are addressed in detail in the EIS.

A study of workforce housing requirements was prepared to evaluate secondary impacts. As agreements between the State and JDI prohibit residential development at Kona Kai Ola, workforce housing would need to be located off-site. The most suitable location for workforce housing units is the Villages at La'i'Ōpua community, a Department of Hawaiian Home Lands (DHHL) project, or within the Hawai'i Housing Finance and Development Corporation affordable housing development planned for Keahuolu. These are two State-owned undertakings directly across the highway in the same or adjacent ahupua'a. Locating workforce affordable housing units in these communities would substantially lessen the traffic impacts associated with a community subject workforce. Alternatively, the State lands adjacent to Waikoloa Village would be appropriate for workforce housing.

JDI will comply with all affordable housing requirements of applicable Hawaii County ordinances.

The developer is continuing to work with public agencies in developing new water sources and the success of these efforts will not only benefit Kona Kai Ola, but also, adjacent communities that are also subject to an insufficient water supply.

The anticipated infrastructure improvements to the wastewater treatment plant are expected to actually improve the health and safety of the community by bringing an older facility up to higher operational standards. All structures will be built to current building and safety codes, while access to the shore and around the site will be improved.
The EIS has been revised to include information from these additional studies.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Dear Jacoby Development, Hawaiian Homelands, and politicians of Hawaii

Re: Harbor Development

I think that the harbor development is a very bad idea because the traffic in that area is already bad enough and if you add 2500 rooms and timeshares that is a lot more traffic. And they would be tourist and tourist are the worst drivers because they never know where they are going and they drive slowly, and it takes them so long at intersections because they do not know which way to turn. The also want to build a road though the Queen Lili'uokalani trust fund land. But I doubt that will help traffic. Plus it would not be so bad because it would give local people jobs, but they want to import Filipinos to take the jobs.

Not only are the people going to have problems, the animals will have problems to. This Jacoby also wants to add on to the marina so that there will be more stalls to park your boats, but the registration in Hawaii for boating is low, which means it will mostly be the tourist boats. With all the construction that would be needed to build this, it will create noise pollution and chemical pollution. Also with more boats it is more likely that a lot more turtles will get hit by propellers.

JD Ansel

JD Ansel

PO Box 1469 Kapaau 96755 Hi

oceanit
innovation through engineering & scientific excellence

July 23, 2007

J.D. Ansel
P.O. Box 1469
Kapaa, HI 96755

Dear Mr. Ansel:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are based on a paragraph designation.

Paragraph 1

To mitigate traffic impacts, Kona Kai Ola will include various signalization improvements and roadway improvements will be implemented. To connect Kona Kai Ola with the neighboring communities, Kona International Airport, and Kailua-Kona Village, the project proposes to sponsor a regularly scheduled shuttle service, so that people could utilize Kona Kai Ola without having to use a car for access. Further, the project includes the construction and realignment of Kealakehe Parkway makai of Queen Ka'ahumanu Highway and through the lands of Queen Lili'uokalani Trust connecting with Kuakini Highway in Kailua-Kona. Another measure to enhance road connectivity in the ahupua'a is the improvement of the intersection of Kealakehe Parkway and Queen Ka'ahumanu Highway. These improvements will serve the project as well as the regional community.

Such improvements will be privately-funded and ensure that the project minimizes its own impacts while improving existing conditions. Further, with development of Kona Kai Ola, the Kuakini Highway extension road is anticipated to be built on a more accelerated schedule than would occur without the Kona Kai Ola project.

Paragraph 2

Several studies were conducted to assess the impact of blasting and pollution from runoff. Fauna surveys, terrestrial noise studies, and marine acoustics were conducted to assess impacts for various noise sources. These studies are included as Appendices in the Environmental Impact Statement (EIS).

The Fauna Impact Study, as summarized in EIS Section 7, found that it is not expected that the development of the proposed Kona Kai Ola property will have significant impacts on native avian or mammalian resources present within the North Kona District. Further, Kona Kai Ola will provide additional habitat for shorebirds and some visiting seabirds through the establishment of a brackish water pond area suitable for avian fauna, including stilts, coots and ducks. This is a positive impact and water features will constitute a managed ecosystem that will protect these species.

A complete marine acoustics study was completed in response to comments received on the DEIS. The report is included in Appendix T-2. The model results showed that the noise levels in the developed scenario did not exceed the Level A impacts to marine mammals. Level B impacts to marine mammals and sea turtles generally occur within a range of ten meters. Although noise impacts may occur during blasting the new marina, these impacts could be greatly minimized by using good blasting practices. These are addressed in detail in the EIS.

The development of Kona Kai Ola is broader than providing accommodations for tourists. The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, Jacoby Development, Inc. (JDI) will protect natural resources through the various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities such as parks, other recreational facilities, and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community.

Pollution from contaminants from boats and potential possibility of oil spills is a concern in all of Hawaii, not just for Honokohau Harbor. This issue has been addressed in the EIS in Section 3.9.1.3, including a list of mitigation actions. These include boater education, enforcement of good housekeeping practices on boats and docks, and environmentally sensitive hull cleaning practices.

The developer is continuing to work with public agencies in developing new water sources and the success of these efforts will not only benefit Kona Kai Ola, but also, adjacent communities that are also subject to an insufficient water supply. The EIS has been revised to include information from these additional studies, and Attachment 1 contains Section 3.9.1.3, Zone of Mixing.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

A detailed analysis of the change in flow velocities through the harbor entrance is described within the 3D model shown in Appendix U. It was found that tidally averaged velocities through the harbor entrance may increase by 3-4 cm/s post-expansion. This is due to the increased tidal prism, the addition of the exhibit water, and the increased flow of brackish groundwater into the system.

3.9.1.2 Methodologies and Studies

Three studies were conducted to evaluate project impacts on nearshore and coastal waters. Oceanit completed a Zone of Mixing study that was presented in the DEIS and is contained in Appendix ~~H~~I. This study was tasked with determining the mixing and dispersion of flows emerging from the harbor into the adjacent shallow nearshore waters. To accomplish this, data from previous studies were reviewed and field research was conducted to measure stratification and currents adjacent to the harbor entrance and out into the ocean. A “Zone of Mixing” area was determined outside of which there is no discernable influence to water quality from the existing harbor effluent. This information was used to assess impact from modifications to groundwater inflow from marina expansion, and the seawater effluent flow from the marine water features.

~~The model analysis for mixing and water flow through the existing harbor and the proposed marina included existing water exchange between harbor and ocean and the future water exchange resulting from the expanded marina area and the discharge from the marine water features. The model results include three dimensional water flow patterns as well as water quality distribution details.~~

A Wave Penetration Study was prepared by Moffat and Nichol to determine wave characteristics within the existing harbor and the proposed expansion basin. This study was presented in the DEIS and is contained in Appendix J.

In response to DEIS comments, a Harbor Water Quality Modeling Study was prepared by Moffat and Nichol and is presented in Appendix U of this FEIS.

3.9.1.3 Zone of Mixing ~~Anticipated Impacts and Recommended Mitigation~~

~~Oceanit completed a Zone of Mixing study that is contained in Appendix H. This study was tasked with determining the mixing and dispersion of flows emerging from the harbor into the adjacent shallow nearshore waters. To accomplish this, data from previous studies were reviewed and field research was conducted to measure stratification and currents adjacent to the harbor entrance and out into the ocean. A “Zone of Mixing” area was determined outside of which there is no discernable influence to water quality from the existing harbor effluent. This information was used to assess impact from modifications to groundwater inflow from marina expansion, and the seawater effluent flow from the marine water features.~~

The model analysis for mixing and water flow through the existing harbor and the proposed marina included existing water exchange between harbor and ocean and the future water exchange resulting from the expanded marina area and the discharge from the marine water features. The model results include three-dimensional water flow patterns as well as water quality distribution details.

The three-dimensional model was extended outside of the harbor entrance in order to examine relative changes from baseline conditions. Due to the lack of available data regarding specific brackish discharge events along the coastline, the model is not calibrated outside of the harbor entrance, and any changes predicted in this region are only referred to in terms of relative changes (in relation to model predicted existing conditions). This analysis is shown in Appendix I. It was found that the significance of the additional brackish groundwater inflow into Kona Kai Ola Marina also has an effect on the surrounding surface waters of Honokōhau Bay. The concentrations of nutrients in low flow scenarios are less than existing conditions due to the lack of additional nutrients to the system. However, with higher brackish inflow, the relative growth of algae is more contained while nutrient concentrations relatively increase. Relative nitrogen concentrations in the bottom layers can be maintained in scenarios without additional exhibit flow included, however with the additional saline flow, there is more of a nitrogen load in the bottom layers.

Anticipated Impacts and Mitigation Measures

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water for the water features will be pumped from 100 to 300 foot depth. The total amount of water supplied to the water features will be 75 million gallons per day. The rate of pumping is designed to achieve an approximate 4 hour residence time within the ponds (pers. comm. Cloward H2O, 2007) and to prevent build up of pollutants from users and marine animals. ~~The water for the water features will be pumped from 100 to 300 foot depth. The total amount of water supplied to the water features will be 75 million gallons per day. The rate of pumping is designed to achieve rapid turnover of water within the ponds and to prevent build up of pollutants from marine animals and users. Currently, the nutrient concentrations at the existing marina entrance are very high (1,200ug/l of total dissolved nitrogen (TDN) and 83 ug/l of total dissolved phosphorus (TDP)). The intake water for the features has low levels of nutrients (185 ug/l TDN and 5.6 ug of TDP).~~

The anticipated impacts and mitigation measures discussed below assume construction of an 800-slip harbor. One possible mitigation measure would be to reduce the size of the harbor expansion. Any modification of the final design size of the marina would require modification of contract language with the DLNR. In that Alternative 1 would include a smaller marina and smaller seawater lagoons, the latter of which would represent a 74 percent decrease from 19 acres in the proposed project to five acres in Alternative 1, there would be a proportionate reduction in seawater discharging into the new harbor.

The intake water for the features has low levels of nutrients (185 µg/l TDN and 5.6 µg of TDP). This amount will be modified by the generation of nutrients by marine animals. This quantity was modeled via calculations performed by ClowardH2O (pers. comm., 2007). Through modeling, this level of nutrient input was found to have an effect on both ammonia and nitrate concentrations outside of the harbor. However, the modeled input did not contribute significantly to eutrophication potential due to the limiting nature of phosphorous within the system. These processes and sensitivity tests are described at length in Appendix U.

Although the total amount of nutrients that will be generated per day will increase from the nutrient output of marine animals and users, the concentration of the nutrients will be lower due to the large amount of water available for mixing within the basin. The overall impact will be a reduction of nutrient concentration in the outflowing water.

The boats used in the marina will be small, and spills could occur from boats or while fuelling. These amounts in a majority of cases will be relatively small. The entrance to the marina is relatively narrow and in case of a fuel spill, the traffic will be stopped and a containment boom will be installed to contain the spill within the basin.

Adequate numbers of containment booms, absorption units and oil removal facilities will be at the fueling station and also provided to an identified emergency response station. Personnel will be trained to respond in case of a spill. In addition, the local fire station, police and civil defense and other agencies will be informed in case of a larger spill.

The proposed new marina would significantly increase the size of the water body, but would utilize the existing marina entrance for access to the ocean. This will increase the tidal prism in addition to the extra anticipated inflows to the new marina. It would be expected to intercept additional groundwater, adding these flows to the existing harbor outflow in addition to being the outfall location for the exhibit flows. Model results presented in Appendix U show that the increase in depth-averaged velocities through the harbor entrance can be as great as 4 cm/s under typical conditions,

The proposed marina basin will therefore not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance. There will be an expanded zone of mixing between the brackish effluent and the surrounding ocean waters due to the concentration of flows at the harbor mouth. The addition of effluent water from the marine water features will result in an additional increase outflow across the marina entrance from 30 mgd to an expected value of greater than 135 mgd after development of the marine water features. ~~to the south will intercept additional groundwater, adding these flows to the existing harbor outflow. The proposed marina will therefore not result in any significant increase in groundwater flow to the coastline, but rather a concentration of the existing flows to the harbor entrance. There will be an expanded zone of mixing between the brackish effluent and the surrounding ocean waters due to the concentration of flows at the harbor mouth. The addition of effluent water from the marine water features will result in an additional increase outflow across the marina entrance from 4 mgd at present to 79 mgd after development of the marine water features. The effluent from the marine water features will contain low amounts of nutrients because of the high flow through. The large amount of water will dilute any pollutants that enter the harbor basin from groundwater or surface water. This will improve the water quality and will be a positive impact on the nearshore environment.~~

Despite its proximity to the WWTP, sewers do not service the existing adjacent State harbor or surrounding private structures. All sewage from existing facilities is treated in on-site septic systems with resulting effluent flowing to groundwater that almost certainly flows directly to the existing harbor. Under post-development conditions all of these flows would be connected to the Kona Kai Ola sewage system resulting in a positive impact by eliminating this existing pollutant load into the harbor. Sewage from facilities at the existing marina will be connected to the Kona Kai Ola sewage system. Sumps, connection lines and pumping facilities will be constructed to move the sewage from the present septic tank systems directly to the larger collection system. The work needed for this conversion will be included in the sewage infrastructure design and construction.

~~Hydrogeological studies have concluded that the expansion of the marina does not increase the groundwater flux through the harbor mouth into the ocean significantly. The groundwater from the brackish aquifer already converges to the existing harbor and does not show flow across the planned marina basin area into the ocean.~~

~~It is estimated that the average groundwater discharge is 3 to 4 million gallons per day (mgd). The salinity of the water that discharges from the brackish aquifer is about 12 percent of seawater or about 4.3 parts per thousand (ppt). In addition, 52,000 gallons per minute of surface seawater (36 ppt) will be pumped from the nearshore area for use in the marine lagoon features. This amounts to approximately 75 mgd. This water eventually is discharged into the harbor basin and into the ocean. This water is not expected to reach the existing marina basin because the proposed basin connects to the existing one very close to the common entrance. Therefore the impacts to the existing marina environment from the additional discharge are expected to be negligible.~~

At present, the salinity of the water column remains entirely saline in the bottom layers with more brackish influences near the surface (about 30 ppt). Model results displayed in detail within Appendix U show that salinity differences near the harbor entrance are completely confined to the surface layers and are at maximum about 0.5 ppt less than the current conditions of about 30 ppt (surface). Salinity at the marina entrance, at 10 foot depth is not affected by the brackish water discharge. The benthic flora and fauna close to the marina entrance and at less than 10 feet water depth face variations of salinity from 34.5 ppt to 36.0 ppt.

~~At present the depth averaged salinity of the water exiting the existing basin is about 33.5 ppt close to the marina entrance. The brackish water stays at the surface and shows its influence for distance of about 2,000 feet. Salinity at the marina entrance, at 10 foot depth is not affected by the brackish water discharge. The benthic flora and fauna close to the marina entrance and at less than 10 feet water depth face variations of salinity from 34.5 ppt to 36.0 ppt.~~

~~A straight forward mass balance calculation shows the following changes to the existing flow and salinity. The average outflow from the harbor will increase from 4 mgd to 79 mgd. The salinity of the water will change from an average of 33.5 ppt to about 34.4 ppt. The water will still be less dense, and the depth of impact will be limited to the surface 3 to 4 feet. The benthic flora and fauna will face a smaller variation in salinity that will discourage opportunistic biota dominance and lead to a healthier and more diverse benthic community. This is a positive impact on the benthic environment. The increase in the outflow will cause a very slight increase in water velocities, but this is well below the existing velocity variations in the entrance channel vicinity.~~

Construction of a new marina basin will have ~~short-~~short-term negative impacts on coastal marine resources. Direct construction impacts are likely to be small. Marina construction will be accomplished with a berm separating the construction area from adjacent marine waters, minimizing the discharge of sediment from excavation and dredging. Excess sediment remaining in excavated marina will be removed before the land bridge is removed in order to minimize any temporary sediment plume. When the final land bridge is removed, a temporary sediment plume is anticipated. Silt curtains will be used to ~~minimize the~~prevent suspended sediment entering ocean waters.

Although the runoff at the site is small due to the dry climate and the high porosity of the land, during high rainfall, some runoff might reach the harbor basin as overland sheet flow. The new marina will serve as a collection point for materials utilized or generated at the development site, either through direct runoff or by interception of groundwater flow. There is the potential that fertilizers, pesticides, petroleum products, road wastes, etc, could be discharged from the mouth of Honokōhau Harbor into the coastal marine environment. Structural Best Management Practices (BMPs) will be designed and installed to remove as much of pollutants as possible from the run off during such unusual conditions.

Small boat harbors have been found to be consistent sources of certain types of pollutants to the surrounding environment. These pollutants in general include:

- Heavy metals (zinc, copper, tin, lead) associated with bottom paint or sanding of painted surfaces during maintenance activities;
- Petroleum product release from fueling operations, and bilge discharges exacerbated by the large number of boats and range of operator skills;
- Trash and debris from boat operations and surrounding harbor activities;
- Sewage from intentional or accidental releases from on-board waste systems;
- Biological waste from fish cleaning;
- Waste streams from land-side boat washing and maintenance activities;

Most of the impacts can be minimized through the use of Best Management Practices (BMPs), which are a combination of activities, education and devices that help prevent or reduce water pollution. A "Clean Marina Program" similar to the International Blue Flag Marina Program or the Clean Marinas California Program will be implemented at the new marina and include key elements such as promoting and enforcing:

- Boater education signage, literature and programs
- Emergency and spill response plans
- Safe fuel, hazardous material, sewage and bilge water handling practices
- Use of sewage marina pump out, waste and oil recycling facilities
- Environmentally sensitive boat maintenance and cleaning practices
- Environmentally sensitive hull cleaning practices
- Good housekeeping practices on boats and docks
- Use of fish cleaning stations / receptacles and fish waste composting

- Enforcement of harbor rules and regulations

3.9.1.4 Wave Impacts to the Existing Honokōhau Harbor

The wave climate within the existing Honokōhau Harbor and the proposed marina was analyzed using a numerical model that is further discussed in Appendix J~~I~~. A wave measurement study was conducted to determine the wave response of the existing harbor to outside wave climate. A directional wave gage at a depth of sixty feet directly in front of the existing harbor entrance and a non directional wave gage inside the existing harbor basin were installed to measure wave climates simultaneously. The results of the wave measurements were provided for wave transformation model calibration.

Results of the wave climate analysis with and without the expansion were used to predict wave agitation impacts to the existing harbor. The model was operated for waves with a 9-second period and swells of 13-second period as the dominating waves for the offshore area.

Anticipated Impacts and Proposed Mitigation

Wave climate in the existing harbor from the proposed marina construction depended on the period of the incoming waves. There was a slight decrease in the wave height in the existing basin for outside waves of a 9-second period. For longer period swells, there was no significant change in the wave height in the basin.

For waves with a 9-second period, the wave height at the inner end of the outer basin attenuated to 40 percent of the incident wave. There was no additional wave attenuation due to the presence of the proposed marina. Within the existing harbor inner basin, the wave height attenuated to about 20 percent of the incident wave. The wave height in the inner harbor decreased by about 10 percent with the construction of the proposed marina.

For longer period swells, the wave height in the outer basin remained at 50 percent attenuation. In the inner basin, the wave height reduced to about 20 to 30 percent of the incident wave. There was no significant change in the wave height in the inner basin from marina construction.

The analysis shows that under short storm wave conditions, the proposed marina construction causes a positive impact by reducing the wave height by 10 percent in the existing marina. However, under swell conditions there is no change in wave agitation in the mooring area of the existing harbor with the proposed marina. Overall, the impact of construction of the proposed marina basin is positive since the existing harbor will experience less wave agitation. This may be due to the fact that the amount of wave energy entering through the harbor entrance remains the same, while additional water area and frictional surfaces (both sides and bottom) provide for greater wave dissipation after the expansion. No mitigation is ~~recommended~~ proposed due to the project's positive effect.

3.9.1.5 Harbor Water Quality

A three dimensional hydrodynamic and water quality model of Honokōhau Harbor and its surrounding waters was developed using the Delft3D modeling suite and is described in detail in Appendix U. The model was driven at its offshore boundaries by tidal predictions, and calibrated to reproduce available measurements of water levels, currents, salinity and temperature.

To Whom It May Concern,

Hello my name is Jared Wike. I am writing this letter to tell you why you shouldn't go through with the Kona Kai Ola project. One reason you shouldn't do this project is because there is a lot of Anchialine Ponds in this area. These ponds are all in healthy condition. You guys said that the ponds are not that great but they are in healthy condition. Another thing is that you plan to have 800 more slips for the harbor but that will not work because the harbor mouth is too small. Plus there is really nice fishing grounds were you are planning to build and if you do build then the grounds would get messed up. I know this because the water will not be the same. I would not like to see one of my fishing spots turned in to a resort. The park would have a lot of trash left around the park that you are planning on making.

You plan on building three resorts in this area and that is too much. We have enough resorts already and only once every two years I can afford to stay at one. That's only for a day. You plan on making a lagoon but in order to do that you will have to bomb out the area you want to use. This is wrong because you don't know if there are any Native Hawaiian artifacts and plants in the area. A lot of Native Hawaiians will be angry with you because you have destroyed the native plants and artifacts. This is our history that would be destroyed. Another thing is that with the resort we would have even more traffic. You may think that traffic is not bad but I have seen it get worse through the years. Now traffic is backed up so much everybody is getting angry with each other. I do not want to see the Big Island turn into another Oahu so please let's keep Kona country.

Sincerely

Jared Wike

Jared Wike
73-4168
Malino Place

oceanit
innovation through engineering & scientific excellence

July 23, 2007

Jared Wike
73-4168 Malino Place
Kailua-Kona, HI 96740

Dear Mr. Wike:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are based on a paragraph designation.

Paragraph 1

The anchialine pools south of the existing harbor may be impacted to some degree by the development.

In response to Draft Environmental Impact Statement (DEIS) comments and to further study the pools south of the entrance channel of Honokohau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2 of the Environmental Impact Statement (EIS) and is summarized in EIS Sections 3.9.2.1 and 3.9.2.2. In addition, further comment on the groundwater hydrology effects on anchialine pools was prepared by Waimea Water Services and is contained in Appendix G-3 of the EIS.

These additional studies indicated that with the construction of the new harbor basin, the anchialine pools makai of the proposed basin may not necessarily be negatively impacted by the construction of the proposed project.

In addition, these studies determined that there are mechanisms to mitigate potential impacts. Mitigation measures to facilitate the long term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. As a mitigation measure, bioretention, which is a Best Management Practice (BMP), is a highly appropriate application for the proposed development to prevent any non point source pollution of groundwater. Another mitigation measure that may be included in the management plan is salinity adjustment of the anchialine pools to maintain healthy habitat for the anchialine ecosystem by surcharging man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water.

The proposed 800-slip harbor may cause congestion in the harbor mouth during busy hours. A reduced harbor development was considered as Alternative 1 (400 slips) in the EIS.

A comparison between impacts related to the proposed project concept and impacts related to Alternative 1 indicates that a reduction in the acreage and number of slips in the marina, as well as the reduction in hotel and timeshare units, would generate less environmental, social, and economic impacts. Although positive economic impacts would be reduced, Alternative 1 can be considered as a preferable alternative because of reduced environmental impacts. However, while it can be concluded that the 25-acre (400 slips) marina in Alternative 1 would be the preferred size, the Department of Land and Natural Resources (DLNR) agreement establishes the size of the marina at 45 acres and 800 slips. An amendment to the DLNR agreement is required in order to allow Alternative 1 to proceed. Hence, selection of Alternative 1 is an unresolved issue at this time.

The development will include plans for trash disposal which will be implemented by the users.

Paragraph 2

The development of Kona Kai Ola is broader than providing accommodations for tourists. The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, Jacoby Development, Inc. (JDI) will protect natural resources through the various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities such as parks, other recreational facilities, and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community.

The developer is continuing to work with public agencies in developing new water sources and the success of these efforts will not only benefit Kona Kai Ola, but also, adjacent communities that are also subject to an insufficient water supply.

The anticipated infrastructure improvements to the wastewater treatment plant are expected to actually improve the health and safety of the community by bringing an older facility up to higher operational standards. All structures will be built to current building and safety codes, while access to the shore and around the site will be improved.

The roadway system will also be improved beyond mitigation for project-related impacts. In Phase 1 of the project, JDI will not only provide access to the commercial parcel, but also address regional traffic issues through the improvements of the roadway system. JDI plans to improve the intersection of the Queen Ka‘ahumanu Highway and the Kealakehe WWTP Access Road. The Kealakehe WWTP Access Road is planned to be realigned and widened to an 80-foot road right-of-way (ROW) that will serve the Commercial Parcel No. 1 and eventually intersect with the proposed Kuakini Highway Extension to the west. Such improvements will ensure that project minimize its own impacts while improving existing conditions. Further, with development of Kona Kai Ola, the Kuakini Highway extension road is anticipated to be built on a more accelerated schedule than would occur without the Kona Kai Ola project

An extensive archaeological investigation was conducted during the preparation of the DEIS. Numerous sites both in DLNR and Department of Hawaiian Home Lands (DHHL) land were identified and inventoried. The complete report is included in the EIS, Appendices M-1 and M-2. The archeological study identified eleven sites as culturally significant based on the presence of burials or ritual architecture. Fifty four sites were mapped, photographed and documented. Forty seven sites were recommended through data recovery. Detailed data recovery plans will be prepared for the State Historic Preservation Division of DLNR for review and approval.

The EIS has been revised to include information from these additional studies. Attachment 1 contains Section 3.9.2, Anchialine Pools, and Attachment 2 contains Section 2, Alternatives Analysis.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

The conditions with the project constructed were found to be phosphorous limited. Several simulations were performed including and excluding the inflow from the marine exhibits which provides an additional nitrogen load and also varying the location of this inflow. It was found that the inflow from the marine exhibits can have a beneficial effect on flushing, especially when positioned within the existing harbor basin. However, its effect is significantly less than the effect due to the brackish groundwater inflow. When the exhibit inflow is excluded or positioned at the east end of the new marina, its effect is small in terms of flushing due to its high salinity. From a water quality perspective, since the loads from the exhibit inflow consist primarily of nitrogen, it does not cause increased algae growth. However, this exhibit inflow does raise the concentrations of ammonia and nitrate in the system.

Simulation results indicate that under the conditions when the post-expansion system receives an additional brackish inflow into the new 25-acre marina on the order of 30 mgd or more, water quality within the harbor system and in the surrounding waters remained similar to existing conditions. These conditions are expected to occur based on the findings reported by Waimea Water Services (2007), which states that the proposed marina would exhibit the same or similar flushing action as the existing marina.

An additional mitigation measure proposed by Waimea Water Services (2007), if sufficient inflow is not intercepted, consists of drilling holes in the bottom of the new marina to enhance this inflow and facilitate flushing within the proposed system.

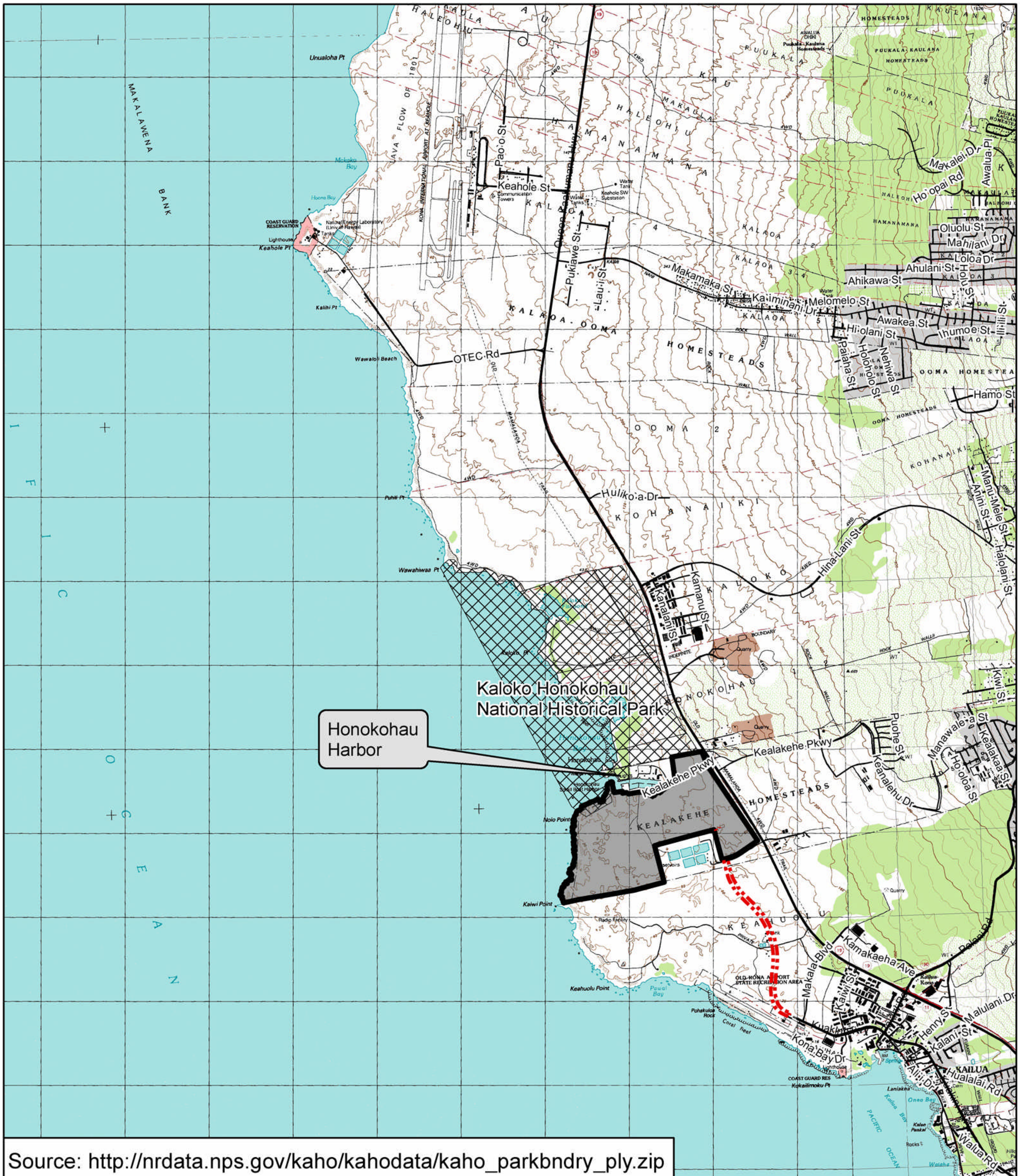
~~3.9.3~~3.9.2 Anchialine ~~Ponds~~ Pools

Two studies on anchialine pools were conducted in this EIS process. The anchialine ~~ponds~~ pools water quality studies and ~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute and is~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute in October 2006 and are included as Appendix ~~G~~H-1. That survey included pools located both north and south of Honokōhau Harbor. In response to DEIS comments and to further study the pools south of entrance channel of Honokōhau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2.

~~3.9.3.1~~3.9.2.1 Existing Conditions

Anchialine ~~ponds~~ pools exist in inland lava depressions near the ocean. Two anchialine ~~pond~~ pool complexes are located immediately to the north and south of the Honokōhau Harbor entrance channel. The complex to the north is located wholly within the designated boundaries of the Kaloko-Honokōhau National Historical Park as shown in Figure Q~~O~~. Many of the ~~ponds~~ pools in the southern complex are within the park administrative boundary as well. ~~Ponds~~ Pools in the northern complex show little evidence of anthropogenic impacts. Many contain typical vegetation and crustacean species in high abundance.

Figure R locates anchialine pools near the harbor entrance and pools~~Ponds~~ in the southern complex are depicted in Figure S.



Source: http://nrdata.nps.gov/kaho/kahodata/kaho_parkbndry_ply.zip

Figure Q: National Historical Park Service Legislative Boundary Map

Legend

- Project Site
- Proposed Parkway
- National Park Boundary

N
W E
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0 2,500 5,000 Feet

oceanit
innovation through engineering & scientific excellence

JDI
JACOBY DEVELOPMENT, INC.

Source: Oceanic Institute

Figure R: Anchialine Pool Locations

oceanit

JDI

JACOBY DEVELOPMENT, INC.

Source: Aquatic Resources Management And Design

Figure S: Anchialine Pool Locations in Southern Complex

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oceanit

JDI

JACOBY DEVELOPMENT, INC.

The 2006 study identified 22 pools in the southern complex. The 2007 study found that three of the 22 pools are part of an estuary complex with direct connection to the ocean. While there were several signs of direct human use and disturbance, such as trash receptacles and toilet facilities, the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickleweed and mangrove. ~~are moderately to heavily impacted, with many containing exotic fish that exclude the anchialine crustaceans. The ponds also show evidence of human impact, including discarded bottles, cans, wrappers, diapers, toilet paper, etc. Water quality conditions within the ponds generally reflect the conditions of the underlying groundwater.~~

~~Figure P locates anchialine ponds near the harbor entrance. The study conducted as a part of this EIS show that the anchialine ponds south of the harbor entrance are moderately to heavily impacted by human activities and introduced fish populations. The study found that the nitrogen phosphorus concentrations in these ponds are significantly higher compared to the ponds north of the harbor entrance. The sources of these additional nutrients are not known. Continuous influx of nutrients will eventually degrade the water quality to levels that could alter the pond ecology.~~

Biota surveys in the two pond systems clearly indicate that counts of typical pond denizens show a remarkable difference between the northern and southern ~~ponds~~ pools. In the northern ~~ponds~~ pools the number of *Halocaridina rubra* ranged from a low of 20–25 to too numerous to count. The biota rich pond bottoms appeared red due to the *Halocaridina rubra* numbers. The only other species visible was the predatory shrimp *Metabetaeus lohena*. In contrast, only four out of the 22 ~~ponds~~ pools examined in the southern pond complex showed a decreased presence of *Halocaridina rubra* (6 to 200) individuals in the pond, and three ~~ponds~~ pools contained *Metabetaeus lohena*. Eight of the ~~ponds~~ pools contained numbers of introduced minnows which is an apparent predator of *Halocaridina rubra* and *Metabetaeus lohena*.

The 2007 study found three of the pools identified in the 2006 study were part of an estuary complex with direct connection to the ocean, and that the southern complex contained 19 anchialine pools. The study further found that a majority of the southern pools are degraded biologically and physically, primarily due to the effects of introduced fish and plant species. Six pools are currently devoid of alien fish, but they face a high level of threat due to the proximity of pools that have these species. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction.

The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 ppt. and that the anchialine biology would then perish. There is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and final determination of anchialine salinity following the harbor construction. The assessment that all anchialine pools will be barren with the construction of the harbor may be premature. *Halocaridina rubra* (opae ula) are routinely drawn from high salinity wells at 30-32 ppt.

Within the 19 pools, native and non-native fauna included 14 species comprised of 5 fish, 2 mollusca, and 6 crustacea. Algae within the pools primarily consisted of a mixed assemblage of diatoms and cyanobacteria, with several pools dominated by matted filamentous *Cladophora*, sp. The darker cave/overhang pools and high tide pools had epilithic *Hildenbrandia* sp. covering the rock substrate. Riparian vegetation was dominated by introduced species consisting of Pickleweed (*Batis maritima*), Mangrove (*Rhyzophora mangle*), and Christmasberry (*Shinus terebenthifolius*). Only two species of native plants Akulikuli (*Sesuvium portulacastrum*) and Makaloa (*Cyperus laevigatus*) existed near the pools and comprised only few small patches and a single tuft (respectively).

Most of the hypogeal anchialine shrimp have adapted to the presence of minnows by foraging in the pools at night. During daylight hours, only the adult shrimp appear to coexist at low population levels with the smaller *P. reticulata*, but the larger *G. affinis* and *Oreochromis* prevent the daytime appearance of hypogeal shrimp due to predation.

The average salinity in Kealakehe pools is relatively high at 13.5 ppt compared to most other pools along the West Hawai‘i coastline, having an average of approximately 7 ppt. This high salinity appears to be characteristic of this region, and is similar to the average of most pools within the adjacent ahupua’a of Honokōhau and Kaloko. The levels of nitrate-nitrogen levels are relatively high compared to other undeveloped areas, but fall in the range of some developed landscapes. Other water quality parameters, including pH and temperature, fall into normal ranges for anchialine pools.

This relatively high salinity is the likely reason aquatic insects were not found in any pools at Kealakehe. Though the rare damselfly *Megalagrion xanthomelas* has been observed and collected from Kaloko, a statewide assessment of its range has not found it to occur in water with salinity greater than 3ppt. However, there has been an unsubstantiated occurrence of the nymph in a pool of up to 8ppt (Polhemus, 1995).

Another species of concern is the hypogeal decapod shrimp *Metabetaeus lohena.* These shrimp are sometimes predatory on *H. rubra* but are more often opportunistic omnivores similar to *H. rubra.* Predusk and nocturnal sampling at high tide is clearly the optimal method to determine habitat range and population densities for this species. These shrimp were found in 13 of the 19 pools, 7 of which had *M. lohena* only at night. The occurrences of *H. rubra* were found in 16 of 19 sampled pools, 8 of which had ‘Ōpae‘ula observed only at night. Consequently, despite having numerous degraded anchialine resources at Kealakehe, there are opportunities for many of the pools to be restored and enhanced to a level where large populations of anchialine shrimp and other native species may return to inhabit the pools as they likely have in the past.

~~As mentioned earlier, the southern ponds also had elevated concentrations of nutrients indicating water quality degradation. These factors indicate that if no restoration or maintenance activities are instituted to reserve these ponds, these ecosystems will degrade beyond recovery.~~

~~3.9.3.2~~3.9.2.2 Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

The anchialine ~~ponds~~ pools that are located north of the existing harbor are not likely to be impacted because no development activities are proposed north of the existing harbor. It is highly unlikely that existing groundwater flows to the Kaloko-Honokōhau pond system to the north of the existing harbor will be impacted by the proposed marina to the south.

Of the 19 pools in the southern complex, three would be eliminated due to harbor construction. Regarding the remaining pools, the DEIS noted that t~~T~~he change in the local groundwater flow pattern in the vicinity of the proposed marina ~~will~~ would impact the anchialine ~~ponds~~ pools that are located between the proposed marina and the shoreline south of the harbor entrance. The 2006 study (Appendix H-1) noted that t~~T~~he salinity of the anchialine ~~ponds~~ pools ~~will~~ would increase due to reduction of brackish groundwater, and that ~~. Some ponds will be excavated to make the new harbor basin. T~~those ~~ponds~~ pools that are not excavated will revert to full salinity, causing the loss of their habitat. ~~and associated aquatic flora and fauna. However, current investigations indicate that these ponds are already enriched by nutrients and the density of associated aquatic fauna is very low. In addition, trash from visitors, and introduction of minnows has already degraded the pond ecology.~~ Even without the potential impacts from the proposed marina construction, the pond ecology might change irreversibly from the nutrient input, human indifference and expansion of non native fauna species.

Further studies conducted in response to DEIS comments (Appendix H-2, and Appendix G-3) indicate that the remaining pools may not increase in salinity to levels unhealthy for *H. rubra* and *M. lohena* and other anchialine pool fauna. In addition, these studies determined that there are realistic mechanisms employed elsewhere that would mitigate changes due to groundwater changes. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore.

Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented. The mitigation plan will be based on the following objectives:

Objective 1 To preserve, maintain, and foster the long-term health and native ecological integrity of anchialine pools at Kealakehe.

Objective 2 To protect and promote cultural practices and traditions surrounding anchialine resources at Kealakehe.

Objective 3 To provide education, interpretation, and interactive opportunities for the community to learn about and appreciate the anchialine resources.

Objective 4 To acquire a pond manager to implement the program, conduct monitoring, research, and reporting, and provide education to the community about anchialine and estuarine resources.

Mitigation measures to facilitate the long-term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on the environment can be measured. The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment and possible new pools.

As a mitigation measure, bioretention, which is a Best Management Practice (BMP) is a feasible application for the proposed development. There is a probability that nutrients and other potential pollutants will runoff landscaping and impermeable surfaces such as roadways and parking lots during medium or high rainfall events. Some of these pollutants could enter the groundwater table and into anchialine pools and ultimately the ocean. As an alternative to directing runoff into the ground through drywells, storm water should be directed into bioretention areas such as constructed surface or subsurface wetlands, vegetated filter strips, grass swales, and planted buffer areas. Storm water held and moved through these living filter systems are essentially stripped of most potential pollutants, and allowed to slowly infiltrate back to the groundwater table.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Another mitigation measure that may be included in the management plan is salinity adjustment. In the 2006 assessment regarding the impact to the southern pools from the proposed construction of the harbor, it was stated that this construction would cause the salinity in the anchialine pools to become equivalent to the ocean at 35ppt. It was then concluded that the anchialine biology would perish.

However, there is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and a final determination of anchialine salinity following the harbor construction. The dynamics of groundwater movement through a porous lava medium both seaward and laterally along the coastline is an inexact science. This is compounded by the variations in water density, including stratification of salinity within the proposed harbor and capillary movement of low-density surface water through the substrata.

The assessment that all anchialine pools will be barren with the construction of the harbor may therefore be premature. *H. rubra* are routinely drawn from high salinity wells at 30 – 32 ppt and survive in this salinity for years. Further, high populations *H. rubra* and *M. lohena* have thrived and reproduced in pool salinities of 27ppt. If the pools do become full strength seawater at 35ppt, there exists uncertainty on the long-term effects to anchialine organisms, since there are no long-term studies or examples of native anchialine ecosystems at 35ppt. Native anchialine pool vegetation also has relatively high salinity tolerance.

If the salinity were expected to rise to 35 ppt, possible mitigation in the management plan will include methods to surcharge man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water. If sufficient volume is used, it is theoretically possible to lower salinity in adjacent natural anchialine pools. This surcharge method has been successfully used to raise salinity in anchialine pools and cause the salinity rise in adjacent pools of at least up to 10 meters away. Surcharging with low salinity should work as well or better since the lower density water will essentially float atop the higher salinity water at the surface layer, and move throughout the complex of natural pools. Surcharging may also be a viable mitigation to dilute and more rapidly disperse any pollutants that may be detected in the pools.

Another mitigation measure includes the creation of new anchialine pools. There is significant opportunity to create new anchialine pools and greatly expand the native habitat and resource. It has been demonstrated at several projects in West Hawai'i that anchialine pools can be created and will be colonized with a full compliment of anchialine species endemic to the area. Anchialine pools are considered focal points of higher productivity relative to the subterranean groundwater habitat around them. Their productivity promotes an increase in population levels of anchialine species within the pools themselves and throughout the subterranean habitat surrounding them.

~~No realistic mechanisms are envisioned for re-injecting fresh water into these systems to maintain their ecological balance as an anchialine system. These ponds will be changed from a brackish water system to a marine system. But, those ponds in the area of the shoreline park and cultural park will be cleaned of vegetation and protected from other physical alteration. A buffer zone around these newly established marine ponds will be protected as well.~~

~~The anchialine pond shrimp (*Metabetaeus lohena)* and the orangeback damsel fly (*Megalagrion xanthomelas)* are listed as candidate endangered species in the Federal Register and were both recorded in surveys of these anchialine ponds done in 2004 by US Geological Survey Biological Resources Division and the NPS Inventory and Monitoring Program. Low numbers of *Metabetaeus lohena* were encountered in three of the 22 ponds surveyed in the southern pond complex. *Megalagrion xanthomelas* was not encountered in any of the southern pond complex ponds during the recent study. The low density of *Metabetaeus lohena* and the observed absence of *Megalagrion xanthomelas* may be due to the impacts from high nutrient input and general degradation of the ponds.~~

~~An attempt should be made to move as much of the existing population of *Metabetaeus lohena* from these anchialine ponds before they become too saline, to possible newly excavated ponds that may be developed off-site. These shrimp should not be introduced into existing populated ponds to avoid any potential pathogenic impacts to the healthy ponds.~~

~~Public education on the unique ecology of the anchialine ponds and the need for preserving their ecology will reduce future human impacts in other healthy ponds.~~

~~Further recommended mitigation includes restoration to degraded anchialine ponds off the project site, preferably those located at the adjacent Kaloko-Honokōhau National Historical Park.~~

Attachment 2

2 Alternatives Analysis

~~In typical land development projects, the initial planning process includes the exploration of alternatives to development objectives. In the EIS process, these alternatives are presented with a disclosure of reasons for the dismissal of non-preferred alternatives.~~

~~Kona Kai Ola does not follow this same pattern of alternatives evaluation.~~ As discussed in Section 1.4, the proposed Kona Kai Ola project is the result of agreements between JDI and the State DLNR and DHHL. The agreements and leases between the State and JDI stipulate the parameters of development for this site in terms of uses, quantities and size of many features, resulting in a limited range of land uses. Unlike a private property project, JDI is required to meet the criteria outlined in the agreements, thereby affording less flexibility in options and uses. From the developer's perspective, the agreements must also provide sufficient flexibility to allow for a development product that responds to market needs and provides a reasonable rate of return on the private investment.

The agreements between JDI and DLNR specify that the proposed harbor basin is to be 45 acres and accommodate 800 slips. This development proposal is the subject of this EIS. In response to DEIS comments, additional water quality studies and modeling were conducted. These studies determined that the water circulation in a 45-acre 800-slip marina would be insufficient to maintain the required standard of water quality. The models of water circulation suggest that a new 25-acre harbor basin could successfully maintain required water quality in the new harbor. Comments on the DEIS from DLNR, from other government agencies, the neighbors and the general community also called for the consideration of alternatives in the EIS, including a project with a smaller harbor basin and less density of hotel and time-share units.

In response to these comments on the DEIS, three alternatives are evaluated in this Final EIS and include Alternative 1, which is a plan with a 25-acre 400-slip harbor basin including a decrease in hotel and time-share units; Alternative 2, which is an alternative that had been previously discussed but not included in the proposed project, that includes an 800-slip harbor and a golf course; and Alternative 3, the no-project alternative. Each alternative is included in the EIS with an evaluation of their potential impacts. These project alternatives are presented to compare the levels of impacts and mitigation measures of the proposed project and alternative development schemes pursuant to requirements set forth in Chapter 343, HRS.

~~JDI is required to provide a new marina basin not less than 45 acres and a minimum of 800 new boat slips. Further, the agreements provide the following options for land uses at the project site:~~

- ~~Golf Course~~
- ~~Retail Commercial Facilities~~
- ~~Hotel Development Parcels~~
- ~~Marina Development Parcels~~
- ~~Community Benefit Development Parcels~~

~~JDI is not pursuing the golf course option and is proposing instead to create various water features throughout the project site. All other optional uses have been incorporated in Kona Kai Ola.~~

2.1 Project Alternatives

2.1.1 Alternative 1: 400-Slip Marina

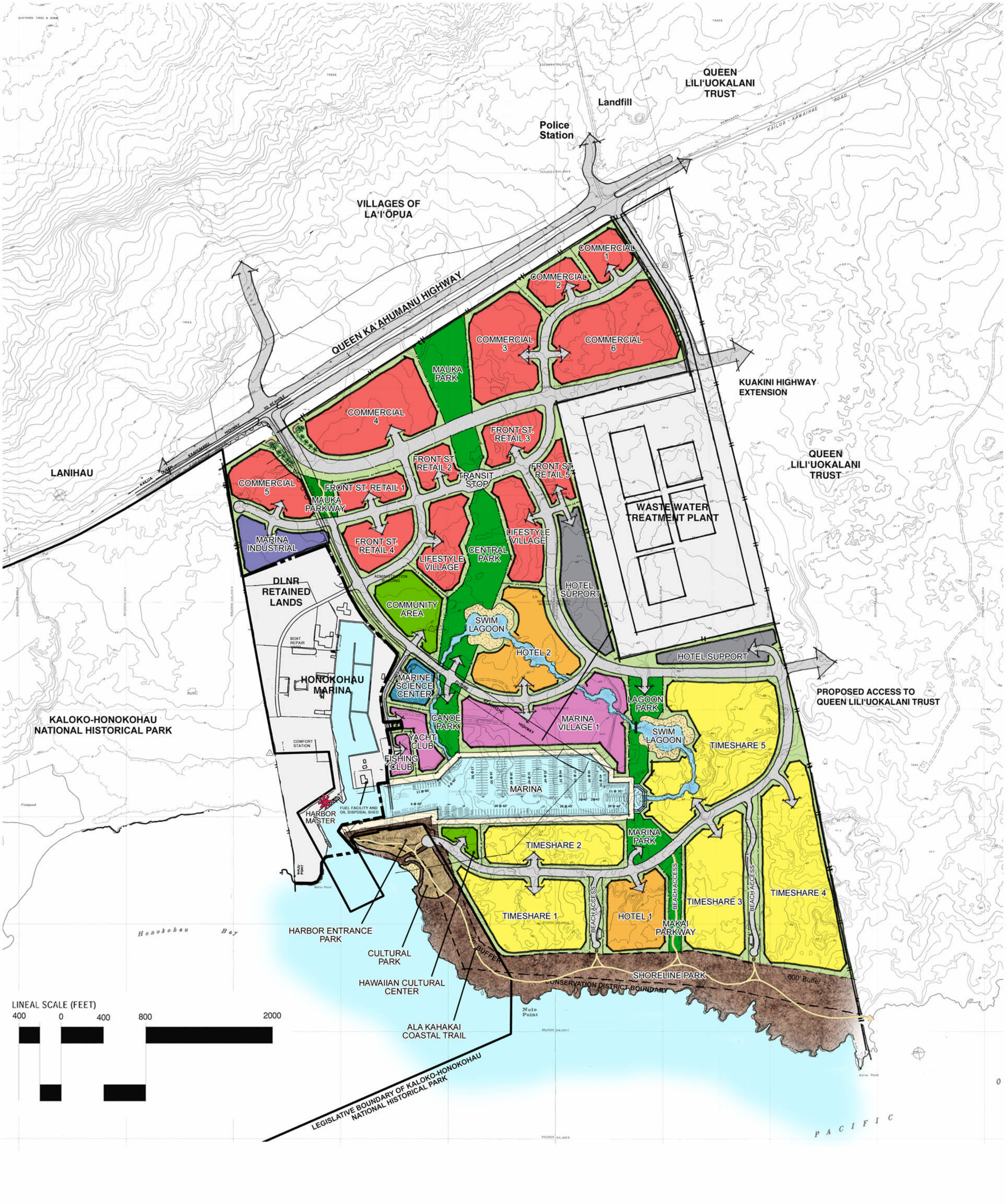
Studies conducted in response to DEIS comments found the construction and operation of an 800-slip marina may significantly impact the water quality within the marina and along the shoreline. Specifically, the Harbor Water Quality Modeling Study, as contained in Appendix U, found that the water circulation in a 45-acre 800-slip harbor was insufficient to maintain an acceptable level of water quality. Further, the existing harbor channel, which would serve both the existing and new harbors, could not adequately serve the increased boat traffic generated by an 800-slip marina during peak traffic. Mitigation measures to accommodate peak boat traffic included the widening of the existing channel, an action that would entail a complex process of Federal and State approvals and encounter significant environmental concern.

Concerns related to the proposed density of hotel and time-share units were also expressed in comments to the DEIS from members of the public, neighbors to the project site, especially the Kaniohale Community Association, and government agencies. Common themes in DEIS comments were related to impacts regarding traffic, project requirements of potable water and infrastructure systems, including sewer, drainage, utility and solid waste systems, and socioeconomic impacts.

In response to the water quality study results, and to the DEIS comments, an alternative plan was developed with a smaller marina with less boat slips, and a related decrease in hotel and time share units. Illustrated in Figure G, Alternative 1 reflects this lesser density project, and features a 400-slip marina encompassing 25 acres. For the purposes of the Alternative 1 analysis, JDI assumed 1,100 time-share units and 400 hotel rooms. Project components include:

- 400 hotel units on 34 acres
- 1,100 time-share units on 106 acres
- 143 acres of commercial uses
- 11 acres of marina support facilities
- 214 acres of parks, roads, open spaces, swim lagoons and community use areas

In addition, Alternative 1 would include the construction of a new intersection of Kealakehe Parkway with Queen Ka‘ahumanu Highway, and the extension of Kealakehe Parkway to join Kuakini Highway to cross the lands of Queen Lili‘uokalani Trust, and connecting with Kuakini Highway in Kailua-Kona. This is a significant off-site infrastructure improvement and is included in the agreements between the State and JDI.



Source: PBR HAWAII

Plan is conceptual only and subject to change

Figure G: Alternative 1: 400-Slip Marina

LEGEND

TIME SHARE	MARINA SUPPORT / COMMERCIAL	UTILITIES
HOTEL	MARINE SCIENCE CENTER	PARKS & GREEN SPACE
RETAIL / COMMERCIAL	COMMUNITY AREA / CULTURAL CENTER	SHORELINE
MARINA RETAIL	SWIM LAGOON	HARBOR ENTRANCE PARK / CULTURAL PARK
	MARINA	

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JDI
JACOBY DEVELOPMENT, INC.

Like the proposed project, Alternative 1 would have a strong ocean orientation, and project components that support this theme would include various water features including seawater lagoons and a marine science center. The new Alternative 1 harbor would include a yacht club, fishing club, a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. The coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use. Additional Alternative 1 community areas would include facilities and space for community use, including programs of the Kona Kai Ola Community Foundation, which supports community programs in health care, culture, education, and employment training for the local community, especially to native Hawaiians. Like the original proposed plan, Alternative 1 includes 40 percent of the land in parks, roads, open spaces, swim lagoons and community use areas.

2.1.2 Alternative 2: Golf Course Feature

Alternative 2 was among the alternatives discussed at a community charrette in September 2003. It includes a golf course, which is a permitted use in the DLNR agreement and DHHL lease. As Figure H illustrates, an 18-hole championship golf course would occupy 222 acres on the southern portion of the project site. As with the proposed project, Alternative 2 includes an 800-slip marina on a minimum of 45 acres.

To support the economic viability of the project, other Alternative 2 uses include:

- Golf course clubhouse on three acres
- 1,570 visitor units on 88 acres fronting the marina
- 118 acres of commercial uses
- 23 acres of community uses

Community uses in Alternative 2 include an amphitheater, a canoe facilities park, a community health center, a Hawaiian cultural center and fishing village, a marine science center and employment training center. The sea water lagoon features contained in the proposed project and Alternative 1 are not included in this alternative.

2.1.3 Alternative 3: No Action

In Alternative 3, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.

~~The economic viability and sustainability of the project is determined by the density and uses proposed. Because JDI is obligated to develop an 800-slip marina for the State, complete road improvements, and provide various public enhancement features at its own expense, the density proposed for the income generating features of the development must be sufficient to provide an acceptable level of economic return for JDI. The market study, which is discussed in Section 4.6, reviewed various development schemes and determined that the currently proposed density and mix is the optimum to meet the anticipated financing and development cost obligations for the public features associated with the development.~~

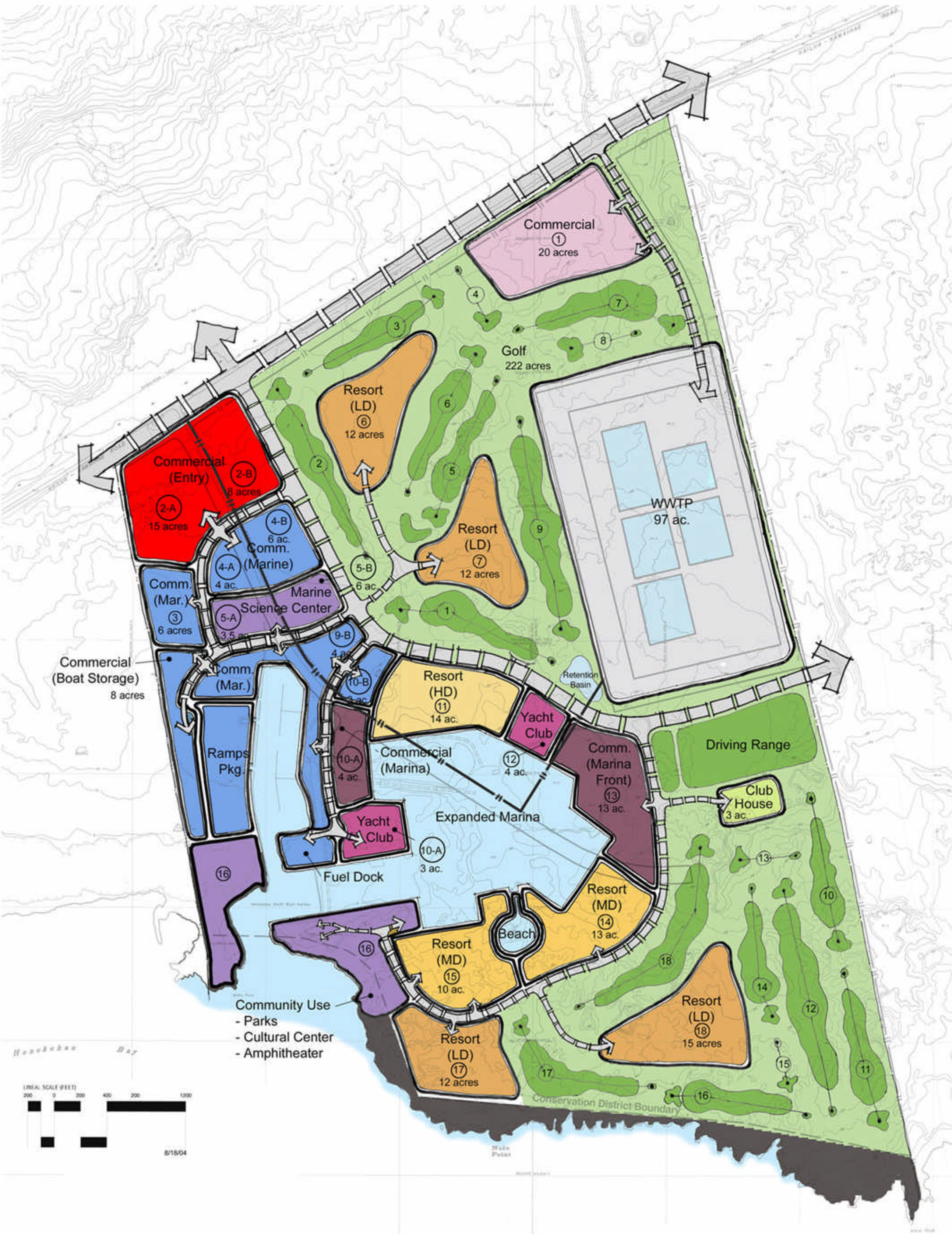

Figure H. Alternative 2: Golf Course Alternative

Legend

N E S W

oceanit

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2.2 Alternatives Analysis

As discussed in Section 2.1, the proposed Kona Kai Ola project (also referred to as "proposed project") is defined by development requirements related for a marina and the related uses that would be needed to generate a reasonable rate of return that covers development costs.

Beginning with Section 2.2.1, the alternative development concepts are comparatively assessed for potential impacts that may reasonably be expected to result from each alternative. Following is an overview of the primary observations of such assessment.

Alternative 1 includes half of the State-required boat slips and 60 percent of the proposed hotel and time-share units and, due to the decreased density, this alternative would generate significantly less environmental and socio-economic impacts. A harbor water quality model found the reduction of the volume of the new marina basin by about half (approximately 25 acres) significantly improved the water circulation and quality. Further, the reduced number of boat slips would generate less boat traffic, thereby reducing congestion and the need to mitigate impacts further by the widening of the existing harbor channel.

A project with fewer hotel and time-share units and increased commercial space with a longer (14 years) absorption period would change the mix of employment offered by the project, and slightly increase the overall employment count. The public costs/benefits associated with Alternative 1 would change, compared to the proposed project, with a general increase in tax collections, and a general decrease in per capita costs. Detailed discussion of Alternative 1 potential economic impacts are provided in Section 4.6.6. Comparisons of levels of impact are presented throughout this FEIS.

While this analysis might indicate that the 25-acre marina in Alternative 1 would be the more prudent choice, the DLNR agreement establishes the minimum size and slip capacity of the marina at 45 acres and 800 slips, respectively. Amendments to the DLNR agreement would be required in order to allow Alternative 1 to proceed as the preferred alternative. Hence, selection of the preferred alternative is an unresolved issue at the writing of this FEIS.

Alternative 2, the golf course alternative, was not previously considered to be the preferred alternative primarily because market conditions at the time of project development might not likely support another golf course. Further, DHHL has a strategy goal to have more revenue-generating activities on the commercial lease lands within the project area. In addition, concerns have been expressed as to environmental impacts of coastal golf courses, including the potential adverse impact on Kona's water supply if potable water is used for golf course irrigation.

While Alternative 3, the no-project alternative, would not generate adverse impacts related to development of these lands associated with the construction and long-term operations, it would also not allow for an expanded public marina that would meet public need and generate income for the public sector. Further, the no-project alternative would foreclose the opportunity to create a master-planned State-initiated development that would result in increased tax revenue, recreation options and community facilities. Crucial privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities, and public access would not be contributed.

~~Hence, the only valid alternative to the proposed project is the no-action alternative. In this alternative, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.~~

~~The no-project alternative would therefore not generate adverse impacts associated with the construction and long-term operations would not occur.~~

~~Likewise, the creation of a master-planned state-initiated development, resulting in increased employment, tax revenue, recreation options and community facilities, would not be created. Privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities and public access would not be contributed.~~

Further, the creation of revenue-producing businesses on the DHHL property to fund homestead programs would not occur, resulting in fewer potential benefits for Hawaiians.

Hence, the agreements and leases between the State and JDI indicate that the no-action alternative is not in the public interest~~has been rejected at this time~~.

2.2.1 Impact Comparison

Grading and Excavation

The proposed project requires grading and excavation. Both actions may impact groundwater due to rainfall runoff during construction. Alternative 1 would require a significantly smaller excavation for the marina basin and would therefore carry a lesser risk of potential adverse effects on water quality. Alternative 2 would require the same basin excavation as the proposed project, and would also include extensive grading and filling to build the golf course, the latter of which would generate additional impacts. Alternative 3 would result in no change to the geography, topography and geology.

Further discussion on grading and excavation is contained in Section 3.3.

Natural Drainage

Most precipitation infiltrates into the porous ground at the site, and no significant sheet flow is likely. Alternative 1 would generate similar levels of impacts on natural drainage as those of the proposed project and thus require similar mitigation measures. The golf course in Alternative 2 would not be as porous since the site would be graded, soil would be placed, and grass and other landscaping would be grown. Sheet flow and runoff can occur on a golf course, and drainage patterns might change. Alternative 3 would result in no change to the existing natural drainage pattern. Further discussion on natural drainage is contained in Section 3.4.

Air Quality

Air quality will be affected by construction activities, as well as pollutants from vehicular, industrial, natural, and agricultural sources. Alternative 1 would generate less construction air quality impacts than the proposed project due to the reduced amount of intensive groundwork associated with the smaller marina basin and fewer long-term impacts by reducing traffic 35 and 40 percent during, respectively, AM and PM peak traffic times. Construction of Alternative 2 would result in fugitive dust and exhaust from equipment and is expected to generate the same level of air quality impact as the proposed project. Alternative 3 would result in no change to existing air quality. Further discussion on air quality is contained in Section 3.5.

Terrestrial Environment

To provide additional habitat for shorebirds and some visiting seabirds, the project proposes to construct a brackishwater pond area suitable for avian fauna, including stilts, coots and ducks. While habitat expansion is beneficial, there is also a possibility that these species may be exposed to activity that may harm them. Alternative 1 would not include a brackish water pond, but will include 5 acres of seawater features, which is 74 percent less than the 19 acres of seawater features in the proposed project. While this would reduce beneficial impacts, it would also decrease exposure to potentially harmful activity. Alternative 2 does not include the brackish water pond features, but would include drainage retention basins that would attract avian fauna and expose them to chemicals used to maintain golf course landscaping. While Alternative 3 would result in no increase in potentially harmful activity, it would also not provide additional habitat for avian fauna. Further discussion on the terrestrial environment is contained in Section 3.7.

Groundwater

Groundwater at the project site occurs as a thin basal brackish water lens. It is influenced by tides and varies in flow direction and salt content. The existing Honokōhau Harbor acts as a drainage point for local groundwater. Any impact to groundwater flow from the proposed harbor is likely to be localized. The proposed marina basin will not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance.

There will be differences in the flow to the marina entrance between the proposed project and Alternative 1. Alternative 1, being smaller in size, will have less impact on groundwater flow than the proposed marina. Alternative 2 will have a similar impact to groundwater quality as the proposed project. Alternative 2 may also impact water quality by contributing nutrients and biocides to the groundwater from the golf course. Alternative 3 would result in no change in existing groundwater conditions. Further discussion on groundwater is contained in Section 3.8.1.

Surface Water

There are no significant natural freshwater streams or ponds at the site, but there are brackish anchialine pools. Surface water at the project site will be influenced by rainfall. Runoff typically percolates rapidly through the permeable ground. The proposed project will include some impermeable surfaces, which together with building roofs, will change runoff and seepage patterns.

Alternative 1 is a lower density project that is expected to have proportionally less impact on surface water and runoff patterns and less potential impact on water quality than the proposed project. Alternative 2 would have more impact on surface water quality than the proposed project due to fertilizers and biocides carried by runoff from the golf course. Alternative 3 would result in no change to surface water conditions. Further discussion on surface water is contained in Section 3.8.2.

Nearshore Environment and Coastal Waters

The potential adverse impacts to the marine environment from the proposed project are due to the construction of an 800-slip marina and the resulting inflow of higher salinity seawater and inadequate water circulation, both of which are anticipated to impair water quality to the extent of falling below applicable standards. One possible mitigation measure is to significantly reduce the size of the marina expansion.

The reduced marina size (from 45 to 25 acres) and reduced lagoon acreage in Alternative 1 are expected to result in a proportionate reduction in seawater discharging into the new harbor and increased water circulation. Alternative 2 includes the same marina basin size and is therefore subject to the same factors that are expected to adversely affect water quality.

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water quality in the proposed harbor depends on several components. These include salinity, nutrients, and sediments that come from the ocean, rainfall runoff, water features with marine animals, and dust. The smaller project offered as Alternative 1 is expected to produce a reduced amount of pollutants and reduce the risk of adverse impact upon water quality.

It is notable that the 45-acre marina basin planned in the proposed project and Alternative 2 only becomes viable from a water quality impact standpoint if the additional brackish groundwater inflow into the new marina exceeds 60 mgd. The resulting flushing from such inflow would be expected to better maintain water quality. However, it is unclear whether 60 mgd of brackish groundwater would be available. As proposed in Alternative 1, reduction of the volume of the new marina basin by 45 percent will significantly improve the flushing and water quality because the lower volume can be flushed by the available groundwater flow.

In addition, there could be higher rainfall runoff from the Alternative 2 golf course into the harbor, because the grassed golf course will be less porous than the natural surface. The golf course will also require relatively high levels of fertilizer, biocides, and irrigation, all of which could contribute to adverse water quality impacts.

Further discussion on nearshore environment and coastal waters is contained in Section 3.9.1.

Anchialine Pools

Anchialine pools are located north of Honokōhau Harbor, and south of the harbor on the project site. The marine life in these pools is sensitive to groundwater quality, and changes due to construction and operation of the project could degrade the viability of the pool ecosystem. In the southern complex, 3 anchialine pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction in the proposed project and Alternatives 1 and 2.

Predicting the extent of change in groundwater flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is therefore extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Due to the uncertainty of changes in groundwater flow and quality due to marina construction, the variability in impacts between the proposed project and Alternatives 1 and 2 is unknown at this time. Alternative 3 would result in no change in groundwater flow. While this would eliminate the potential for adverse impacts, Alternative 3 would also continue the pattern of existing degradation related to human activity and the introduction of alien species. Further discussion on anchialine pools is contained in Section 3.9.2.

Marine Fishing Impacts

The proposed marina will increase the number of boats in the area and it is reasonable to assume that a portion of these new boats will engage in fishing activities. The increase in boats in the area would be primarily related to the marlin and tuna / pelagic fishery, coral reefs due to extractive fisheries, and SCUBA activities. The pressure on fish and invertebrate stocks is expected to increase with or without the marina. Harbor expansion provides the opportunity to address existing conditions to consolidate, focus, and fund management and enforcement activities at one location.

Compared to the proposed project, Alternative 1 would result in a 21 percent decrease in boat traffic, thereby lessening the potential for marine fishing impacts. The level of impacts in Alternative 2 would be similar to that of the proposed project. Alternative 3 would result in no change in existing marine fishing conditions, and no opportunity to address already existing pressure on fish and invertebrate stocks. Further discussion on marine fishing impacts is contained in Section 3.9.3.

Cultural and Archaeological Resources

The proposed project will integrate cultural and archaeological resources in the overall development. Archaeological sites recommended for preservation will be preserved, and cultural practices will be encouraged. Kona Kai Ola includes a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. Proposed is a 400-foot shoreline setback that would serve as a buffer between the ocean and developed areas. This coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use.

Alternative 1 would contain all of the cultural archaeological features and the shoreline setback area would be 400 feet in the northern portion of the site and increase to 600 feet in the southern portion. Alternative 2 would preserve cultural and archaeological resources, but does not include a 400-foot shoreline setback. Alternative 3 would result in no change to existing cultural and archaeological resources and no addition of cultural and community facilities and activities. Further discussion on cultural and archaeological resources is contained in, respectively, Sections 4.1 and 4.2.

Noise

Project-generated noise is due to construction equipment and blasting, boats, marina activities, vehicle traffic, and the Kealakehe Wastewater Treatment Plant operations. Alternative 1 would generate less noise impacts due to reduced construction activities, fewer boats, less traffic and less on-site activity. Alternative 2 would also generate less noise due to reduced traffic and less on-site activity, but noise related to the excavation of the marina basin and an increase in the number of boats would be similar to that of the proposed project. Further discussion on noise impacts is presented in Section 4.4.

Socioeconomic Impacts

The proposed project will generate an increase in de facto population of an estimated 5,321 persons due to the increase in hotel and time-share units. The estimated de facto population increase in Alternative 1 is 37 percent less, at 3,363 persons, than the proposed project. The de facto population increase in Alternative 2 is similar to Alternative 1.

Employment in the commercial components will nearly double in Alternative 1, from a stabilized level of 1,429 full-time equivalent (FTE) positions in the proposed project to 2,740 in the Alternative 1.

Under Alternative 1, the total operating economic activity at Kona Kai Ola will increase due to the added commercial space more than off-setting the fewer visitor units, moving upward from $557.6 million per year to circa $814.3 million annually. The total base economic impact resulting from development and operation of Alternative 1 will similarly be higher by between 35 and 45 percent than that of the proposed project.

Alternative 1, which has a reduced marina size of 25 acres, and fewer hotel and time-share units, would have a meaningful market standing, create significant economic opportunities, and provide a net benefit to State and County revenues. From a market perspective, a smaller Kona Kai Ola would still be the only mixed use community in the Keahole to Kailua-Kona Corridor offering competitive hotel and time-share product.

The estimated absorption periods for marketable components of Alternative 1 are generally shorter than those for the same components in the proposed project. Marina slips under Alternative 1 are estimated to be absorbed within 2 years after groundbreaking, as compared with 9 years for absorption of slips in the proposed project. Hotel rooms under Alternative 1 are estimated to be absorbed within 4 years after groundbreaking, as compared with 7 years under the proposed project. Time-share units would be absorbed within 10 years under Alternative 1, while 15 years are projected under the proposed project. Due to the planned increase in commercial facilities under Alternative 1, the absorption period of commercial space is estimated at 14 years, as compared with 8 years for absorption of such facilities under the proposed project.

The State and County will still both receive a net benefit (tax receipts relative to public expenditures) annually on a stabilized basis under the Alternative 1. The County net benefits will be some $12.2 million per year under the Alternative 1 versus $14.9 million under the proposed project. The State net benefits will increase under the Alternative 1 to about $37.5 million annually, up substantially from the $11.4 million in the proposed project.

Due to the lower de facto population at build-out, the effective stabilized public costs for both the State and County will decline meaningfully under the Alternative 1, dropping from $7.7 million annually for the County and $36.5 million for the State, to $4.9 million and $23 million per year, respectively.

Alternative 3 would result in no increase in de facto population and improvement to economic conditions. Further discussion on social and economic impacts are contained in, respectively, Sections 4.5 and 4.6.

Vehicular Traffic

The proposed project will impact the nearby road network that currently is congested during peak traffic times. The proposed project includes roadway improvements that would reduce the impact and improve roadway conditions for the regional community.

Alternative 1 includes the same roadway system improvements as the proposed project, yet would reduce vehicular traffic by 35 percent when compared to the proposed project. Alternative 2 would have similar traffic conditions and roadway improvements as Alternative 1. Alternative 3 would result in no increase in traffic and no roadway improvements.

Marina Traffic Study

The increase in boat traffic due to the proposed 800-slip marina would cause entrance channel congestion during varying combinations of existing and new marina peak traffic flow. Worst case conditions of active sport fishing weekend and summer holiday recreational traffic result in traffic volumes exceeding capacity over a short afternoon period. Mitigation to address boat traffic in the proposed project include widening the entrance channel, traffic control, implementation of a permanent traffic control tower, or limiting vessel size.

Alternative 1 would result in a 21 percent reduction in boat traffic congestion under average existing conditions and ten percent reduction during peak existing conditions. The reduction to 400 slips also reduces the impacts of congestion at the entrance channel, thereby reducing the need for any modifications to the entrance channel.

Alternative 2 would have the same level of boat traffic as the proposed project. Alternative 3 would not meet the demand for additional boat slips and would not generate additional boat traffic. Further discussion on marina traffic is contained in Section 4.8.

Police, Fire and Medical Services

The proposed project will impact police, fire and medical services due to an increase in de facto population and increased on-site activity. Alternatives 1 and 2 would have similar levels of impact as the proposed project due to increased on-site activity. Further discussion on police, fire and medical services are contained, respectively, in Sections 4.10.1, 4.10.2 and 4.10.3.

Drainage and Storm Water Facilities

The proposed project will increase drainage flows, quantities, velocities, erosion, and sediment runoff.

Alternative 1 involves a reduction of the project density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces associated with hotel and time-share development and to the creation of more open space. However, roadway areas will increase by about 30 percent in Alternative 1. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings. The golf course in Alternative 2 may also change drainage characteristics from those of the proposed project and may not reduce impacts. Alternative 3 would result in no change in existing conditions and no improvements to drainage infrastructure. Further discussion on drainage and storm water facilities is contained in Section 4.10.5

Wastewater Facilities

The proposed development is located within the service area of the Kealakehe WWTP and a sewer system will be installed that connects to the WWTP. The sewer system will be comprised of a network of gravity sewers, force mains, and pumping stations which collect and convey wastewater to the existing Kealakehe WWTP. Project improvements will incorporate the usage of recycled / R1 water. Improvements implemented by the proposed project will also accommodate the needs of the regional service population.

Alternative 1 would generate approximately 10 percent less wastewater flow than the proposed project. Wastewater flow in Alternative 2 is undetermined. Alternative 3 would result in no additional flow, as well as no improvements that will benefit the regional community. Further discussion on wastewater facilities is contained in Section 4.10.6.

Potable Water Facilities

The proposed project average daily water demand is estimated at 1.76 million gallons per day. Existing County sources are not adequate to meet this demand and source development is required. The developer is working with DLNR and two wells have been identified that will produce a sustainable yield that will serve the project. These wells will also serve water needs beyond the project.

Alternative 1 would result in net decrease of about five percent of potable water demand. Alternative 2 may have a lower water demand than the proposed project as long as potable water is not used for irrigation. Alternative 3 would result in no additional flow, as well as no source development that will benefit the regional community. Further discussion on potable water facilities is contained in Section 4.10.8.

Energy and Communications

Regarding Alternative 1, preliminary estimates for electrical, telecommunications, and cable resulted in a net demand load that remains similar to the proposed project. Further discussion on energy and communications is contained in Section 4.10.9.1.

The proposed project will increase the demand for electrical energy and telecommunications. The demand would be reduced in Alternative 1 because the number of boat slips and units would decrease. Similarly, Alternative 2 would have fewer units than the proposed project and therefore reduce energy demands. Further reduction in energy demand for either alternative could be achieved by using seawater air conditioning (SWAC) and other energy reduction measures, as planned by the developer. Further discussion on energy and telecommunications is contained in Section 4.10.9.2.

Water Features and Lagoons

The proposed project includes a brackishwater pond, lagoons, and marine life exhibits supplied by clean seawater. The water features in Alternative 1 would significantly decrease by 74 percent from 19 acres in the proposed project to five acres in Alternative 1. This decrease in water features would result in a corresponding decrease in water source requirements and seawater discharge. Alternative 2 does not include the seawater features. Alternative 3 would result in no additional demand for water source requirements and seawater discharge.

2.2.2 Conformance with Public Plans and Policies

State of Hawai‘i

Chapter 343, Hawai‘i Revised Statutes

Compliance with this chapter is effected, as described in Section 5.1.1 in regard to the proposed project and the alternatives discussed.

- State Land Use Law, Chapter 205, Hawai‘i Revised Statutes

  The discussion in Section 5.1.2 is directly applicable to Alternative 1, the proposed project. Alternative 1 will involve a setback of 400 feet that increases to 600 feet along the southern portion of the project site’s shoreline area. Alternative 2 does not provide for such a setback, but may still require approvals from DLNR for cultural, recreational, and community uses and structures within the Conservation district.

- Coastal Zone Management Program, Chapter 205A, Hawai‘i Revised Statutes

  Recreational Resources:

  In addition to the discussion of consistency with the associated objective and policies, as described in Section 5.1.3, the reduction from the proposed project’s 800-slip marina to a 400-slip marina under Alternative 1 will still expand the region’s boating opportunities and support facilities. The existing harbor entrance will still be utilized under this alternative; however, potential risks relating to boat traffic and congestion in the marina entrance area will be reduced significantly. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities, and marine science center remain important recreational components under Alternative 1.

Alternative 2 includes a golf course component, which would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Alternative 2, like the proposed project, will expand the region's boating opportunities and support facilities through its 800-slip marina. However, the potential adverse impacts of increased boat traffic from the size of the marina are significant enough to offset the benefits of increased boating opportunities.

Coastal Ecosystems:

The discussion in Section 5.1.3 is directly applicable to Alternative 1.

Alternative 1 not only reduces the number of slips proposed by 50 percent, but it also reduces the size of the marina from 45 acres to 25 acres. The 25-acre marina will increase the body of water within the existing harbor, but to a significantly lesser extent than the proposed project's estimated increase, which is also applicable to the 45-acre size that is proposed for the marina under Alternative 2.

The findings of the Harbor Water Quality Modeling Study conclude that a reduction in the size of the harbor expansion is an alternative that will mitigate the risk of significant impacts upon water quality within the marina and existing harbor. Accordingly, the reduction in both the number of slips and the size of the marina basin under Alternative 1, in combination with proper facilities design, public education, and enforcement of harbor rules and regulations, would result in fewer long-term impacts to water quality and coastal ecosystems. Short-term (construction-related) impacts would likely remain the same although the reduction in the total acreage of excavation is expected to result in a shorter duration of such impacts.

In addition to its 800-slip marina and potential adverse impacts upon water quality and the marine environment, Alternative 2 includes a golf course component, which has the potential to impact coastal ecosystems by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Economic Uses

Although reduced in the number of slips, the smaller marina under Alternative 1 will nevertheless serve public demand for more boating facilities in West Hawai'i and is consistent with the objective and policies and discussion set forth in Section 5.1.3. The economic impacts of Alternative 2, while comparable to those of the proposed project's marina development, are notably marginal as to the golf course component, based on the marketability analysis that indicates a condition of saturation within the region.

Coastal Hazards

The discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Tsunami risks mainly affect the large shoreline setback area that is proposed for the project and Alternative 1. Alternative 2 projects a transient accommodation site that is partially within the tsunami hazard zone and thus carries a higher hazard risk. However, the essential requirement for these alternatives, as well as the proposed project, is a well-prepared and properly implemented evacuation plan.

Beach Protection

Discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Alternative 1 and, to a lesser extent, Alternative 2, will retain the shoreline area in its natural condition.

Similar to the proposed project, Alternative 1 provides for a shoreline setback of considerable width within which no structure, except for possible culturally-related structures, would be allowed. Alternatives 1 and 2 will thus be designed to avoid erosion of structures and minimize interference with natural shoreline processes.

Marine Resources

The discussion in Section 5.1.3 is also applicable to Alternative 1 which is described to be an alternative that is specifically projected to mitigate anticipated adverse impacts on water quality and the marine environment that might otherwise result from the original harbor design and scale, which is also incorporated in Alternative 2 . The reduced marina size under Alternative 1 is projected to meet water quality standards and enable greater compliance with the objective and policies addressed in this section.

Alternative 2 includes a golf course component and thus the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Hawai'i State Plans, Chapter 226, Hawai'i Revised Statutes

Section 226-4 (State goals), 5 (Objectives and policies for population, and 6 (Objective and policies for economy in general):

The discussion in Section 5.1.4 is applicable to Alternatives 1 and 2, in addition to the proposed project. These development concepts generally conform to the goals, objectives, and policies set forth in these sections because they will provide some degree of economic viability, stability, and sustainability for future generations. Kona Kai Ola will convert essentially vacant land into a mixed-use development with a distinctive marina and boating element, providing a wide range of recreational, business, and employment opportunities to the community.

Section 226-8 Objective and policies for the economy – the visitor industry:

Alternatives 1 and 2 will be consistent with the State's economic objective and policies relating to the tourism industry for the same reasons that are discussed in regard to the proposed project in Section 5.1.4. They will incorporate JDI's commitment to sustainability principles in the planning and design of the development concepts in Alternatives 1 and 2. Although the total hotel and time-share unit count is reduced to approximately 1,500 in Alternatives 1 and 2, the transient accommodations component of these alternatives will still further the State's objective and policies for increased visitor industry employment opportunities and training, foster better visitor understanding of Hawai'i's cultural values, and contribute to the synergism of this mixed-use project concept that addresses the needs of the neighboring community, as well as the visitor industry.

Section 226-11 Objectives and policies for the physical environment: land-based, shoreline and marine resources:

Alternative 1 is expected to involve less potential adverse impacts upon these environmental resources than the proposed project. Likewise, and Alternative 2 would have less adverse impact because of its reduction in the size of the marina and in the total hotel and time-share unit count. Alternative 1 carries less potential risk to water quality and related impacts upon the marine environment and anchialine pool ecosystems. Although approximately three anchialine pools are expected to be destroyed, the great majority of pools will be preserved within and outside of the proposed 400-foot shoreline setback.

The golf course component in Alternative 2 has the potential to impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the marina basin and nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools by introducing the chemicals into the pond systems.

Section 226-12 Objective and policies for the physical environment: scenic, natural beauty, and historic resources:

The discussion in Section 5.1.4 is directly applicable to Alternative 1 and describes the compliance with the objective and policies addressed.

The golf course component of Alternative 2 would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area.

Just as with the proposed project, Alternatives 1 and 2 would also be designed to blend with the natural terrain and to honor and protect the cultural history, resources, and practices of these lands.

Section 226-13 Objectives and policies for the physical environment: land, air and water quality:

As stated above, because of the reduction in both the number of slips and the size of the marina basin, with proper facilities design, public education and enforcement of harbor rules and regulations, Alternative 1 is anticipated to cause fewer long-term impacts to water quality than either the proposed project or Alternative 2. Based on the findings of the Harbor Water Quality Modeling Study, water quality resulting from a reduced marina basin size as proposed under Alternative 1 is expected to be similar to existing conditions.

As previously noted, Alternative 2 has the potential to adversely impact water quality by increasing the nutrient loading in surface runoff and groundwater by introducing pesticides, herbicides and other chemicals common in golf course development and maintenance into the marina basin and nearshore waters surrounding the project site.

Section 226-14 Objectives and policies for facility systems - general:

Alternatives 1 and 2 will conform to the objective and policies of this section on the grounds that are discussed in regard to the proposed project in Section 5.1.4. The master-planning and phasing of the project concepts under these alternatives will be coordinated with associated public and private infrastructural planning and related private and public infrastructural financing. The cost of the marina construction and project-related infrastructure is to be borne by the developer, resulting in considerable savings for the public. In addition, the projected lease revenue from these public lands will provide additional public benefits by establishing a revenue stream for capital improvements and maintenance of a range of State facilities.

Section 226-15 Objectives and policies for facility systems - solid and liquid wastes:

In addition to the developer's commitment to sustainable development design, the project will involve upgrades to the County of Hawaiʻi's Kealakehe Wastewater Treatment Plant to meet current needs, as well as the project's future needs. This commitment is applicable to Alternatives 1 and 2, as well as the proposed project that is discussed in Section 5.1.4.

Section 226-16 Objectives and policies for facility systems – water:

The discussion of water conservation methods and the need to secure additional potable water sources in Section 5.1.4 is also applicable to Alternative 1 and demonstrates conformity to the objective and policies for water facilities. Alternative 2 involves greater irrigation demands in regard to its golf course component and greater potable water demands for human consumption than those for Alternative 1. Alternative 2 is expected to face more serious challenges in securing adequate and reliable sources of water.

Section 229-17 Objectives and policies for facility systems – transportation:

Alternatives 1 and 2 will conform to this objective and policies because they will present water transportation opportunities, including the possible use of transit water shuttles to Kailua-Kona, as described in regard to the proposed project in Section 5.1.4.

Section 226-18 Objectives and policies for facility systems – energy:

Alternatives 1 and 2 conform to these objective and policies through the use of energy efficient design and technology and commitment to the use and production of renewable energy to serve the project's needs. Solar energy production, solar hot water heating, and the use of deep cold seawater for cooling systems are currently identified as means of saving substantial electrical energy costs for the community and the developer.

Section 226-23 Objectives and policies for socio-cultural advancement – leisure:

Alternative 1 conforms to this objective and related policies for the reasons offered in Section 5.1.4 in regard to the proposed project. Alternative 1 will be of greater conformity with the policy regarding access to significant natural and cultural resources in light of the 400-600 foot shoreline setback that has been designed for this alternative.

Although it does not propose the considerable shoreline setback that is planned for Alternative 1, Alternative 2 is consistent with this objective and related policies in incorporating opportunities for shoreline-oriented activities, such as the walking trails. In addition, the golf course component adds a more passive recreation alternative to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Section 226-25 Objectives and policies for socio-cultural advancement-culture:

The discussion in Section 5.1.4 is relevant to Alternatives 1 and 2 and demonstrate their conformity the objective and policies of this section.

Both alternatives involve the preservation and protection of cultural features that have been identified by the Cultural Impact Assessment and archaeological studies for the project area. Both provide for public shoreline access, and both will continue the policy of close consultation with the local Hawaiian community and cultural and lineal descendants in the planning of cultural resource preservation and protection.

Section 226-103 Economic priority guidelines:

Alternatives 1 and 2 conform to these guidelines for the same reasons that are set forth in Section 5.1.4. They involve private investment in a public project that will create economic diversification through a mix of marina, industrial, commercial, visitor, and cultural facilities. This presents a wide range of entrepreneurial opportunities, long-term employment opportunities, and job training opportunities.

Section 226-104 Population growth and land resources priority guidelines:

As described in Section 5.1.4, the policy support for the proposed project also extends to the similar development concepts considered in Alternatives 1 and 2. Those alternatives conform to the guidelines of this section because they involve an urban development under parameters and within geographical bounds that are supported by the County's General Plan, a preliminary form of the Kona Community Development Plan, the County's Keahole to Kailua Regional Development Plan, and the reality of being located along the primary commercial/industrial corridor between Keahole Airport and Kailua-Kona. As with the proposed project, the development concepts of Alternatives 1 and 2 are essentially alternatives for the implementation and "in-filling" of the urban expansion area in North Kona.

DHHL Hawai'i Island Plan

This 2002 plan projects DHHL's Honokōhau makai lands for commercial use. As compared to the proposed project and Alternative 2, Alternative 1 presents an expanded commercial component that provides greater compliance with the plan, while addressing certain beneficiaries' concerns about the scale of the marina originally required in the Project. Alternative 2 also conforms to the recommended commercial uses in the makai lands but to a lesser degree than Alternative 1 because of its more limited commercial component. Like the proposed project, its marina size and number of slips raise environmental issues, as more specifically discussed in Part 3, and community concerns.

County of Hawai'i General Plan

HCGP Section 4 – Environmental Quality Goals, Policies and Courses of Action:

Alternative 1 is consistent with this section. It presents a reduction in both the number of slips and the size of the marina basin that, in combination with proper facilities design, public education and enforcement of harbor rules and regulations, would result in very few long term impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions.

Alternative 2 is the least consistent with this section. In addition to the potential significant impacts of its 800 slip marina basin, its golf course component has the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides and other chemicals common in golf course use and management into the nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools beyond their current conditions by introducing such substances into the pool systems.

HCGP Section 7 – Natural Beauty Goals and Policies:

Alternative 2 conforms to some degree with this section. Its golf course component would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area, as demonstrated in other makai golf courses within the region.

HCGP Section 8 – Natural Resources and Shoreline:

Alternative 1 is most consistent with the goals and policies of this section. It would require considerably less marina excavation than the proposed project and Alternative 2 and would reduce the potential risk of long-term adverse impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions with the degree of reduction in marina basin size that is proposed under Alternative 1. This reduction is also expected to reduce potential impacts upon anchialine pools and their ecosytems, as well as shoreline and marine resources that are affected by water quality. Alternative 1 also retains the shoreline preservation and protection concepts that are proposed in and described for the Project.

HCGP Section 10 – Public Facilities Goals and Policies:

The discussion in Section 5.2.1. in relation to the proposed project is applicable to Alternatives 1 and 2. Improvements to public facilities are are integral to the Kona Kai Ola development. The provision of additional boat slips and numerous road improvements, including a makai extension of Kuakini Highway south to Kailua-Kona are incorporated into plans for the project's development. In light of these elements, Alternatives 1 and 2 are consistent with the goals and policies of this section.

HCGP Section 11 – Public Utility Goals, Policies:

As with the proposed project, Alternatives 1 and 2 are consistent with the goals and policies of this section, based on the relevant grounds set forth in Section 5.2.1. The developer is committed to design, fund, and develop environmentally sensitive and energy efficient utility systems to the extent possible, as described previously in Part 5. Its master planning provides for the coordinated development of such systems with the objective of achieving significant savings for the public. As previously-mentioned example, the project development involves the upgrading of the Kealakehe Wastewater Treatment Plant.

HCGP Section 12 – Recreation:

Alternative 1 is consistent with the goals, policies, and courses of action for North Kona in this section.

Although the number of slips is reduced under Alternative 1, the region's boating opportunities and support facilities will still be expanded. The existing marina entrance would still be utilized under this alternative. However, concerns relating to increased activity leading to increased congestion in the marina entrance area would be mitigated to a certain extent. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities and marine science center remain important components of Alternative 1.

The golf course component of Alternative 2 would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola. Alternative 2 is also considered to be consistent with this section.

HCGP Section 13 and 13.2 – Transportation:

The reduced marina component under Alternative 1 will still provide transportation opportunities and provide for possible use of transit water shuttles to Kailua-Kona, although to a lesser degree than under the proposed project and Alternative 2 . However, in each scenario, internal people-movers are planned, and numerous roadway improvements are planned for coordination with public agencies, including but not limited to the construction of the Kuakini Highway extension between Honokōhau and Kailua-Kona. Accordingly, both Alternatives 1 and 2 are consistent with the goals, policies, and courses of action for North Kona under these sections of the General Plan.

HCGP Section 14.3 – Commercial Development:

For the reasons presented in the discussion under Section 226-104 of the State Plan, the planned commercial component under Alternatives 1 and 2 are consistent with this section.

HCGP Section 14.8 – Open Space:

Alternatives 1 and 2 are consistent with the goals and policies of this section. Alternative 1 provides a considerable (400-600 foot) shoreline setback along the entire ocean frontage of the project site as a means of protecting the area's scenic and open space resources, as well as natural and cultural resources. Although it does not incorporate the shoreline setback planned in Alternative 1, Alternative 2 provides a golf course component would contribute to the amount of open space that is currently proposed and allow additional view corridors to be created.

Community Development Plans

Community development plans are being formulated for different regions in the County in order to supplement the County's General Plan. The Kona Kai Ola project is located in the Kona Community Development Plan (CDP) area. Maps associated with the preliminary work phases

of the Kona CDP include the Kona Kai Ola project site within the "Preferred Urban Growth" boundary of the North Kona district. The Kona CDP process is guided by a Steering Committee composed of a broad cross-section of the community. The Steering Committee will eventually complete its work and recommend the CDP's adoption.

After the DEIS was published, the Kona CDP has progressed to the development of plans for the major urban growth corridor north of Kailua-Kona. The Kona CDP has produced a draft plan showing a transit oriented development that includes a midlevel public transit corridor along the mauka residential elevation, and a makai transit corridor that runs along a proposed new frontage road just makai and parallel to Queen Kaahumanu Highway. The development plan for Alternative 1 includes the Kuakini Highway as part of this proposed frontage road and transit line from Kailua Kona to the Kealakehe area, along with a transit stop at Kona Kai Ola. The Alternative 1 plan also includes a road that could be extended to be part of the proposed frontage road should it be approved and implemented. In addition, the Kona CDP has continued to emphasize the principles of smart growth planning with mixed use urban areas where people can live, work, play and learn in the same region. Kona Kai Ola has been specifically designed to be consistent with this policy in order to provide a stable employment base close to where people live in the mauka residential areas already planned for DHHL and HHFDC lands.

It should be noted that currently and over the years, the 1990 Keāhole to Kailua Development Plan (K-to-K Plan) guides land use actions by the public and private sectors. It is intended to carry out the General Plan goals and policies related to the development of the portion of North Kona area, including the Kona Kai Ola site. The "Preferred Growth Plan" of the Keāhole to Kailua Development Plan identifies the project site as a new regional urban center to include commercial, civic, and financial business related uses, an expanded "Harbor Complex," a shoreline road, and a shoreline park. The proposed project and the development concepts in Alternatives 1 and 2 are therefore consistent with the recommendations in the Keāhole to Kailua Development Plan.

Hawai'i County Zoning

As shown on Figure AA, the project site is zoned "Open". Under Section 25-5-160 of the Hawai'i County Code, "The O (Open) district applies to areas that contribute to the general welfare, the full enjoyment, or the economic well-being of open land type use which has been established, or is proposed. The object of this district is to encourage development around it such as a golf course and park, and to protect investments which have been or shall be made in reliance upon the retention of such open type use, to buffer an otherwise incompatible land use or district, to preserve a valuable scenic vista or an area of special historical significance, or to protect and preserve submerged land, fishing ponds, and lakes (natural or artificial tide lands)".

Some of the proposed uses at Kona Kai Ola are permitted uses in the Open zone such as:

- Heiau, historical areas, structures, and monuments;
- Natural features, phenomena, and vistas as tourist attractions;
- Private recreational uses involving no aboveground structure except dressing rooms and comfort stations;

- Public parks;
- Public uses and structures, as permitted under Section 25-4-11.

In addition to those uses permitted outright, the following uses are permitted after issuance of a use permit:

- Yacht harbors and boating facilities; provided that the use, in its entirety, is compatible with the stated purpose of the O district.
- Uses considered directly accessory to the uses permitted in this section shall also be permitted in the O district.

The proposed time-share and hotel units and commercial uses would not be consistent with the zoning designation of "Open". Project implementation therefore requires rezoning of portions of the project to the appropriate zoning category or use permits for certain uses.

Special Management Area

As shown in Figure AB, the entire project area up to the highway is within the coastal zone management zone known as the Special Management Area ("SMA"). At the County level, implementation of the CZM Program is through the review and administering of the SMA permit regulations. Kona Kai Ola complies with and implements the objectives and policies of the Coastal Zone Management (CZM) Program, and a full discussion is provided in Section 5.1.3. The development concepts in the proposed project and Alternatives 1 and 2 will be subject to applicable SMA rules and regulations.

Dear Jacoby Development Inc., Hawaiian Homelands, and politicians or Hawaii,

The issue of harbor development is a big issue right now for the citizens of the Big Island. Everyone has their own opinion, which is totally fine but they usually never change it. Personally, I hate how people are so one minded about this issue. Of course there are pros and cons like there are in every issue. However, people don't always consider the other side of things. Personally, its hard for me to choose about being pro or con for this issue, because I feel I am open minded and consider all the issues, and have my feelings about the different problems. Yellow = against the issue, Pink = for the issue.

Many environmentalists are extremely against this issue. The reasons are apparent that this development could and probably will harm animals living near or in the harbor. No one wants to kills these animals, that is not what they want to do, but as with any development there will be some impact to nature. Another issue that was brought up was the issue of the killing of native Hawaiian plants. Native Hawaiian plant populations are down, and to kill more of these plants for development isn't good. However, think about all the invasive species that are already choking out the Hawaiian plants. If they don't go through with this development, then I hope people are out their weeding out the invasive plants, because they care so much about the plants. Traffic is another issue that is brought up, and traffic affects everyone in Hawaii. It is said that because this development will bring in more people, more traffic problems will occur. However, if this development goes through, then they will have more of a reason to fix that problem, plus let's look at the other side of this development.

This development, when complete, will generate a lot of revenue for the state of Hawaii. Tourism is the largest income source for Hawaii, and unless tourists come to visit, we would have to depend on our crops. So regarding the traffic issue, more money would be coming in, therefore we could actually have money to fix the road issues. Our roads are never going to be better unless we have the money to fix them. This development also offers a nice place for tourists and locals alike to spend time. This is a good place for tourists to stay which is far away from the airport. Where is Hawaii going to get the workers, and where are they going to live? Housing will be built especially for the workers, and because of this it will may create a nicer place for people to live.

Again, I think this development is good and bad, but not all bad or all good. I just really wish people could have more of an open mind when discussing this issue, as I try to have. If I were to have to pick a side, I think I would probably lean more to wanting the development, but I am still not sure 100%. I think a compromise is more in mind, like making the project smaller. I do appreciate that people are taking the time to read my view. Please don't judge me, because we all have the right to our opinions. Thank you.

Sincerely,

Joey Donaldson

Joey Donaldson

87-493 Kaohe Mauka Road

Captain Cook, HI 96704

innovation through engineering & scientific excellence

July 23, 2007

Joey Donaldson
87-493 Kaohe Mauka Road
Captain Cook, HI 96704

Dear Mr. Donaldson:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are based on a paragraph designation.

Paragraph 1

Kona Kai Ola development is the result of a development agreement between Jacoby Development, Inc. (JDI) and the Department of Land and Natural Resources (DLNR), and as part of the Draft Environmental Impact Statement (DEIS), several studies were conducted to assess impacts and propose mitigation actions.

The Fauna Impact Study, as summarized in EIS Section 7, found that it is not expected that the development of the proposed Kona Kai Ola property will have significant impacts on native avian or mammalian resources present within the North Kona District. Further, Kona Kai Ola will provide additional habitat for shorebirds and some visiting seabirds through the establishment of a brackish water pond area suitable for avian fauna, including stilts, coots, and ducks. This is a positive impact and water features will constitute a managed ecosystem that will protect these species.

A flora study was conducted to assess impacts from this development on plants at the site. The report is included as Appendix E in the EIS. Out of the 42 plant species observed during the survey, only three species are endemic to Hawaii and nine species are indigenous to Hawaii and other Pacific Islands. The study concluded that the proposed development will not cause significant impacts on the plants in the area. A 400-foot wide strip of land extending back from the shoreline will be protected as there are native species dominating the area.

Oceanit Center 828 Fort Street Mall, Suite 600 Honolulu, Hawaii 96813 Phone: 808.531.3017 Fax: 808.531.3177
www.oceanit.com

Paragraph 2

We agree that this development will provide opportunities for local community and generate revenue for the County and State of Hawaii. In addition, the development will provide private funds to solve some of the local traffic problems and improve infrastructure such as water, wastewater disposal and housing.

The EIS has been revised to include information from these additional studies.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Harbor Comment

John Chadband

2//1/2007

There are pros to harbor development and there are cons to harbor development. The pros are simple. If we build more places more tourist to spend there money the more money our county will have to spend on our roads and education. The cons are, if we build this new development on our land it might kill some habitat and species. The harbor development will have a huge impact on out economy and our lives.

I am for harbor development because we need it desperately. The more money our county brings in the better. If this harbor development gets shut down it isn't going to ruin are economy it just that we need all the more money we can get. I will stand for it now unless a new proposal brings up points that will will make me change my mind.

John Chadband

P.O. Box 620 Captain Cook Hi 96704

oceanit
innovation through engineering & scientific excellence

July 23, 2007

John Chadband
P.O. Box 620, Captain Cook
Captain Cook, HI 96704

Dear Mr. Chadband:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are given below.

Comment: If we build more places, more tourist to spend money, the more the county will have to spend on our roads and education.

Response: We agree with you on the positive benefits this project will bring to County of Hawaii.

The project is funded by private investment and will generate a reasonable rate of return. Further, the project includes crucial privately-funded improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Private funds will also be used in the development of community-oriented facilities such as parks, other recreational facilities, and public access. Hence, public interest will be served through the development of the Kona Kai Ola project.

Kona Kai Ola will provide residents with opportunities to improve their quality of life through economic development that enhances the County's natural and social environments. The proposed uses at Kona Kai Ola will broaden the spectrum of business opportunities in the area, and provide a wider range of employment options.

In addition to employment and entrepreneurial opportunities related to the commercial areas and the hotel and timeshare complexes, Kona Kai Ola will offer diverse opportunities related to skilled marina support jobs, SWAC facility mechanical jobs, and the water features and marine science center will involve employment of marine biology and environmental education jobs.

<u>Comment</u>: *If we build this new development on our land it might kill some habitat and species.*

<u>Response</u>: We do not agree that this development will kill habitat and species.

The Fauna Impact Study, as summarized in the Environmental Impact Statement (EIS) Section 7, found that it is not expected that the development of the proposed Kona Kai Ola property will have significant impacts on native avian or mammalian resources present within the North Kona District. Further, Kona Kai Ola will provide additional habitat for shorebirds and some visiting seabirds through the establishment of a brackish water pond area suitable for avian fauna, including stilts, coots, and ducks. This is a positive impact and water features will constitute a managed ecosystem that will protect these species.

The EIS has been revised to include information from these additional studies.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Kainui Rapaport
1/22/06 Mrs. Rita
WHEA 7th grade
Testimony

Concerns over Possible Negative Impact by Kona Kai Ola

Jacoby Development Inc.'s (JDI) plans for a commercial mixed-use development in Honokohau, Kona have many proposed benefits but serious concerns have been raised by nearby residents and scientists. The development promises to provide jobs for people, a shoreline setback, and minimal pollution. However, the development is likely to cause road traffic because of the numerous new people (and local residents) coming to stay in hotel rooms, time shares, and recreational activities. They are trying to increase boat slips in Honokohau harbor by 800, which is four times the current amount, and this will increase boat traffic. They plan to construct a lagoon for manta rays and sharks, but there might be deaths if someone falls in. It would be better to have a lagoon with less dangerous animals, such as turtles and dolphins. JDI's flier is very biased and does not admit to any possibility of possible negative impact. Crescent Beach, south of Honokohau, is right next to the planned waterfront village. New development would mean parking areas initially, but the arrival of many new people would result in less spots on the beach.

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July 23, 2007

Kainui Rapaport
c/o West Hawaii Explorations Academy
73-4460 Queen Kaahumanu Hwy, Ste. 105
Kailua-Kona, HI 96740

Dear Mr. Rapaport:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are given below.

We agree with you that Kona Kai Ola Development will provide employment opportunities to people in Kona, set up a wide buffer zone for preservation, and minimize pollution by using Best Management Practices (BMP)'s.

In order to reduce traffic impacts from the development the developer will provide funds to improve and modify roadways, traffic signals, and other improvements. The roadway system will also be improved beyond mitigation for project-related impacts. In Phase 1 of the project, Jacoby Development, Inc. (JDI) will not only provide access to the commercial parcel, but also address regional traffic issues through the improvements of the roadway system. JDI plans to improve the intersection of the Queen Ka'ahumanu Highway and the Kealakehe WWTP Access Road. The Kealakehe WWTP Access Road is planned to be realigned and widened to an 80-foot road right-of-way (ROW) that will serve the Commercial Parcel No. 1 and eventually intersect with the proposed Kuakini Highway Extension to the west. Such improvements will ensure that the project minimizes its own impacts while improving existing conditions. Further, with development of Kona Kai Ola, the Kuakini Highway extension road is anticipated to be built on a more accelerated schedule than it would occur without the Kona Kai Ola project.

Comparison between impacts related to the proposed project concept and impacts related to Alternative 1 indicates that a reduction in the acreage and number of slips in the marina, as well as the reduction in hotel and timeshare units, would generate less environmental, social, and economic impacts.

Although positive economic impacts would be reduced, Alternative 1 can be considered as a preferable alternative because of reduced environmental impacts. However, while it can be concluded that the 25-acre, 400-slip, marina in Alternative 1 would be the preferred size, the Department of Land and Natural Resources (DLNR) agreement establishes the size of the marina at 45 acres and 800 slips. An amendment to the DLNR agreement is required in order to allow Alternative 1 to proceed. Hence, selection of Alternative 1 is an unresolved issue at this time.

Management of habitats within lagoons is a question of aquaria technology and fish husbandry. The limiting criteria in aquaria is typically water quality, with habitat design more a matter of providing the correct physical habitat (sand, coral, rock, caves, etc.) in an ecologically balanced fashion, aesthetically pleasing, fashion. The display type of animals has not been finalized at this time. The superb water quality, and low turn overtime in the lagoons will preclude the necessity of filtration. Professional aquarists and staff will manage the lagoon features and associated educational activities from the Marine Science offices adjacent to the upper lagoon. Providing safety of visitors and operators from possible accidents with lagoons and animals will be given the top priority in lagoon management.

The EIS has been revised and Attachment 1 contains Section 2, Alternatives Analysis.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

2 Alternatives Analysis

~~In typical land development projects, the initial planning process includes the exploration of alternatives to development objectives. In the EIS process, these alternatives are presented with a disclosure of reasons for the dismissal of non-preferred alternatives.~~

~~Kona Kai Ola does not follow this same pattern of alternatives evaluation.~~ As discussed in Section 1.4, the proposed Kona Kai Ola project is the result of agreements between JDI and the State DLNR and DHHL. The agreements and leases between the State and JDI stipulate the parameters of development for this site in terms of uses, quantities and size of many features, resulting in a limited range of land uses. Unlike a private property project, JDI is required to meet the criteria outlined in the agreements, thereby affording less flexibility in options and uses. From the developer's perspective, the agreements must also provide sufficient flexibility to allow for a development product that responds to market needs and provides a reasonable rate of return on the private investment.

The agreements between JDI and DLNR specify that the proposed harbor basin is to be 45 acres and accommodate 800 slips. This development proposal is the subject of this EIS. In response to DEIS comments, additional water quality studies and modeling were conducted. These studies determined that the water circulation in a 45-acre 800-slip marina would be insufficient to maintain the required standard of water quality. The models of water circulation suggest that a new 25-acre harbor basin could successfully maintain required water quality in the new harbor. Comments on the DEIS from DLNR, from other government agencies, the neighbors and the general community also called for the consideration of alternatives in the EIS, including a project with a smaller harbor basin and less density of hotel and time-share units.

In response to these comments on the DEIS, three alternatives are evaluated in this Final EIS and include Alternative 1, which is a plan with a 25-acre 400-slip harbor basin including a decrease in hotel and time-share units; Alternative 2, which is an alternative that had been previously discussed but not included in the proposed project, that includes an 800-slip harbor and a golf course; and Alternative 3, the no-project alternative. Each alternative is included in the EIS with an evaluation of their potential impacts. These project alternatives are presented to compare the levels of impacts and mitigation measures of the proposed project and alternative development schemes pursuant to requirements set forth in Chapter 343, HRS.

~~JDI is required to provide a new marina basin not less than 45 acres and a minimum of 800 new boat slips. Further, the agreements provide the following options for land uses at the project site:~~

- ~~Golf Course~~
- ~~Retail Commercial Facilities~~
- ~~Hotel Development Parcels~~
- ~~Marina Development Parcels~~
- ~~Community Benefit Development Parcels~~

~~JDI is not pursuing the golf course option and is proposing instead to create various water features throughout the project site. All other optional uses have been incorporated in Kona Kai Ola.~~

2.1 Project Alternatives

2.1.1 Alternative 1: 400-Slip Marina

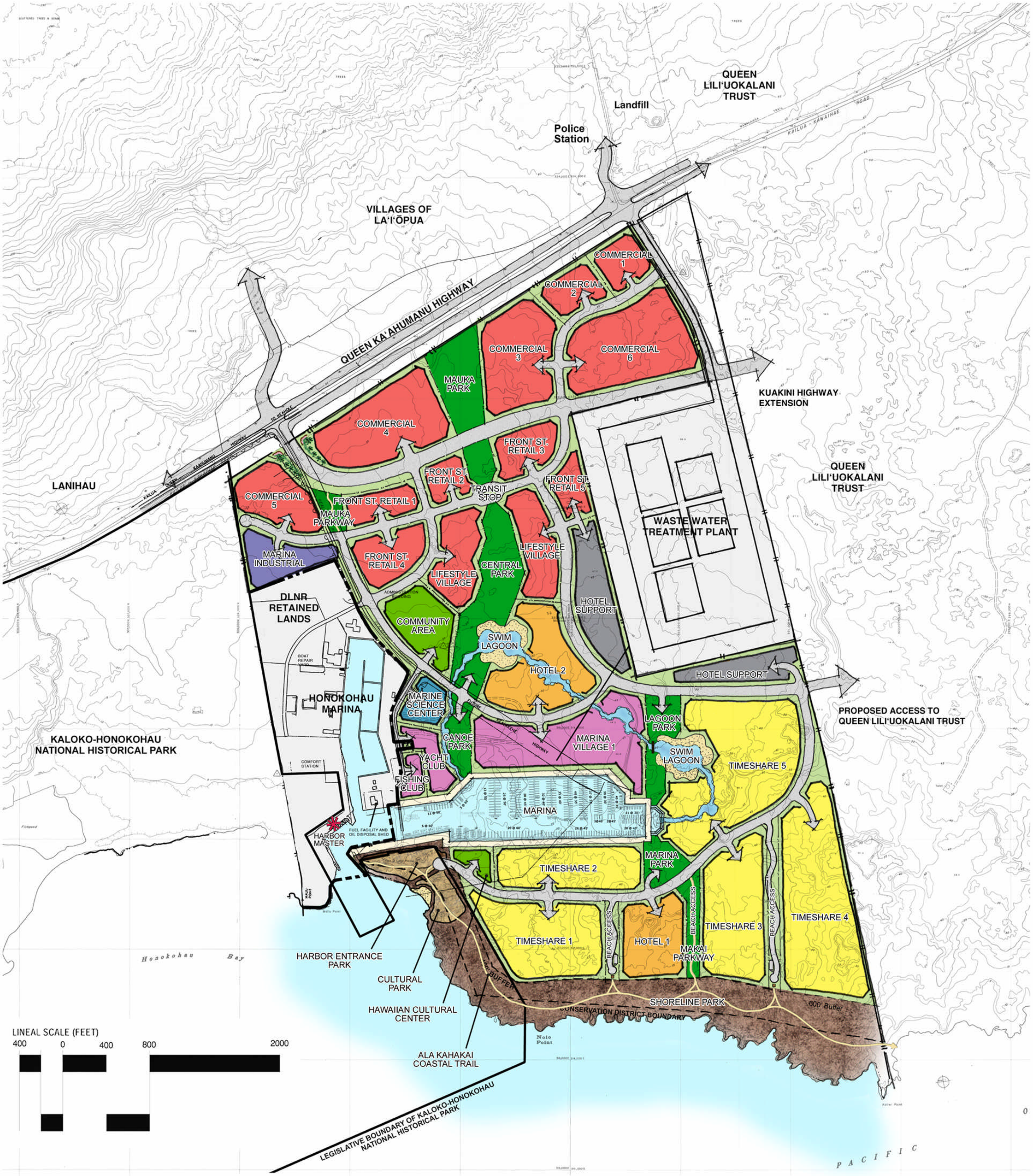
Studies conducted in response to DEIS comments found the construction and operation of an 800-slip marina may significantly impact the water quality within the marina and along the shoreline. Specifically, the Harbor Water Quality Modeling Study, as contained in Appendix U, found that the water circulation in a 45-acre 800-slip harbor was insufficient to maintain an acceptable level of water quality. Further, the existing harbor channel, which would serve both the existing and new harbors, could not adequately serve the increased boat traffic generated by an 800-slip marina during peak traffic. Mitigation measures to accommodate peak boat traffic included the widening of the existing channel, an action that would entail a complex process of Federal and State approvals and encounter significant environmental concern.

Concerns related to the proposed density of hotel and time-share units were also expressed in comments to the DEIS from members of the public, neighbors to the project site, especially the Kaniohale Community Association, and government agencies. Common themes in DEIS comments were related to impacts regarding traffic, project requirements of potable water and infrastructure systems, including sewer, drainage, utility and solid waste systems, and socioeconomic impacts.

In response to the water quality study results, and to the DEIS comments, an alternative plan was developed with a smaller marina with less boat slips, and a related decrease in hotel and time share units. Illustrated in Figure G, Alternative 1 reflects this lesser density project, and features a 400-slip marina encompassing 25 acres. For the purposes of the Alternative 1 analysis, JDI assumed 1,100 time-share units and 400 hotel rooms. Project components include:

- 400 hotel units on 34 acres
- 1,100 time-share units on 106 acres
- 143 acres of commercial uses
- 11 acres of marina support facilities
- 214 acres of parks, roads, open spaces, swim lagoons and community use areas

In addition, Alternative 1 would include the construction of a new intersection of Kealakehe Parkway with Queen Ka‘ahumanu Highway, and the extension of Kealakehe Parkway to join Kuakini Highway to cross the lands of Queen Lili‘uokalani Trust, and connecting with Kuakini Highway in Kailua-Kona. This is a significant off-site infrastructure improvement and is included in the agreements between the State and JDI.



Source: PBR HAWAII

Plan is conceptual only and subject to change

Figure G: Alternative 1: 400-Slip Marina

LEGEND

TIME SHARE	MARINA SUPPORT / COMMERCIAL	UTILITIES
HOTEL	MARINE SCIENCE CENTER	PARKS & GREEN SPACE
RETAIL / COMMERCIAL	COMMUNITY AREA / CULTURAL CENTER	SHORELINE
MARINA RETAIL	SWIM LAGOON	HARBOR ENTRANCE PARK / CULTURAL PARK
	MARINA	

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JDI
JACOBY DEVELOPMENT, INC.

Like the proposed project, Alternative 1 would have a strong ocean orientation, and project components that support this theme would include various water features including seawater lagoons and a marine science center. The new Alternative 1 harbor would include a yacht club, fishing club, a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. The coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and ‘Alula for community use. Additional Alternative 1 community areas would include facilities and space for community use, including programs of the Kona Kai Ola Community Foundation, which supports community programs in health care, culture, education, and employment training for the local community, especially to native Hawaiians. Like the original proposed plan, Alternative 1 includes 40 percent of the land in parks, roads, open spaces, swim lagoons and community use areas.

2.1.2 Alternative 2: Golf Course Feature

Alternative 2 was among the alternatives discussed at a community charrette in September 2003. It includes a golf course, which is a permitted use in the DLNR agreement and DHHL lease. As Figure H illustrates, an 18-hole championship golf course would occupy 222 acres on the southern portion of the project site. As with the proposed project, Alternative 2 includes an 800-slip marina on a minimum of 45 acres.

To support the economic viability of the project, other Alternative 2 uses include:

- Golf course clubhouse on three acres
- 1,570 visitor units on 88 acres fronting the marina
- 118 acres of commercial uses
- 23 acres of community uses

Community uses in Alternative 2 include an amphitheater, a canoe facilities park, a community health center, a Hawaiian cultural center and fishing village, a marine science center and employment training center. The sea water lagoon features contained in the proposed project and Alternative 1 are not included in this alternative.

2.1.3 Alternative 3: No Action

In Alternative 3, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.

~~The economic viability and sustainability of the project is determined by the density and uses proposed. Because JDI is obligated to develop an 800-slip marina for the State, complete road improvements, and provide various public enhancement features at its own expense, the density proposed for the income generating features of the development must be sufficient to provide an acceptable level of economic return for JDI. The market study, which is discussed in Section 4.6, reviewed various development schemes and determined that the currently proposed density and mix is the optimum to meet the anticipated financing and development cost obligations for the public features associated with the development.~~

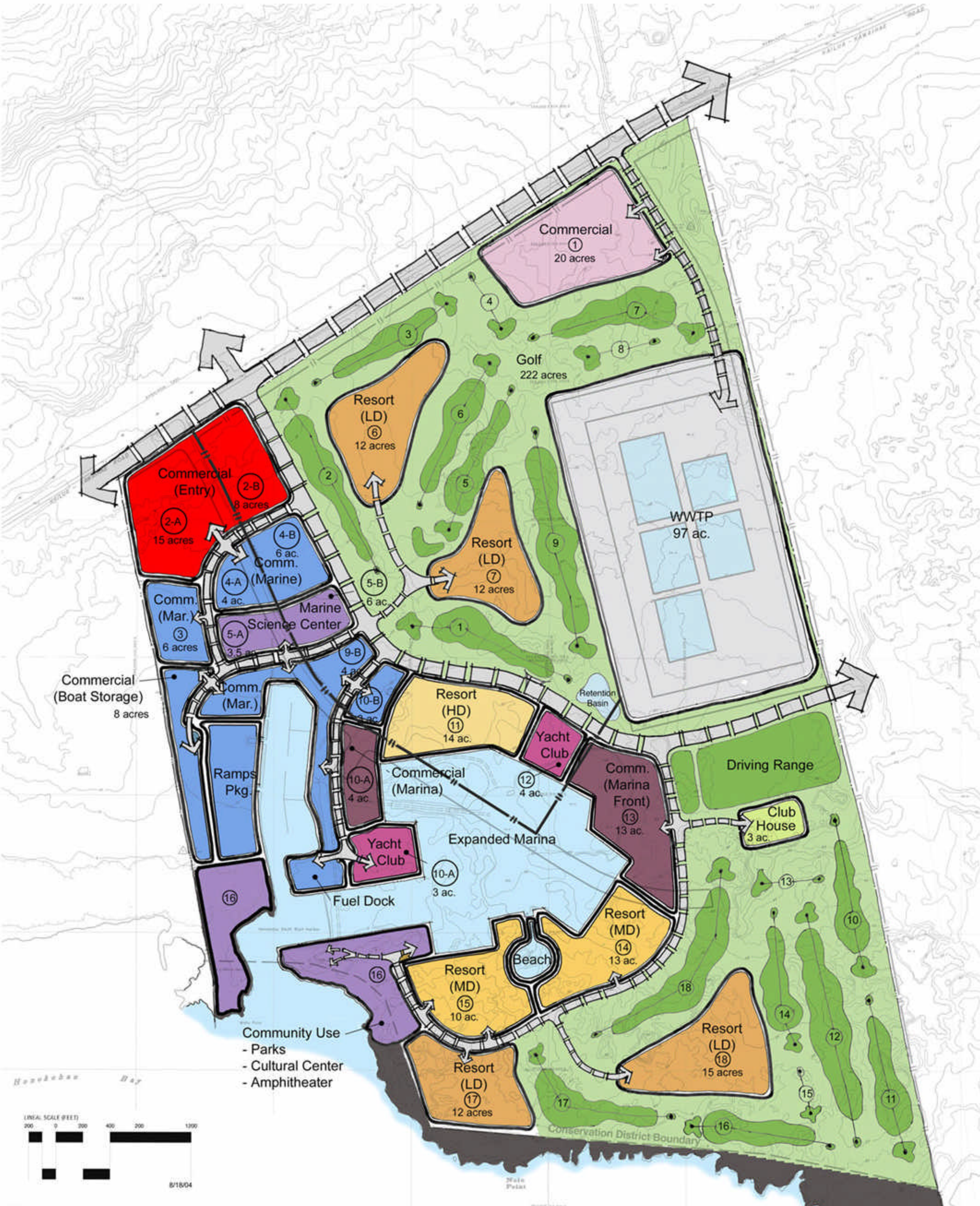


Figure H. Alternative 2: Golf Course Alternative

Legend

JDI

JACOBY DEVELOPMENT, INC.

2.2 Alternatives Analysis

As discussed in Section 2.1, the proposed Kona Kai Ola project (also referred to as "proposed project") is defined by development requirements related for a marina and the related uses that would be needed to generate a reasonable rate of return that covers development costs.

Beginning with Section 2.2.1, the alternative development concepts are comparatively assessed for potential impacts that may reasonably be expected to result from each alternative. Following is an overview of the primary observations of such assessment.

Alternative 1 includes half of the State-required boat slips and 60 percent of the proposed hotel and time-share units and, due to the decreased density, this alternative would generate significantly less environmental and socio-economic impacts. A harbor water quality model found the reduction of the volume of the new marina basin by about half (approximately 25 acres) significantly improved the water circulation and quality. Further, the reduced number of boat slips would generate less boat traffic, thereby reducing congestion and the need to mitigate impacts further by the widening of the existing harbor channel.

A project with fewer hotel and time-share units and increased commercial space with a longer (14 years) absorption period would change the mix of employment offered by the project, and slightly increase the overall employment count. The public costs/benefits associated with Alternative 1 would change, compared to the proposed project, with a general increase in tax collections, and a general decrease in per capita costs. Detailed discussion of Alternative 1 potential economic impacts are provided in Section 4.6.6. Comparisons of levels of impact are presented throughout this FEIS.

While this analysis might indicate that the 25-acre marina in Alternative 1 would be the more prudent choice, the DLNR agreement establishes the minimum size and slip capacity of the marina at 45 acres and 800 slips, respectively. Amendments to the DLNR agreement would be required in order to allow Alternative 1 to proceed as the preferred alternative. Hence, selection of the preferred alternative is an unresolved issue at the writing of this FEIS.

Alternative 2, the golf course alternative, was not previously considered to be the preferred alternative primarily because market conditions at the time of project development might not likely support another golf course. Further, DHHL has a strategy goal to have more revenue-generating activities on the commercial lease lands within the project area. In addition, concerns have been expressed as to environmental impacts of coastal golf courses, including the potential adverse impact on Kona's water supply if potable water is used for golf course irrigation.

While Alternative 3, the no-project alternative, would not generate adverse impacts related to development of these lands associated with the construction and long-term operations, it would also not allow for an expanded public marina that would meet public need and generate income for the public sector. Further, the no-project alternative would foreclose the opportunity to create a master-planned State-initiated development that would result in increased tax revenue, recreation options and community facilities. Crucial privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities, and public access would not be contributed.

~~Hence, the only valid alternative to the proposed project is the no-action alternative. In this alternative, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.~~

~~The no-project alternative would therefore not generate adverse impacts associated with the construction and long-term operations would not occur.~~

~~Likewise, the creation of a master-planned state-initiated development, resulting in increased employment, tax revenue, recreation options and community facilities, would not be created. Privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities and public access would not be contributed.~~

Further, the creation of revenue-producing businesses on the DHHL property to fund homestead programs would not occur, resulting in fewer potential benefits for Hawaiians.

Hence, the agreements and leases between the State and JDI indicate that the no-action alternative is not in the public interest~~has been rejected at this time~~.

2.2.1 Impact Comparison

Grading and Excavation

The proposed project requires grading and excavation. Both actions may impact groundwater due to rainfall runoff during construction. Alternative 1 would require a significantly smaller excavation for the marina basin and would therefore carry a lesser risk of potential adverse effects on water quality. Alternative 2 would require the same basin excavation as the proposed project, and would also include extensive grading and filling to build the golf course, the latter of which would generate additional impacts. Alternative 3 would result in no change to the geography, topography and geology.

Further discussion on grading and excavation is contained in Section 3.3.

Natural Drainage

Most precipitation infiltrates into the porous ground at the site, and no significant sheet flow is likely. Alternative 1 would generate similar levels of impacts on natural drainage as those of the proposed project and thus require similar mitigation measures. The golf course in Alternative 2 would not be as porous since the site would be graded, soil would be placed, and grass and other landscaping would be grown. Sheet flow and runoff can occur on a golf course, and drainage patterns might change. Alternative 3 would result in no change to the existing natural drainage pattern. Further discussion on natural drainage is contained in Section 3.4.

Air Quality

Air quality will be affected by construction activities, as well as pollutants from vehicular, industrial, natural, and agricultural sources. Alternative 1 would generate less construction air quality impacts than the proposed project due to the reduced amount of intensive groundwork associated with the smaller marina basin and fewer long-term impacts by reducing traffic 35 and 40 percent during, respectively, AM and PM peak traffic times. Construction of Alternative 2 would result in fugitive dust and exhaust from equipment and is expected to generate the same level of air quality impact as the proposed project. Alternative 3 would result in no change to existing air quality. Further discussion on air quality is contained in Section 3.5.

Terrestrial Environment

To provide additional habitat for shorebirds and some visiting seabirds, the project proposes to construct a brackishwater pond area suitable for avian fauna, including stilts, coots and ducks. While habitat expansion is beneficial, there is also a possibility that these species may be exposed to activity that may harm them. Alternative 1 would not include a brackish water pond, but will include 5 acres of seawater features, which is 74 percent less than the 19 acres of seawater features in the proposed project. While this would reduce beneficial impacts, it would also decrease exposure to potentially harmful activity. Alternative 2 does not include the brackish water pond features, but would include drainage retention basins that would attract avian fauna and expose them to chemicals used to maintain golf course landscaping. While Alternative 3 would result in no increase in potentially harmful activity, it would also not provide additional habitat for avian fauna. Further discussion on the terrestrial environment is contained in Section 3.7.

Groundwater

Groundwater at the project site occurs as a thin basal brackish water lens. It is influenced by tides and varies in flow direction and salt content. The existing Honokōhau Harbor acts as a drainage point for local groundwater. Any impact to groundwater flow from the proposed harbor is likely to be localized. The proposed marina basin will not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance.

There will be differences in the flow to the marina entrance between the proposed project and Alternative 1. Alternative 1, being smaller in size, will have less impact on groundwater flow than the proposed marina. Alternative 2 will have a similar impact to groundwater quality as the proposed project. Alternative 2 may also impact water quality by contributing nutrients and biocides to the groundwater from the golf course. Alternative 3 would result in no change in existing groundwater conditions. Further discussion on groundwater is contained in Section 3.8.1.

Surface Water

There are no significant natural freshwater streams or ponds at the site, but there are brackish anchialine pools. Surface water at the project site will be influenced by rainfall. Runoff typically percolates rapidly through the permeable ground. The proposed project will include some impermeable surfaces, which together with building roofs, will change runoff and seepage patterns.

Alternative 1 is a lower density project that is expected to have proportionally less impact on surface water and runoff patterns and less potential impact on water quality than the proposed project. Alternative 2 would have more impact on surface water quality than the proposed project due to fertilizers and biocides carried by runoff from the golf course. Alternative 3 would result in no change to surface water conditions. Further discussion on surface water is contained in Section 3.8.2.

Nearshore Environment and Coastal Waters

The potential adverse impacts to the marine environment from the proposed project are due to the construction of an 800-slip marina and the resulting inflow of higher salinity seawater and inadequate water circulation, both of which are anticipated to impair water quality to the extent of falling below applicable standards. One possible mitigation measure is to significantly reduce the size of the marina expansion.

The reduced marina size (from 45 to 25 acres) and reduced lagoon acreage in Alternative 1 are expected to result in a proportionate reduction in seawater discharging into the new harbor and increased water circulation. Alternative 2 includes the same marina basin size and is therefore subject to the same factors that are expected to adversely affect water quality.

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water quality in the proposed harbor depends on several components. These include salinity, nutrients, and sediments that come from the ocean, rainfall runoff, water features with marine animals, and dust. The smaller project offered as Alternative 1 is expected to produce a reduced amount of pollutants and reduce the risk of adverse impact upon water quality.

It is notable that the 45-acre marina basin planned in the proposed project and Alternative 2 only becomes viable from a water quality impact standpoint if the additional brackish groundwater inflow into the new marina exceeds 60 mgd. The resulting flushing from such inflow would be expected to better maintain water quality. However, it is unclear whether 60 mgd of brackish groundwater would be available. As proposed in Alternative 1, reduction of the volume of the new marina basin by 45 percent will significantly improve the flushing and water quality because the lower volume can be flushed by the available groundwater flow.

In addition, there could be higher rainfall runoff from the Alternative 2 golf course into the harbor, because the grassed golf course will be less porous than the natural surface. The golf course will also require relatively high levels of fertilizer, biocides, and irrigation, all of which could contribute to adverse water quality impacts.

Further discussion on nearshore environment and coastal waters is contained in Section 3.9.1.

Anchialine Pools

Anchialine pools are located north of Honokōhau Harbor, and south of the harbor on the project site. The marine life in these pools is sensitive to groundwater quality, and changes due to construction and operation of the project could degrade the viability of the pool ecosystem. In the southern complex, 3 anchialine pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction in the proposed project and Alternatives 1 and 2.

Predicting the extent of change in groundwater flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is therefore extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Due to the uncertainty of changes in groundwater flow and quality due to marina construction, the variability in impacts between the proposed project and Alternatives 1 and 2 is unknown at this time. Alternative 3 would result in no change in groundwater flow. While this would eliminate the potential for adverse impacts, Alternative 3 would also continue the pattern of existing degradation related to human activity and the introduction of alien species. Further discussion on anchialine pools is contained in Section 3.9.2.

Marine Fishing Impacts

The proposed marina will increase the number of boats in the area and it is reasonable to assume that a portion of these new boats will engage in fishing activities. The increase in boats in the area would be primarily related to the marlin and tuna / pelagic fishery, coral reefs due to extractive fisheries, and SCUBA activities. The pressure on fish and invertebrate stocks is expected to increase with or without the marina. Harbor expansion provides the opportunity to address existing conditions to consolidate, focus, and fund management and enforcement activities at one location.

Compared to the proposed project, Alternative 1 would result in a 21 percent decrease in boat traffic, thereby lessening the potential for marine fishing impacts. The level of impacts in Alternative 2 would be similar to that of the proposed project. Alternative 3 would result in no change in existing marine fishing conditions, and no opportunity to address already existing pressure on fish and invertebrate stocks. Further discussion on marine fishing impacts is contained in Section 3.9.3.

Cultural and Archaeological Resources

The proposed project will integrate cultural and archaeological resources in the overall development. Archaeological sites recommended for preservation will be preserved, and cultural practices will be encouraged. Kona Kai Ola includes a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. Proposed is a 400-foot shoreline setback that would serve as a buffer between the ocean and developed areas. This coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use.

Alternative 1 would contain all of the cultural archaeological features and the shoreline setback area would be 400 feet in the northern portion of the site and increase to 600 feet in the southern portion. Alternative 2 would preserve cultural and archaeological resources, but does not include a 400-foot shoreline setback. Alternative 3 would result in no change to existing cultural and archaeological resources and no addition of cultural and community facilities and activities. Further discussion on cultural and archaeological resources is contained in, respectively, Sections 4.1 and 4.2.

Noise

Project-generated noise is due to construction equipment and blasting, boats, marina activities, vehicle traffic, and the Kealakehe Wastewater Treatment Plant operations. Alternative 1 would generate less noise impacts due to reduced construction activities, fewer boats, less traffic and less on-site activity. Alternative 2 would also generate less noise due to reduced traffic and less on-site activity, but noise related to the excavation of the marina basin and an increase in the number of boats would be similar to that of the proposed project. Further discussion on noise impacts is presented in Section 4.4.

Socioeconomic Impacts

The proposed project will generate an increase in de facto population of an estimated 5,321 persons due to the increase in hotel and time-share units. The estimated de facto population increase in Alternative 1 is 37 percent less, at 3,363 persons, than the proposed project. The de facto population increase in Alternative 2 is similar to Alternative 1.

Employment in the commercial components will nearly double in Alternative 1, from a stabilized level of 1,429 full-time equivalent (FTE) positions in the proposed project to 2,740 in the Alternative 1.

Under Alternative 1, the total operating economic activity at Kona Kai Ola will increase due to the added commercial space more than off-setting the fewer visitor units, moving upward from $557.6 million per year to circa $814.3 million annually. The total base economic impact resulting from development and operation of Alternative 1 will similarly be higher by between 35 and 45 percent than that of the proposed project.

Alternative 1, which has a reduced marina size of 25 acres, and fewer hotel and time-share units, would have a meaningful market standing, create significant economic opportunities, and provide a net benefit to State and County revenues. From a market perspective, a smaller Kona Kai Ola would still be the only mixed use community in the Keahole to Kailua-Kona Corridor offering competitive hotel and time-share product.

The estimated absorption periods for marketable components of Alternative 1 are generally shorter than those for the same components in the proposed project. Marina slips under Alternative 1 are estimated to be absorbed within 2 years after groundbreaking, as compared with 9 years for absorption of slips in the proposed project. Hotel rooms under Alternative 1 are estimated to be absorbed within 4 years after groundbreaking, as compared with 7 years under the proposed project. Time-share units would be absorbed within 10 years under Alternative 1, while 15 years are projected under the proposed project. Due to the planned increase in commercial facilities under Alternative 1, the absorption period of commercial space is estimated at 14 years, as compared with 8 years for absorption of such facilities under the proposed project.

The State and County will still both receive a net benefit (tax receipts relative to public expenditures) annually on a stabilized basis under the Alternative 1. The County net benefits will be some $12.2 million per year under the Alternative 1 versus $14.9 million under the proposed project. The State net benefits will increase under the Alternative 1 to about $37.5 million annually, up substantially from the $11.4 million in the proposed project.

Due to the lower de facto population at build-out, the effective stabilized public costs for both the State and County will decline meaningfully under the Alternative 1, dropping from $7.7 million annually for the County and $36.5 million for the State, to $4.9 million and $23 million per year, respectively.

Alternative 3 would result in no increase in de facto population and improvement to economic conditions. Further discussion on social and economic impacts are contained in, respectively, Sections 4.5 and 4.6.

Vehicular Traffic

The proposed project will impact the nearby road network that currently is congested during peak traffic times. The proposed project includes roadway improvements that would reduce the impact and improve roadway conditions for the regional community.

Alternative 1 includes the same roadway system improvements as the proposed project, yet would reduce vehicular traffic by 35 percent when compared to the proposed project. Alternative 2 would have similar traffic conditions and roadway improvements as Alternative 1. Alternative 3 would result in no increase in traffic and no roadway improvements.

Marina Traffic Study

The increase in boat traffic due to the proposed 800-slip marina would cause entrance channel congestion during varying combinations of existing and new marina peak traffic flow. Worst case conditions of active sport fishing weekend and summer holiday recreational traffic result in traffic volumes exceeding capacity over a short afternoon period. Mitigation to address boat traffic in the proposed project include widening the entrance channel, traffic control, implementation of a permanent traffic control tower, or limiting vessel size.

Alternative 1 would result in a 21 percent reduction in boat traffic congestion under average existing conditions and ten percent reduction during peak existing conditions. The reduction to 400 slips also reduces the impacts of congestion at the entrance channel, thereby reducing the need for any modifications to the entrance channel.

Alternative 2 would have the same level of boat traffic as the proposed project. Alternative 3 would not meet the demand for additional boat slips and would not generate additional boat traffic. Further discussion on marina traffic is contained in Section 4.8.

Police, Fire and Medical Services

The proposed project will impact police, fire and medical services due to an increase in de facto population and increased on-site activity. Alternatives 1 and 2 would have similar levels of impact as the proposed project due to increased on-site activity. Further discussion on police, fire and medical services are contained, respectively, in Sections 4.10.1, 4.10.2 and 4.10.3.

Drainage and Storm Water Facilities

The proposed project will increase drainage flows, quantities, velocities, erosion, and sediment runoff.

Alternative 1 involves a reduction of the project density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces associated with hotel and time-share development and to the creation of more open space. However, roadway areas will increase by about 30 percent in Alternative 1. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings. The golf course in Alternative 2 may also change drainage characteristics from those of the proposed project and may not reduce impacts. Alternative 3 would result in no change in existing conditions and no improvements to drainage infrastructure. Further discussion on drainage and storm water facilities is contained in Section 4.10.5

Wastewater Facilities

The proposed development is located within the service area of the Kealakehe WWTP and a sewer system will be installed that connects to the WWTP. The sewer system will be comprised of a network of gravity sewers, force mains, and pumping stations which collect and convey wastewater to the existing Kealakehe WWTP. Project improvements will incorporate the usage of recycled / R1 water. Improvements implemented by the proposed project will also accommodate the needs of the regional service population.

Alternative 1 would generate approximately 10 percent less wastewater flow than the proposed project. Wastewater flow in Alternative 2 is undetermined. Alternative 3 would result in no additional flow, as well as no improvements that will benefit the regional community. Further discussion on wastewater facilities is contained in Section 4.10.6.

Potable Water Facilities

The proposed project average daily water demand is estimated at 1.76 million gallons per day. Existing County sources are not adequate to meet this demand and source development is required. The developer is working with DLNR and two wells have been identified that will produce a sustainable yield that will serve the project. These wells will also serve water needs beyond the project.

Alternative 1 would result in net decrease of about five percent of potable water demand. Alternative 2 may have a lower water demand than the proposed project as long as potable water is not used for irrigation. Alternative 3 would result in no additional flow, as well as no source development that will benefit the regional community. Further discussion on potable water facilities is contained in Section 4.10.8.

Energy and Communications

Regarding Alternative 1, preliminary estimates for electrical, telecommunications, and cable resulted in a net demand load that remains similar to the proposed project. Further discussion on energy and communications is contained in Section 4.10.9.1.

The proposed project will increase the demand for electrical energy and telecommunications. The demand would be reduced in Alternative 1 because the number of boat slips and units would decrease. Similarly, Alternative 2 would have fewer units than the proposed project and therefore reduce energy demands. Further reduction in energy demand for either alternative could be achieved by using seawater air conditioning (SWAC) and other energy reduction measures, as planned by the developer. Further discussion on energy and telecommunications is contained in Section 4.10.9.2.

Water Features and Lagoons

The proposed project includes a brackishwater pond, lagoons, and marine life exhibits supplied by clean seawater. The water features in Alternative 1 would significantly decrease by 74 percent from 19 acres in the proposed project to five acres in Alternative 1. This decrease in water features would result in a corresponding decrease in water source requirements and seawater discharge. Alternative 2 does not include the seawater features. Alternative 3 would result in no additional demand for water source requirements and seawater discharge.

2.2.2 Conformance with Public Plans and Policies

State of Hawai‘i

Chapter 343, Hawai‘i Revised Statutes

Compliance with this chapter is effected, as described in Section 5.1.1 in regard to the proposed project and the alternatives discussed.

- State Land Use Law, Chapter 205, Hawai‘i Revised Statutes

  The discussion in Section 5.1.2 is directly applicable to Alternative 1, the proposed project. Alternative 1 will involve a setback of 400 feet that increases to 600 feet along the southern portion of the project site’s shoreline area. Alternative 2 does not provide for such a setback, but may still require approvals from DLNR for cultural, recreational, and community uses and structures within the Conservation district.

- Coastal Zone Management Program, Chapter 205A, Hawai‘i Revised Statutes

  Recreational Resources:

  In addition to the discussion of consistency with the associated objective and policies, as described in Section 5.1.3, the reduction from the proposed project’s 800-slip marina to a 400-slip marina under Alternative 1 will still expand the region’s boating opportunities and support facilities. The existing harbor entrance will still be utilized under this alternative; however, potential risks relating to boat traffic and congestion in the marina entrance area will be reduced significantly. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities, and marine science center remain important recreational components under Alternative 1.

Alternative 2 includes a golf course component, which would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Alternative 2, like the proposed project, will expand the region's boating opportunities and support facilities through its 800-slip marina. However, the potential adverse impacts of increased boat traffic from the size of the marina are significant enough to offset the benefits of increased boating opportunities.

Coastal Ecosystems:

The discussion in Section 5.1.3 is directly applicable to Alternative 1.

Alternative 1 not only reduces the number of slips proposed by 50 percent, but it also reduces the size of the marina from 45 acres to 25 acres. The 25-acre marina will increase the body of water within the existing harbor, but to a significantly lesser extent than the proposed project's estimated increase, which is also applicable to the 45-acre size that is proposed for the marina under Alternative 2.

The findings of the Harbor Water Quality Modeling Study conclude that a reduction in the size of the harbor expansion is an alternative that will mitigate the risk of significant impacts upon water quality within the marina and existing harbor. Accordingly, the reduction in both the number of slips and the size of the marina basin under Alternative 1, in combination with proper facilities design, public education, and enforcement of harbor rules and regulations, would result in fewer long-term impacts to water quality and coastal ecosystems. Short-term (construction-related) impacts would likely remain the same although the reduction in the total acreage of excavation is expected to result in a shorter duration of such impacts.

In addition to its 800-slip marina and potential adverse impacts upon water quality and the marine environment, Alternative 2 includes a golf course component, which has the potential to impact coastal ecosystems by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Economic Uses

Although reduced in the number of slips, the smaller marina under Alternative 1 will nevertheless serve public demand for more boating facilities in West Hawai‘i and is consistent with the objective and policies and discussion set forth in Section 5.1.3. The economic impacts of Alternative 2, while comparable to those of the proposed project's marina development, are notably marginal as to the golf course component, based on the marketability analysis that indicates a condition of saturation within the region.

Coastal Hazards

The discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Tsunami risks mainly affect the large shoreline setback area that is proposed for the project and Alternative 1. Alternative 2 projects a transient accommodation site that is partially within the tsunami hazard zone and thus carries a higher hazard risk. However, the essential requirement for these alternatives, as well as the proposed project, is a well-prepared and properly implemented evacuation plan.

Beach Protection

Discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Alternative 1 and, to a lesser extent, Alternative 2, will retain the shoreline area in its natural condition.

Similar to the proposed project, Alternative 1 provides for a shoreline setback of considerable width within which no structure, except for possible culturally-related structures, would be allowed. Alternatives 1 and 2 will thus be designed to avoid erosion of structures and minimize interference with natural shoreline processes.

Marine Resources

The discussion in Section 5.1.3 is also applicable to Alternative 1 which is described to be an alternative that is specifically projected to mitigate anticipated adverse impacts on water quality and the marine environment that might otherwise result from the original harbor design and scale, which is also incorporated in Alternative 2 . The reduced marina size under Alternative 1 is projected to meet water quality standards and enable greater compliance with the objective and policies addressed in this section.

Alternative 2 includes a golf course component and thus the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Hawai'i State Plans, Chapter 226, Hawai'i Revised Statutes

Section 226-4 (State goals), 5 (Objectives and policies for population, and 6 (Objective and policies for economy in general):

The discussion in Section 5.1.4 is applicable to Alternatives 1 and 2, in addition to the proposed project. These development concepts generally conform to the goals, objectives, and policies set forth in these sections because they will provide some degree of economic viability, stability, and sustainability for future generations. Kona Kai Ola will convert essentially vacant land into a mixed-use development with a distinctive marina and boating element, providing a wide range of recreational, business, and employment opportunities to the community.

Section 226-8 Objective and policies for the economy – the visitor industry:

Alternatives 1 and 2 will be consistent with the State's economic objective and policies relating to the tourism industry for the same reasons that are discussed in regard to the proposed project in Section 5.1.4. They will incorporate JDI's commitment to sustainability principles in the planning and design of the development concepts in Alternatives 1 and 2. Although the total hotel and time-share unit count is reduced to approximately 1,500 in Alternatives 1 and 2, the transient accommodations component of these alternatives will still further the State's objective and policies for increased visitor industry employment opportunities and training, foster better visitor understanding of Hawai'i's cultural values, and contribute to the synergism of this mixed-use project concept that addresses the needs of the neighboring community, as well as the visitor industry.

Section 226-11 Objectives and policies for the physical environment: land-based, shoreline and marine resources:

Alternative 1 is expected to involve less potential adverse impacts upon these environmental resources than the proposed project. Likewise, and Alternative 2 would have less adverse impact because of its reduction in the size of the marina and in the total hotel and time-share unit count. Alternative 1 carries less potential risk to water quality and related impacts upon the marine environment and anchialine pool ecosystems. Although approximately three anchialine pools are expected to be destroyed, the great majority of pools will be preserved within and outside of the proposed 400-foot shoreline setback.

The golf course component in Alternative 2 has the potential to impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the marina basin and nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools by introducing the chemicals into the pond systems.

Section 226-12 Objective and policies for the physical environment: scenic, natural beauty, and historic resources:

The discussion in Section 5.1.4 is directly applicable to Alternative 1 and describes the compliance with the objective and policies addressed.

The golf course component of Alternative 2 would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area.

Just as with the proposed project, Alternatives 1 and 2 would also be designed to blend with the natural terrain and to honor and protect the cultural history, resources, and practices of these lands.

Section 226-13 Objectives and policies for the physical environment: land, air and water quality:

As stated above, because of the reduction in both the number of slips and the size of the marina basin, with proper facilities design, public education and enforcement of harbor rules and regulations, Alternative 1 is anticipated to cause fewer long-term impacts to water quality than either the proposed project or Alternative 2. Based on the findings of the Harbor Water Quality Modeling Study, water quality resulting from a reduced marina basin size as proposed under Alternative 1 is expected to be similar to existing conditions.

As previously noted, Alternative 2 has the potential to adversely impact water quality by increasing the nutrient loading in surface runoff and groundwater by introducing pesticides, herbicides and other chemicals common in golf course development and maintenance into the marina basin and nearshore waters surrounding the project site.

Section 226-14 Objectives and policies for facility systems - general:

Alternatives 1 and 2 will conform to the objective and policies of this section on the grounds that are discussed in regard to the proposed project in Section 5.1.4. The master-planning and phasing of the project concepts under these alternatives will be coordinated with associated public and private infrastructural planning and related private and public infrastructural financing. The cost of the marina construction and project-related infrastructure is to be borne by the developer, resulting in considerable savings for the public. In addition, the projected lease revenue from these public lands will provide additional public benefits by establishing a revenue stream for capital improvements and maintenance of a range of State facilities.

Section 226-15 Objectives and policies for facility systems - solid and liquid wastes:

In addition to the developer's commitment to sustainable development design, the project will involve upgrades to the County of Hawai‘i's Kealakehe Wastewater Treatment Plant to meet current needs, as well as the project's future needs. This commitment is applicable to Alternatives 1 and 2, as well as the proposed project that is discussed in Section 5.1.4.

Section 226-16 Objectives and policies for facility systems – water:

The discussion of water conservation methods and the need to secure additional potable water sources in Section 5.1.4 is also applicable to Alternative 1 and demonstrates conformity to the objective and policies for water facilities. Alternative 2 involves greater irrigation demands in regard to its golf course component and greater potable water demands for human consumption than those for Alternative 1. Alternative 2 is expected to face more serious challenges in securing adequate and reliable sources of water.

Section 229-17 Objectives and policies for facility systems – transportation:

Alternatives 1 and 2 will conform to this objective and policies because they will present water transportation opportunities, including the possible use of transit water shuttles to Kailua-Kona, as described in regard to the proposed project in Section 5.1.4.

Section 226-18 Objectives and policies for facility systems – energy:

Alternatives 1 and 2 conform to these objective and policies through the use of energy efficient design and technology and commitment to the use and production of renewable energy to serve the project's needs. Solar energy production, solar hot water heating, and the use of deep cold seawater for cooling systems are currently identified as means of saving substantial electrical energy costs for the community and the developer.

Section 226-23 Objectives and policies for socio-cultural advancement – leisure:

Alternative 1 conforms to this objective and related policies for the reasons offered in Section 5.1.4 in regard to the proposed project. Alternative 1 will be of greater conformity with the policy regarding access to significant natural and cultural resources in light of the 400-600 foot shoreline setback that has been designed for this alternative.

Although it does not propose the considerable shoreline setback that is planned for Alternative 1, Alternative 2 is consistent with this objective and related policies in incorporating opportunities for shoreline-oriented activities, such as the walking trails. In addition, the golf course component adds a more passive recreation alternative to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Section 226-25 Objectives and policies for socio-cultural advancement-culture:

The discussion in Section 5.1.4 is relevant to Alternatives 1 and 2 and demonstrate their conformity the objective and policies of this section.

Both alternatives involve the preservation and protection of cultural features that have been identified by the Cultural Impact Assessment and archaeological studies for the project area. Both provide for public shoreline access, and both will continue the policy of close consultation with the local Hawaiian community and cultural and lineal descendants in the planning of cultural resource preservation and protection.

Section 226-103 Economic priority guidelines:

Alternatives 1 and 2 conform to these guidelines for the same reasons that are set forth in Section 5.1.4. They involve private investment in a public project that will create economic diversification through a mix of marina, industrial, commercial, visitor, and cultural facilities. This presents a wide range of entrepreneurial opportunities, long-term employment opportunities, and job training opportunities.

Section 226-104 Population growth and land resources priority guidelines:

As described in Section 5.1.4, the policy support for the proposed project also extends to the similar development concepts considered in Alternatives 1 and 2. Those alternatives conform to the guidelines of this section because they involve an urban development under parameters and within geographical bounds that are supported by the County's General Plan, a preliminary form of the Kona Community Development Plan, the County's Keahole to Kailua Regional Development Plan, and the reality of being located along the primary commercial/industrial corridor between Keahole Airport and Kailua-Kona. As with the proposed project, the development concepts of Alternatives 1 and 2 are essentially alternatives for the implementation and "in-filling" of the urban expansion area in North Kona.

DHHL Hawai‘i Island Plan

This 2002 plan projects DHHL's Honokōhau makai lands for commercial use. As compared to the proposed project and Alternative 2, Alternative 1 presents an expanded commercial component that provides greater compliance with the plan, while addressing certain beneficiaries' concerns about the scale of the marina originally required in the Project. Alternative 2 also conforms to the recommended commercial uses in the makai lands but to a lesser degree than Alternative 1 because of its more limited commercial component. Like the proposed project, its marina size and number of slips raise environmental issues, as more specifically discussed in Part 3, and community concerns.

County of Hawai‘i General Plan

HCGP Section 4 – Environmental Quality Goals, Policies and Courses of Action:

Alternative 1 is consistent with this section. It presents a reduction in both the number of slips and the size of the marina basin that, in combination with proper facilities design, public education and enforcement of harbor rules and regulations, would result in very few long term impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions.

Alternative 2 is the least consistent with this section. In addition to the potential significant impacts of its 800 slip marina basin, its golf course component has the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides and other chemicals common in golf course use and management into the nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools beyond their current conditions by introducing such substances into the pool systems.

HCGP Section 7 – Natural Beauty Goals and Policies:

Alternative 2 conforms to some degree with this section. Its golf course component would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area, as demonstrated in other makai golf courses within the region.

HCGP Section 8 – Natural Resources and Shoreline:

Alternative 1 is most consistent with the goals and policies of this section. It would require considerably less marina excavation than the proposed project and Alternative 2 and would reduce the potential risk of long-term adverse impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions with the degree of reduction in marina basin size that is proposed under Alternative 1. This reduction is also expected to reduce potential impacts upon anchialine pools and their ecosytems, as well as shoreline and marine resources that are affected by water quality. Alternative 1 also retains the shoreline preservation and protection concepts that are proposed in and described for the Project.

HCGP Section 10 – Public Facilities Goals and Policies:

The discussion in Section 5.2.1. in relation to the proposed project is applicable to Alternatives 1 and 2. Improvements to public facilities are are integral to the Kona Kai Ola development. The provision of additional boat slips and numerous road improvements, including a makai extension of Kuakini Highway south to Kailua-Kona are incorporated into plans for the project's development. In light of these elements, Alternatives 1 and 2 are consistent with the goals and policies of this section.

HCGP Section 11 – Public Utility Goals, Policies:

As with the proposed project, Alternatives 1 and 2 are consistent with the goals and policies of this section, based on the relevant grounds set forth in Section 5.2.1. The developer is committed to design, fund, and develop environmentally sensitive and energy efficient utility systems to the extent possible, as described previously in Part 5. Its master planning provides for the coordinated development of such systems with the objective of achieving significant savings for the public. As previously-mentioned example, the project development involves the upgrading of the Kealakehe Wastewater Treatment Plant.

HCGP Section 12 – Recreation:

Alternative 1 is consistent with the goals, policies, and courses of action for North Kona in this section.

Although the number of slips is reduced under Alternative 1, the region's boating opportunities and support facilities will still be expanded. The existing marina entrance would still be utilized under this alternative. However, concerns relating to increased activity leading to increased congestion in the marina entrance area would be mitigated to a certain extent. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities and marine science center remain important components of Alternative 1.

The golf course component of Alternative 2 would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola. Alternative 2 is also considered to be consistent with this section.

HCGP Section 13 and 13.2 – Transportation:

The reduced marina component under Alternative 1 will still provide transportation opportunities and provide for possible use of transit water shuttles to Kailua-Kona, although to a lesser degree than under the proposed project and Alternative 2 . However, in each scenario, internal people-movers are planned, and numerous roadway improvements are planned for coordination with public agencies, including but not limited to the construction of the Kuakini Highway extension between Honokōhau and Kailua-Kona. Accordingly, both Alternatives 1 and 2 are consistent with the goals, policies, and courses of action for North Kona under these sections of the General Plan.

HCGP Section 14.3 – Commercial Development:

For the reasons presented in the discussion under Section 226-104 of the State Plan, the planned commercial component under Alternatives 1 and 2 are consistent with this section.

HCGP Section 14.8 – Open Space:

Alternatives 1 and 2 are consistent with the goals and policies of this section. Alternative 1 provides a considerable (400-600 foot) shoreline setback along the entire ocean frontage of the project site as a means of protecting the area's scenic and open space resources, as well as natural and cultural resources. Although it does not incorporate the shoreline setback planned in Alternative 1, Alternative 2 provides a golf course component would contribute to the amount of open space that is currently proposed and allow additional view corridors to be created.

Community Development Plans

Community development plans are being formulated for different regions in the County in order to supplement the County's General Plan. The Kona Kai Ola project is located in the Kona Community Development Plan (CDP) area. Maps associated with the preliminary work phases

of the Kona CDP include the Kona Kai Ola project site within the “Preferred Urban Growth” boundary of the North Kona district. The Kona CDP process is guided by a Steering Committee composed of a broad cross-section of the community. The Steering Committee will eventually complete its work and recommend the CDP’s adoption.

After the DEIS was published, the Kona CDP has progressed to the development of plans for the major urban growth corridor north of Kailua-Kona. The Kona CDP has produced a draft plan showing a transit oriented development that includes a midlevel public transit corridor along the mauka residential elevation, and a makai transit corridor that runs along a proposed new frontage road just makai and parallel to Queen Kaahumanu Highway. The development plan for Alternative 1 includes the Kuakini Highway as part of this proposed frontage road and transit line from Kailua Kona to the Kealakehe area, along with a transit stop at Kona Kai Ola. The Alternative 1 plan also includes a road that could be extended to be part of the proposed frontage road should it be approved and implemented. In addition, the Kona CDP has continued to emphasize the principles of smart growth planning with mixed use urban areas where people can live, work, play and learn in the same region. Kona Kai Ola has been specifically designed to be consistent with this policy in order to provide a stable employment base close to where people live in the mauka residential areas already planned for DHHL and HHFDC lands.

It should be noted that currently and over the years, the 1990 Keāhole to Kailua Development Plan (K-to-K Plan) guides land use actions by the public and private sectors. It is intended to carry out the General Plan goals and policies related to the development of the portion of North Kona area, including the Kona Kai Ola site. The “Preferred Growth Plan” of the Keāhole to Kailua Development Plan identifies the project site as a new regional urban center to include commercial, civic, and financial business related uses, an expanded “Harbor Complex,” a shoreline road, and a shoreline park. The proposed project and the development concepts in Alternatives 1 and 2 are therefore consistent with the recommendations in the Keāhole to Kailua Development Plan.

Hawai‘i County Zoning

As shown on Figure AA, the project site is zoned “Open”. Under Section 25-5-160 of the Hawai‘i County Code, “The O (Open) district applies to areas that contribute to the general welfare, the full enjoyment, or the economic well-being of open land type use which has been established, or is proposed. The object of this district is to encourage development around it such as a golf course and park, and to protect investments which have been or shall be made in reliance upon the retention of such open type use, to buffer an otherwise incompatible land use or district, to preserve a valuable scenic vista or an area of special historical significance, or to protect and preserve submerged land, fishing ponds, and lakes (natural or artificial tide lands)”.

Some of the proposed uses at Kona Kai Ola are permitted uses in the Open zone such as:

- Heiau, historical areas, structures, and monuments;
- Natural features, phenomena, and vistas as tourist attractions;
- Private recreational uses involving no aboveground structure except dressing rooms and comfort stations;

- Public parks;
- Public uses and structures, as permitted under Section 25-4-11.

In addition to those uses permitted outright, the following uses are permitted after issuance of a use permit:

- Yacht harbors and boating facilities; provided that the use, in its entirety, is compatible with the stated purpose of the O district.
- Uses considered directly accessory to the uses permitted in this section shall also be permitted in the O district.

The proposed time-share and hotel units and commercial uses would not be consistent with the zoning designation of "Open". Project implementation therefore requires rezoning of portions of the project to the appropriate zoning category or use permits for certain uses.

Special Management Area

As shown in Figure AB, the entire project area up to the highway is within the coastal zone management zone known as the Special Management Area ("SMA"). At the County level, implementation of the CZM Program is through the review and administering of the SMA permit regulations. Kona Kai Ola complies with and implements the objectives and policies of the Coastal Zone Management (CZM) Program, and a full discussion is provided in Section 5.1.3. The development concepts in the proposed project and Alternatives 1 and 2 will be subject to applicable SMA rules and regulations.

Linda Lingle

Testimony of Kaniela Guieb

I strongly recommend they do not do the Kona Kai Ola project. This project consists of a new marina, three hotels, and several lagoons. I do not want this project to happen because it is not good for the environment. This is where I fish and I don't want this spot developed. There are also 22 anchaline pools on the site and if they decide to develop on this sight they will destroy the ponds and the environment for many animals. Also in the spot that this project will take place there are lots of native plants. Native plants cannot be replanted effectively. I don't think they should blow up the plants that have been living there. In this area there is also Hawaiian artifacts like petroglyphs and other things. They should not destroy our history. They are also going to make three hotels there, which will affect the traffic in Kailua-Kona. There is already bad traffic. The proposed road will not help, because the development will bring too much traffic for even the new road to handle. There will also be boat traffic because they are going to use the same entrance as Honokohau. This is entrance is used by my friend that paddle kayaks; more boat traffic would make that too dangerous. Kona is a place that I want to live when I am older, but with this kind of development it will negatively impact the way of life in Kona. These are the reasons that I think that the Kona Kai Ola project should not happen. Thank you.

July 23, 2007

Kaniela Guieb
c/o West Hawaii Explorations Academy
73-4460 Queen Kaahumanu Hwy, Ste. 105
Kailua-Kona, HI 96740

Dear Mr. Guieb:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are given below.

The development of Kona Kai Ola is broader than providing accommodations for tourists. The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, Jacoby Development, Inc. (JDI) will protect natural resources through the various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities such as parks, other recreational facilities, and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community.

In response to Draft Environmental Impact Statement (DEIS) comments and to further study the pools south of the entrance channel of Honokohau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2 of the Environmental Impact Statement (EIS) and is summarized in EIS Sections 3.9.2.1 and 3.9.2.2. In addition, further comment on the groundwater hydrology effects on anchialine pools was prepared by Waimea Water Services and is contained in Appendix G-3 of the EIS.

The DEIS identified 22 anchialine pools. Further studies determined that three of these pools are actually part of an estuary complex with direct connection to the ocean. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the

19 anchialine pools, three pools with a combined surface area of 20 m^2 would be eliminated due to the harbor construction.

While the second survey confirmed the presence of direct human use and disturbance, such as trash receptacles and toilet facilities, it found that the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickelweed and mangrove.

The additional studies indicate that the remaining pools may not increase in salinity to levels unhealthy for anchialine pool fauna. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will either be the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally, but is not quantified at this time.

Hence, the additional studies found that changes in groundwater quality may, or may not, impact biological communities in the anchialine and estuarine environment. In either case, the developer is committed to practicing good stewardship over the pools to be preserved and eliminating or reducing alien species to the extent practicable. The developer recognizes it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Mitigation measures to facilitate the long term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on these environments can be measured.

The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment, and possible new pools. These measures are described in detail in EIS Section 3.9.2, Anchialine Pools.

Every effort will also be made to protect, preserve and improve the anchialine pools to the south of the harbor. Two additional studies were conducted in response to DEIS comments, including your comments, and these additional studies are summarized in EIS Section 3.9.2 and presented in Appendices G-3 and H-2.

These additional studies indicated that with the construction of the new harbor basin, the anchialine pools makai of the proposed basin may not necessarily be negatively impacted by the construction of the proposed project.

In addition, these studies determined that there are mechanisms to mitigate potential impacts. Mitigation measures to facilitate the long term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. As a mitigation measure, bioretention, which is a Best Management Practice (BMP), is a highly appropriate application for the proposed development to prevent any nonpoint source pollution of groundwater. Another mitigation measure that may be included in the management plan is salinity adjustment of the anchialine pools to maintain healthy habitat for the anchialine ecosystem by surcharging man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water.

A flora study was conducted to assess impacts from this development on plants at the site. The report is included as Appendix E in the EIS. Out of the 42 plant species observed during the survey, only three species are endemic to Hawaii and nine species are indigenous to Hawaii and other Pacific Islands. The study concluded that the proposed development will not cause significant impacts on the plants in the area. A 400-foot wide strip of land extending back from the shoreline will be protected as there are native species dominating the area.

An extensive archaeological investigation was conducted during the preparation of the DEIS. Numerous sites both in the Department of Natural Resources (DLNR) and Department of Hawaiian Home Lands (DHHL) land were identified and inventoried. The complete report is included in the EIS, Appendices M-1 and M-2. The archeological study identified eleven sites as culturally significant based on the presence of burials or ritual architecture. Fifty four sites were mapped, photographed and documented. Forty seven sites were recommended through data recovery. Detailed data recovery plans will be prepared for the State Historic Preservation Division (SHPD) of DLNR for review and approval.

In order to reduce traffic impacts from the development the developer will provide funds to improve and modify roadways, traffic signals and other improvements. The roadway system will also be improved beyond mitigation for project-related impacts. In Phase 1 of the project, JDI will not only provide access to the commercial parcel, but also address regional traffic issues through the improvements of the roadway system. JDI plans to improve the intersection of the Queen Ka‘ahumanu Highway and the Kealakehe WWTP Access Road. The Kealakehe WWTP Access Road is planned to be realigned and widened to an 80-foot road right-of-way (ROW) that will serve the Commercial Parcel No. 1 and eventually intersect with the proposed Kuakini Highway Extension to the west. Such improvements will ensure that the project minimizes its own impacts while improving existing conditions. Further, with development of Kona Kai Ola, the Kuakini Highway extension road is anticipated to be built on a more accelerated schedule than it would occur without the Kona Kai Ola project.

The EIS has been revised to include information from these additional studies, and Attachment 1 contains Section 3.9.2, Anchialine Pools.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

The conditions with the project constructed were found to be phosphorous limited. Several simulations were performed including and excluding the inflow from the marine exhibits which provides an additional nitrogen load and also varying the location of this inflow. It was found that the inflow from the marine exhibits can have a beneficial effect on flushing, especially when positioned within the existing harbor basin. However, its effect is significantly less than the effect due to the brackish groundwater inflow. When the exhibit inflow is excluded or positioned at the east end of the new marina, its effect is small in terms of flushing due to its high salinity. From a water quality perspective, since the loads from the exhibit inflow consist primarily of nitrogen, it does not cause increased algae growth. However, this exhibit inflow does raise the concentrations of ammonia and nitrate in the system.

Simulation results indicate that under the conditions when the post-expansion system receives an additional brackish inflow into the new 25-acre marina on the order of 30 mgd or more, water quality within the harbor system and in the surrounding waters remained similar to existing conditions. These conditions are expected to occur based on the findings reported by Waimea Water Services (2007), which states that the proposed marina would exhibit the same or similar flushing action as the existing marina.

An additional mitigation measure proposed by Waimea Water Services (2007), if sufficient inflow is not intercepted, consists of drilling holes in the bottom of the new marina to enhance this inflow and facilitate flushing within the proposed system.

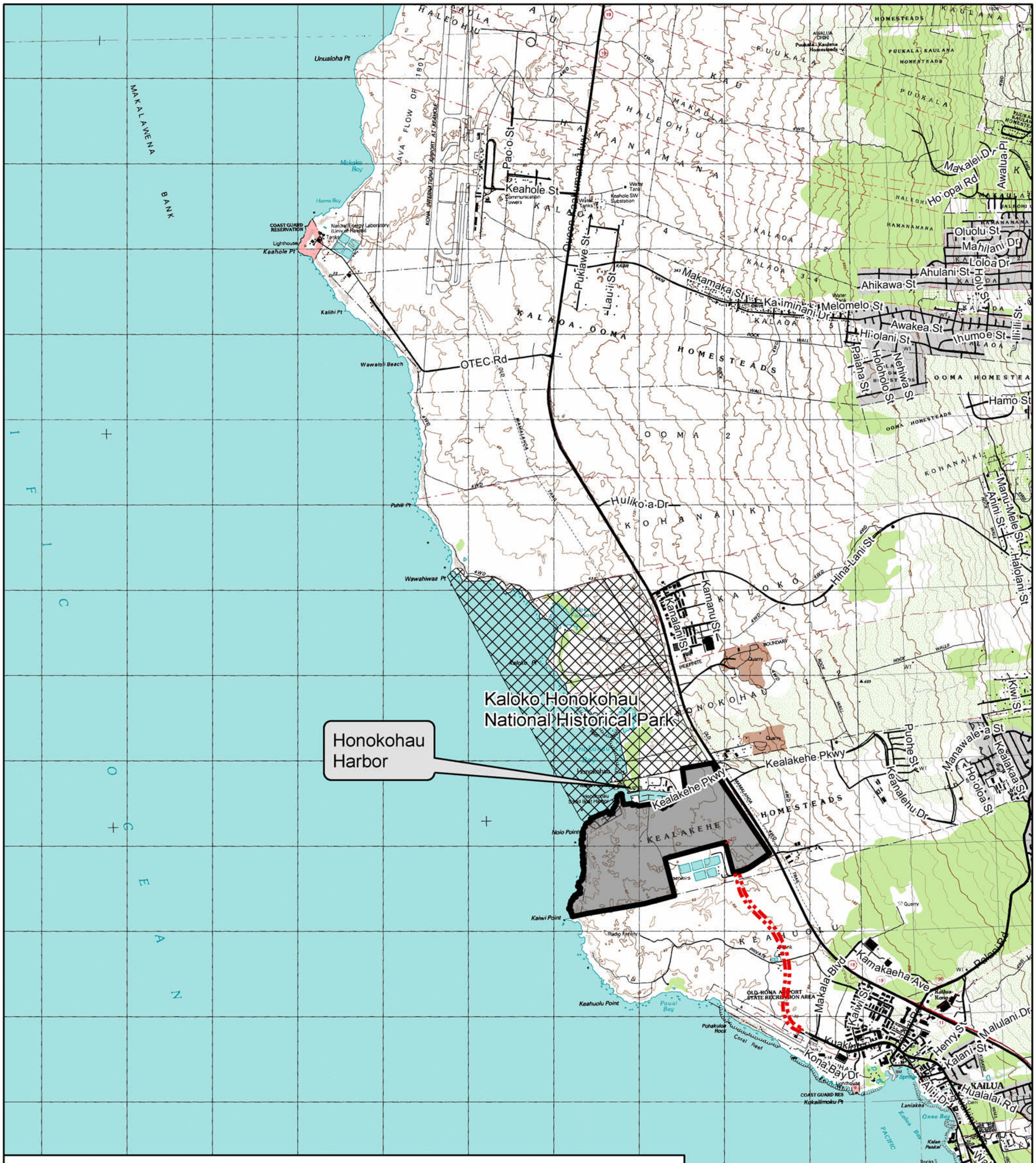
~~3.9.3~~3.9.2 Anchialine ~~Ponds~~ Pools

Two studies on anchialine pools were conducted in this EIS process. The anchialine ~~ponds~~ pools water quality studies and ~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute and is~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute in October 2006 and are included as Appendix ~~G~~H-1. That survey included pools located both north and south of Honokōhau Harbor. In response to DEIS comments and to further study the pools south of entrance channel of Honokōhau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2.

~~3.9.3.1~~3.9.2.1 Existing Conditions

Anchialine ~~ponds~~ pools exist in inland lava depressions near the ocean. Two anchialine ~~pond~~ pool complexes are located immediately to the north and south of the Honokōhau Harbor entrance channel. The complex to the north is located wholly within the designated boundaries of the Kaloko-Honokōhau National Historical Park as shown in Figure Q~~O~~. Many of the ~~ponds~~ pools in the southern complex are within the park administrative boundary as well. ~~Ponds~~ Pools in the northern complex show little evidence of anthropogenic impacts. Many contain typical vegetation and crustacean species in high abundance.

Figure R locates anchialine pools near the harbor entrance and pools~~Ponds~~ in the southern complex are depicted in Figure S.



Source: http://nrdata.nps.gov/kaho/kahodata/kaho_parkbndry_ply.zip

Figure Q: National Historical Park Service Legislative Boundary Map

Legend

- Project Site
- Proposed Parkway
- National Park Boundary

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JDI
JACOBY DEVELOPMENT, INC.

Source: Oceanic Institute

Figure R: Anchialine Pool Locations

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oceanit

JDI

JACOBY DEVELOPMENT, INC.

Source: Aquatic Resources Management And Design

Figure S: Anchialine Pool Locations in Southern Complex

Oceanit

JDI
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The 2006 study identified 22 pools in the southern complex. The 2007 study found that three of the 22 pools are part of an estuary complex with direct connection to the ocean. While there were several signs of direct human use and disturbance, such as trash receptacles and toilet facilities, the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickleweed and mangrove. ~~are moderately to heavily impacted, with many containing exotic fish that exclude the anchialine crustaceans. The ponds also show evidence of human impact, including discarded bottles, cans, wrappers, diapers, toilet paper, etc. Water quality conditions within the ponds generally reflect the conditions of the underlying groundwater.~~

~~Figure P locates anchialine ponds near the harbor entrance. The study conducted as a part of this EIS show that the anchialine ponds south of the harbor entrance are moderately to heavily impacted by human activities and introduced fish populations. The study found that the nitrogen phosphorus concentrations in these ponds are significantly higher compared to the ponds north of the harbor entrance. The sources of these additional nutrients are not known. Continuous influx of nutrients will eventually degrade the water quality to levels that could alter the pond ecology.~~

Biota surveys in the two pond systems clearly indicate that counts of typical pond denizens show a remarkable difference between the northern and southern ~~ponds~~ pools. In the northern ~~ponds~~ pools the number of *Halocaridina rubra* ranged from a low of 20–25 to too numerous to count. The biota rich pond bottoms appeared red due to the *Halocaridina rubra* numbers. The only other species visible was the predatory shrimp *Metabetaeus lohena*. In contrast, only four out of the 22 ~~ponds~~ pools examined in the southern pond complex showed a decreased presence of *Halocaridina rubra* (6 to 200) individuals in the pond, and three ~~ponds~~ pools contained *Metabetaeus lohena*. Eight of the ~~ponds~~ pools contained numbers of introduced minnows which is an apparent predator of *Halocaridina rubra* and *Metabetaeus lohena*.

The 2007 study found three of the pools identified in the 2006 study were part of an estuary complex with direct connection to the ocean, and that the southern complex contained 19 anchialine pools. The study further found that a majority of the southern pools are degraded biologically and physically, primarily due to the effects of introduced fish and plant species. Six pools are currently devoid of alien fish, but they face a high level of threat due to the proximity of pools that have these species. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction.

The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 ppt. and that the anchialine biology would then perish. There is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and final determination of anchialine salinity following the harbor construction. The assessment that all anchialine pools will be barren with the construction of the harbor may be premature. *Halocaridina rubra* (opae ula) are routinely drawn from high salinity wells at 30-32 ppt.

Within the 19 pools, native and non-native fauna included 14 species comprised of 5 fish, 2 mollusca, and 6 crustacea. Algae within the pools primarily consisted of a mixed assemblage of diatoms and cyanobacteria, with several pools dominated by matted filamentous *Cladophora*, sp. The darker cave/overhang pools and high tide pools had epilithic *Hildenbrandia* sp. covering the rock substrate. Riparian vegetation was dominated by introduced species consisting of Pickleweed (*Batis maritima*), Mangrove (*Rhyzophora mangle*), and Christmasberry (*Shinus terebenthifolius*). Only two species of native plants Akulikuli (*Sesuvium portulacastrum*) and Makaloa (*Cyperus laevigatus*) existed near the pools and comprised only few small patches and a single tuft (respectively).

Most of the hypogeal anchialine shrimp have adapted to the presence of minnows by foraging in the pools at night. During daylight hours, only the adult shrimp appear to coexist at low population levels with the smaller *P. reticulata*, but the larger *G. affinis* and *Oreochromis* prevent the daytime appearance of hypogeal shrimp due to predation.

The average salinity in Kealakehe pools is relatively high at 13.5 ppt compared to most other pools along the West Hawai'i coastline, having an average of approximately 7 ppt. This high salinity appears to be characteristic of this region, and is similar to the average of most pools within the adjacent ahupua'a of Honokōhau and Kaloko. The levels of nitrate-nitrogen levels are relatively high compared to other undeveloped areas, but fall in the range of some developed landscapes. Other water quality parameters, including pH and temperature, fall into normal ranges for anchialine pools.

This relatively high salinity is the likely reason aquatic insects were not found in any pools at Kealakehe. Though the rare damselfly *Megalagrion xanthomelas* has been observed and collected from Kaloko, a statewide assessment of its range has not found it to occur in water with salinity greater than 3ppt. However, there has been an unsubstantiated occurrence of the nymph in a pool of up to 8ppt (Polhemus, 1995).

Another species of concern is the hypogeal decapod shrimp *Metabetaeus lohena.* These shrimp are sometimes predatory on *H. rubra* but are more often opportunistic omnivores similar to *H. rubra.* Predusk and nocturnal sampling at high tide is clearly the optimal method to determine habitat range and population densities for this species. These shrimp were found in 13 of the 19 pools, 7 of which had *M. lohena* only at night. The occurrences of *H. rubra* were found in 16 of 19 sampled pools, 8 of which had 'Ōpae'ula observed only at night. Consequently, despite having numerous degraded anchialine resources at Kealakehe, there are opportunities for many of the pools to be restored and enhanced to a level where large populations of anchialine shrimp and other native species may return to inhabit the pools as they likely have in the past.

~~As mentioned earlier, the southern ponds also had elevated concentrations of nutrients indicating water quality degradation. These factors indicate that if no restoration or maintenance activities are instituted to reserve these ponds, these ecosystems will degrade beyond recovery.~~

~~3.9.3.2~~3.9.2.2 Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

The anchialine ~~ponds~~ pools that are located north of the existing harbor are not likely to be impacted because no development activities are proposed north of the existing harbor. It is highly unlikely that existing groundwater flows to the Kaloko-Honokōhau pond system to the north of the existing harbor will be impacted by the proposed marina to the south.

Of the 19 pools in the southern complex, three would be eliminated due to harbor construction. Regarding the remaining pools, the DEIS noted that t~~T~~he change in the local groundwater flow pattern in the vicinity of the proposed marina ~~will~~ would impact the anchialine ~~ponds~~ pools that are located between the proposed marina and the shoreline south of the harbor entrance. The 2006 study (Appendix H-1) noted that t~~T~~he salinity of the anchialine ~~ponds~~ pools ~~will~~ would increase due to reduction of brackish groundwater, and that ~~. Some ponds will be excavated to make the new harbor basin. T~~those ~~ponds~~ pools that are not excavated will revert to full salinity, causing the loss of their habitat. ~~and associated aquatic flora and fauna. However, current investigations indicate that these ponds are already enriched by nutrients and the density of associated aquatic fauna is very low. In addition, trash from visitors, and introduction of minnows has already degraded the pond ecology.~~ Even without the potential impacts from the proposed marina construction, the pond ecology might change irreversibly from the nutrient input, human indifference and expansion of non native fauna species.

Further studies conducted in response to DEIS comments (Appendix H-2, and Appendix G-3) indicate that the remaining pools may not increase in salinity to levels unhealthy for *H. rubra* and *M. lohena* and other anchialine pool fauna. In addition, these studies determined that there are realistic mechanisms employed elsewhere that would mitigate changes due to groundwater changes. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore.

Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented. The mitigation plan will be based on the following objectives:

Objective 1 To preserve, maintain, and foster the long-term health and native ecological integrity of anchialine pools at Kealakehe.

Objective 2 To protect and promote cultural practices and traditions surrounding anchialine resources at Kealakehe.

Objective 3 To provide education, interpretation, and interactive opportunities for the community to learn about and appreciate the anchialine resources.

Objective 4 To acquire a pond manager to implement the program, conduct monitoring, research, and reporting, and provide education to the community about anchialine and estuarine resources.

Mitigation measures to facilitate the long-term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on the environment can be measured. The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment and possible new pools.

As a mitigation measure, bioretention, which is a Best Management Practice (BMP) is a feasible application for the proposed development. There is a probability that nutrients and other potential pollutants will runoff landscaping and impermeable surfaces such as roadways and parking lots during medium or high rainfall events. Some of these pollutants could enter the groundwater table and into anchialine pools and ultimately the ocean. As an alternative to directing runoff into the ground through drywells, storm water should be directed into bioretention areas such as constructed surface or subsurface wetlands, vegetated filter strips, grass swales, and planted buffer areas. Storm water held and moved through these living filter systems are essentially stripped of most potential pollutants, and allowed to slowly infiltrate back to the groundwater table.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Another mitigation measure that may be included in the management plan is salinity adjustment. In the 2006 assessment regarding the impact to the southern pools from the proposed construction of the harbor, it was stated that this construction would cause the salinity in the anchialine pools to become equivalent to the ocean at 35ppt. It was then concluded that the anchialine biology would perish.

However, there is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and a final determination of anchialine salinity following the harbor construction. The dynamics of groundwater movement through a porous lava medium both seaward and laterally along the coastline is an inexact science. This is compounded by the variations in water density, including stratification of salinity within the proposed harbor and capillary movement of low-density surface water through the substrata.

The assessment that all anchialine pools will be barren with the construction of the harbor may therefore be premature. *H. rubra* are routinely drawn from high salinity wells at 30 – 32 ppt and survive in this salinity for years. Further, high populations *H. rubra* and *M. lohena* have thrived and reproduced in pool salinities of 27ppt. If the pools do become full strength seawater at 35ppt, there exists uncertainty on the long-term effects to anchialine organisms, since there are no long-term studies or examples of native anchialine ecosystems at 35ppt. Native anchialine pool vegetation also has relatively high salinity tolerance.

If the salinity were expected to rise to 35 ppt, possible mitigation in the management plan will include methods to surcharge man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water. If sufficient volume is used, it is theoretically possible to lower salinity in adjacent natural anchialine pools. This surcharge method has been successfully used to raise salinity in anchialine pools and cause the salinity rise in adjacent pools of at least up to 10 meters away. Surcharging with low salinity should work as well or better since the lower density water will essentially float atop the higher salinity water at the surface layer, and move throughout the complex of natural pools. Surcharging may also be a viable mitigation to dilute and more rapidly disperse any pollutants that may be detected in the pools.

Another mitigation measure includes the creation of new anchialine pools. There is significant opportunity to create new anchialine pools and greatly expand the native habitat and resource. It has been demonstrated at several projects in West Hawaiʻi that anchialine pools can be created and will be colonized with a full compliment of anchialine species endemic to the area. Anchialine pools are considered focal points of higher productivity relative to the subterranean groundwater habitat around them. Their productivity promotes an increase in population levels of anchialine species within the pools themselves and throughout the subterranean habitat surrounding them.

~~No realistic mechanisms are envisioned for re-injecting fresh water into these systems to maintain their ecological balance as an anchialine system. These ponds will be changed from a brackish water system to a marine system. But, those ponds in the area of the shoreline park and cultural park will be cleaned of vegetation and protected from other physical alteration. A buffer zone around these newly established marine ponds will be protected as well.~~

~~The anchialine pond shrimp (*Metabetaeus lohena)* and the orangeback damsel fly (*Megalagrion xanthomelas)* are listed as candidate endangered species in the Federal Register and were both recorded in surveys of these anchialine ponds done in 2004 by US Geological Survey Biological Resources Division and the NPS Inventory and Monitoring Program. Low numbers of *Metabetaeus lohena* were encountered in three of the 22 ponds surveyed in the southern pond complex. *Megalagrion xanthomelas* was not encountered in any of the southern pond complex ponds during the recent study. The low density of *Metabetaeus lohena* and the observed absence of *Megalagrion xanthomelas* may be due to the impacts from high nutrient input and general degradation of the ponds.~~

~~An attempt should be made to move as much of the existing population of *Metabetaeus lohena* from these anchialine ponds before they become too saline, to possible newly excavated ponds that may be developed off-site. These shrimp should not be introduced into existing populated ponds to avoid any potential pathogenic impacts to the healthy ponds.~~

~~Public education on the unique ecology of the anchialine ponds and the need for preserving their ecology will reduce future human impacts in other healthy ponds.~~

~~Further recommended mitigation includes restoration to degraded anchialine ponds off the project site, preferably those located at the adjacent Kaloko-Honokōhau National Historical Park.~~

Testimony of Katie Clemons

Oppose the Kona Kai Ola Harbor Development

No, I do not agree on the topic that the harbor idea should be developed because of these eight reasons: (1) it is not good for the sea life, like Hawaiian green sea turtles and the other animals that live there, (2) it is super close to the national park as well, (3) there will be more noise and more people, (4) people could disturb the sea life, (5) it is wrong to have unnatural lagoons that will have sharks, turtles, manta rays and one for people to swim in, (6) it would be dangerous for 3 hotels and for so many people and kids running around the lagoons they could fall in one of them, (7) there would be to many boats running all over that could hurt someone or something and (8) I do not think that the idea of having sea animals in a lagoon is natural they should be in the sea!!!

July 23, 2007

Katie Clemons
c/o West Hawaii Explorations Academy
73-4460 Queen Kaahumanu Hwy, Ste. 105
Kailua-Kona, HI 96740

Dear Ms. Clemons:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are given below.

The development of Kona Kai Ola is broader than providing accommodations for tourists. The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, Jacoby Development, Inc. (JDI) will protect natural resources through the various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities such as parks, other recreational facilities, and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community.

Numerous studies were conducted to assess existing resources status, impacts from development, and possible actions to mitigate these impacts. Studies included impacts on marine animals, noise, nearshore impacts, and other impacts. The lagoon will be managed by aquaria experts who will minimize impacts to animals and visitors.

A complete marine acoustics study was completed in response to comments received on the Draft Environmental Impact Statement (DEIS). The report is included in Appendix T-2. The model results showed that the noise levels in the developed scenario did not exceed the Level A impacts to marine mammals. Level B impacts to marine mammals and sea turtles generally occur within a range of ten meters. Although noise impacts may occur during blasting the new marina, these impacts could be greatly minimized by using good blasting practices. These are addressed in detail in the Environmental Impact Statement (EIS).

Management of habitats within lagoons is a question of aquaria technology and fish husbandry. The limiting criteria in aquaria is typically water quality, with habitat design more a matter of providing the correct physical habitat (sand, coral, rock, caves, etc.) in an ecologically balanced, aesthetically pleasing, fashion. The display type of animals has not been finalized at this time. The superb water quality, and low turn overtime in the lagoons will preclude the necessity of filtration. Professional aquarists and staff will manage the lagoon features and associated educational activities from the Marine Science offices adjacent to the upper lagoon.

Every effort will also be made to protect, preserve, and improve the anchialine pools to the south of the harbor. Two additional studies were conducted in response to DEIS comments, including your comments, and these additional studies are summarized in EIS Section 3.9.2, Anchialine Pools, and presented in Appendices G-3 and H-2.

These additional studies indicated that with the construction of the new harbor basin, the anchialine pools makai of the proposed basin may not necessarily be negatively impacted by the construction of the proposed project.

The EIS has been revised to include information from these additional studies, and Attachment 1 contains Section 3.9.2, Anchialine Pools.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

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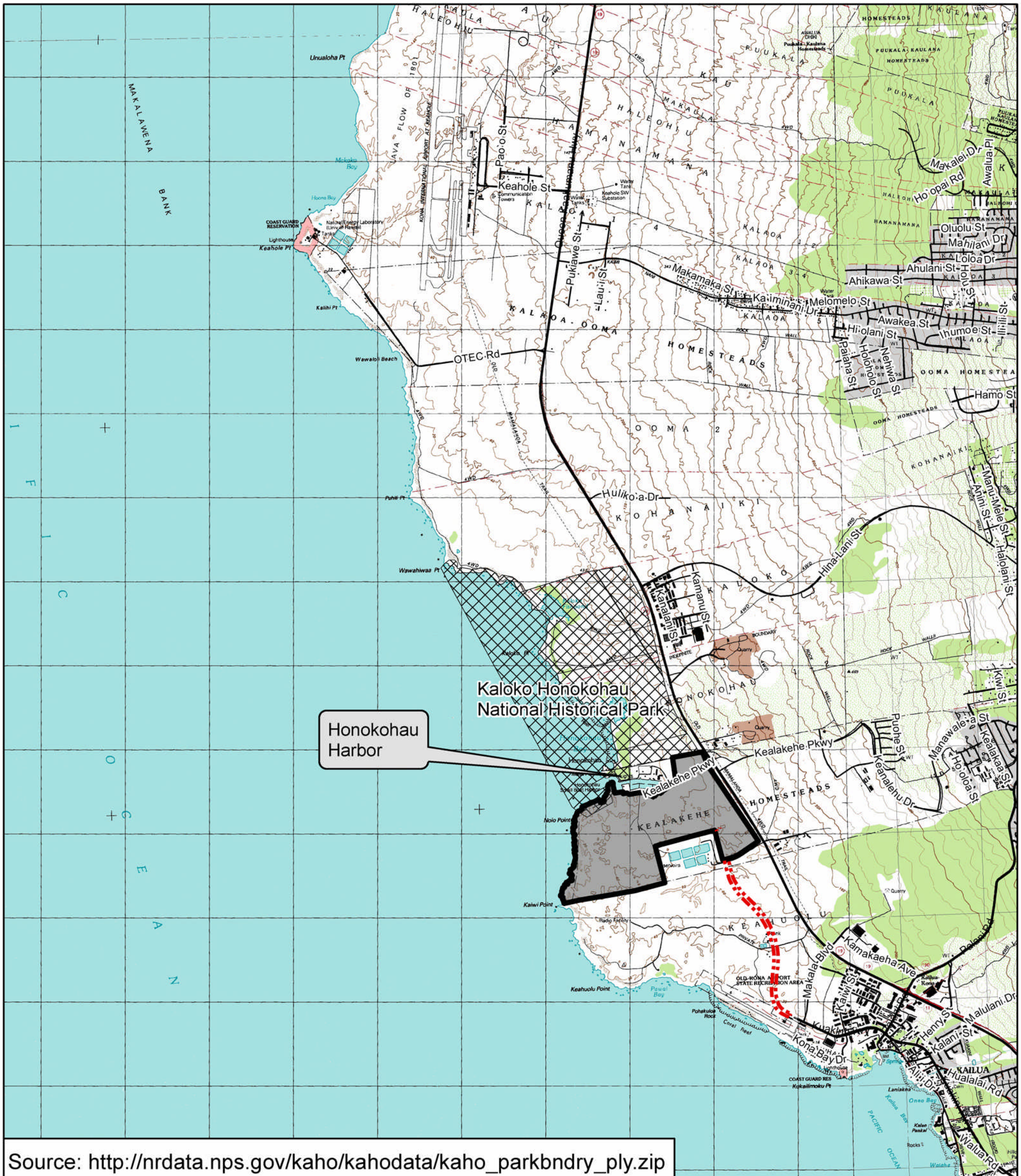

Source: http://nrdata.nps.gov/kaho/kahodata/kaho_parkbndry_ply.zip

Figure Q: National Historical Park Service Legislative Boundary Map

Legend

- Project Site
- Proposed Parkway
- National Park Boundary

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innovation through engineering & scientific excellence

JDI
JACOBY DEVELOPMENT, INC.

Source: Oceanic Institute

Figure R: Anchialine Pool Locations

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0 2,000 4,000 Feet

oceanit

JDI

JACOBY DEVELOPMENT, INC.

Source: Aquatic Resources Management And Design

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oceanit

JDI

JACOBY DEVELOPMENT, INC.

The 2006 study identified 22 pools in the southern complex. The 2007 study found that three of the 22 pools are part of an estuary complex with direct connection to the ocean. While there were several signs of direct human use and disturbance, such as trash receptacles and toilet facilities, the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickleweed and mangrove. ~~are moderately to heavily impacted, with many containing exotic fish that exclude the anchialine crustaceans. The ponds also show evidence of human impact, including discarded bottles, cans, wrappers, diapers, toilet paper, etc. Water quality conditions within the ponds generally reflect the conditions of the underlying groundwater.~~

~~Figure P locates anchialine ponds near the harbor entrance. The study conducted as a part of this EIS show that the anchialine ponds south of the harbor entrance are moderately to heavily impacted by human activities and introduced fish populations. The study found that the nitrogen phosphorus concentrations in these ponds are significantly higher compared to the ponds north of the harbor entrance. The sources of these additional nutrients are not known. Continuous influx of nutrients will eventually degrade the water quality to levels that could alter the pond ecology.~~

Biota surveys in the two pond systems clearly indicate that counts of typical pond denizens show a remarkable difference between the northern and southern ~~ponds~~ pools. In the northern ~~ponds~~ pools the number of *Halocaridina rubra* ranged from a low of 20–25 to too numerous to count. The biota rich pond bottoms appeared red due to the *Halocaridina rubra* numbers. The only other species visible was the predatory shrimp *Metabetaeus lohena*. In contrast, only four out of the 22 ~~ponds~~ pools examined in the southern pond complex showed a decreased presence of *Halocaridina rubra* (6 to 200) individuals in the pond, and three ~~ponds~~ pools contained *Metabetaeus lohena*. Eight of the ~~ponds~~ pools contained numbers of introduced minnows which is an apparent predator of *Halocaridina rubra* and *Metabetaeus lohena*.

The 2007 study found three of the pools identified in the 2006 study were part of an estuary complex with direct connection to the ocean, and that the southern complex contained 19 anchialine pools. The study further found that a majority of the southern pools are degraded biologically and physically, primarily due to the effects of introduced fish and plant species. Six pools are currently devoid of alien fish, but they face a high level of threat due to the proximity of pools that have these species. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of 20m^2 would be eliminated due to the harbor construction.

The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 ppt. and that the anchialine biology would then perish. There is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and final determination of anchialine salinity following the harbor construction. The assessment that all anchialine pools will be barren with the construction of the harbor may be premature. *Halocaridina rubra* (opae ula) are routinely drawn from high salinity wells at 30-32 ppt.

Within the 19 pools, native and non-native fauna included 14 species comprised of 5 fish, 2 mollusca, and 6 crustacea. Algae within the pools primarily consisted of a mixed assemblage of diatoms and cyanobacteria, with several pools dominated by matted filamentous *Cladophora*, sp. The darker cave/overhang pools and high tide pools had epilithic *Hildenbrandia* sp. covering the rock substrate. Riparian vegetation was dominated by introduced species consisting of Pickleweed (*Batis maritima*), Mangrove (*Rhyzophora mangle*), and Christmasberry (*Shinus terebenthifolius*). Only two species of native plants Akulikuli (*Sesuvium portulacastrum*) and Makaloa (*Cyperus laevigatus*) existed near the pools and comprised only few small patches and a single tuft (respectively).

Most of the hypogeal anchialine shrimp have adapted to the presence of minnows by foraging in the pools at night. During daylight hours, only the adult shrimp appear to coexist at low population levels with the smaller *P. reticulata*, but the larger *G. affinis* and *Oreochromis* prevent the daytime appearance of hypogeal shrimp due to predation.

The average salinity in Kealakehe pools is relatively high at 13.5 ppt compared to most other pools along the West Hawai‘i coastline, having an average of approximately 7 ppt. This high salinity appears to be characteristic of this region, and is similar to the average of most pools within the adjacent ahupua’a of Honokōhau and Kaloko. The levels of nitrate-nitrogen levels are relatively high compared to other undeveloped areas, but fall in the range of some developed landscapes. Other water quality parameters, including pH and temperature, fall into normal ranges for anchialine pools.

This relatively high salinity is the likely reason aquatic insects were not found in any pools at Kealakehe. Though the rare damselfly *Megalagrion xanthomelas* has been observed and collected from Kaloko, a statewide assessment of its range has not found it to occur in water with salinity greater than 3ppt. However, there has been an unsubstantiated occurrence of the nymph in a pool of up to 8ppt (Polhemus, 1995).

Another species of concern is the hypogeal decapod shrimp *Metabetaeus lohena.* These shrimp are sometimes predatory on *H. rubra* but are more often opportunistic omnivores similar to *H. rubra.* Predusk and nocturnal sampling at high tide is clearly the optimal method to determine habitat range and population densities for this species. These shrimp were found in 13 of the 19 pools, 7 of which had *M. lohena* only at night. The occurrences of *H. rubra* were found in 16 of 19 sampled pools, 8 of which had ‘Ōpae‘ula observed only at night. Consequently, despite having numerous degraded anchialine resources at Kealakehe, there are opportunities for many of the pools to be restored and enhanced to a level where large populations of anchialine shrimp and other native species may return to inhabit the pools as they likely have in the past.

~~As mentioned earlier, the southern ponds also had elevated concentrations of nutrients indicating water quality degradation. These factors indicate that if no restoration or maintenance activities are instituted to reserve these ponds, these ecosystems will degrade beyond recovery.~~

~~3.9.3.2~~3.9.2.2 Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

The anchialine ~~ponds~~ pools that are located north of the existing harbor are not likely to be impacted because no development activities are proposed north of the existing harbor. It is highly unlikely that existing groundwater flows to the Kaloko-Honokōhau pond system to the north of the existing harbor will be impacted by the proposed marina to the south.

Of the 19 pools in the southern complex, three would be eliminated due to harbor construction. Regarding the remaining pools, the DEIS noted that t~~T~~he change in the local groundwater flow pattern in the vicinity of the proposed marina ~~will~~ would impact the anchialine ~~ponds~~ pools that are located between the proposed marina and the shoreline south of the harbor entrance. The 2006 study (Appendix H-1) noted that t~~T~~he salinity of the anchialine ~~ponds~~ pools ~~will~~ would increase due to reduction of brackish groundwater, and that ~~. Some ponds will be excavated to make the new harbor basin. T~~those ~~ponds~~ pools that are not excavated will revert to full salinity, causing the loss of their habitat. ~~and associated aquatic flora and fauna. However, current investigations indicate that these ponds are already enriched by nutrients and the density of associated aquatic fauna is very low. In addition, trash from visitors, and introduction of minnows has already degraded the pond ecology.~~ Even without the potential impacts from the proposed marina construction, the pond ecology might change irreversibly from the nutrient input, human indifference and expansion of non native fauna species.

Further studies conducted in response to DEIS comments (Appendix H-2, and Appendix G-3) indicate that the remaining pools may not increase in salinity to levels unhealthy for *H. rubra* and *M. lohena* and other anchialine pool fauna. In addition, these studies determined that there are realistic mechanisms employed elsewhere that would mitigate changes due to groundwater changes. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore.

Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented. The mitigation plan will be based on the following objectives:

Objective 1 To preserve, maintain, and foster the long-term health and native ecological integrity of anchialine pools at Kealakehe.

Objective 2 To protect and promote cultural practices and traditions surrounding anchialine resources at Kealakehe.

Objective 3 To provide education, interpretation, and interactive opportunities for the community to learn about and appreciate the anchialine resources.

Objective 4 To acquire a pond manager to implement the program, conduct monitoring, research, and reporting, and provide education to the community about anchialine and estuarine resources.

Mitigation measures to facilitate the long-term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on the environment can be measured. The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment and possible new pools.

As a mitigation measure, bioretention, which is a Best Management Practice (BMP) is a feasible application for the proposed development. There is a probability that nutrients and other potential pollutants will runoff landscaping and impermeable surfaces such as roadways and parking lots during medium or high rainfall events. Some of these pollutants could enter the groundwater table and into anchialine pools and ultimately the ocean. As an alternative to directing runoff into the ground through drywells, storm water should be directed into bioretention areas such as constructed surface or subsurface wetlands, vegetated filter strips, grass swales, and planted buffer areas. Storm water held and moved through these living filter systems are essentially stripped of most potential pollutants, and allowed to slowly infiltrate back to the groundwater table.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Another mitigation measure that may be included in the management plan is salinity adjustment. In the 2006 assessment regarding the impact to the southern pools from the proposed construction of the harbor, it was stated that this construction would cause the salinity in the anchialine pools to become equivalent to the ocean at 35ppt. It was then concluded that the anchialine biology would perish.

However, there is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and a final determination of anchialine salinity following the harbor construction. The dynamics of groundwater movement through a porous lava medium both seaward and laterally along the coastline is an inexact science. This is compounded by the variations in water density, including stratification of salinity within the proposed harbor and capillary movement of low-density surface water through the substrata.

The assessment that all anchialine pools will be barren with the construction of the harbor may therefore be premature. *H. rubra* are routinely drawn from high salinity wells at 30 – 32 ppt and survive in this salinity for years. Further, high populations *H. rubra* and *M. lohena* have thrived and reproduced in pool salinities of 27ppt. If the pools do become full strength seawater at 35ppt, there exists uncertainty on the long-term effects to anchialine organisms, since there are no long-term studies or examples of native anchialine ecosystems at 35ppt. Native anchialine pool vegetation also has relatively high salinity tolerance.

If the salinity were expected to rise to 35 ppt, possible mitigation in the management plan will include methods to surcharge man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water. If sufficient volume is used, it is theoretically possible to lower salinity in adjacent natural anchialine pools. This surcharge method has been successfully used to raise salinity in anchialine pools and cause the salinity rise in adjacent pools of at least up to 10 meters away. Surcharging with low salinity should work as well or better since the lower density water will essentially float atop the higher salinity water at the surface layer, and move throughout the complex of natural pools. Surcharging may also be a viable mitigation to dilute and more rapidly disperse any pollutants that may be detected in the pools.

Another mitigation measure includes the creation of new anchialine pools. There is significant opportunity to create new anchialine pools and greatly expand the native habitat and resource. It has been demonstrated at several projects in West Hawai'i that anchialine pools can be created and will be colonized with a full compliment of anchialine species endemic to the area. Anchialine pools are considered focal points of higher productivity relative to the subterranean groundwater habitat around them. Their productivity promotes an increase in population levels of anchialine species within the pools themselves and throughout the subterranean habitat surrounding them.

~~No realistic mechanisms are envisioned for re-injecting fresh water into these systems to maintain their ecological balance as an anchialine system. These ponds will be changed from a brackish water system to a marine system. But, those ponds in the area of the shoreline park and cultural park will be cleaned of vegetation and protected from other physical alteration. A buffer zone around these newly established marine ponds will be protected as well.~~

~~The anchialine pond shrimp (*Metabetaeus lohena)* and the orangeback damsel fly (*Megalagrion xanthomelas)* are listed as candidate endangered species in the Federal Register and were both recorded in surveys of these anchialine ponds done in 2004 by US Geological Survey Biological Resources Division and the NPS Inventory and Monitoring Program. Low numbers of *Metabetaeus lohena* were encountered in three of the 22 ponds surveyed in the southern pond complex. *Megalagrion xanthomelas* was not encountered in any of the southern pond complex ponds during the recent study. The low density of *Metabetaeus lohena* and the observed absence of *Megalagrion xanthomelas* may be due to the impacts from high nutrient input and general degradation of the ponds.~~

~~An attempt should be made to move as much of the existing population of *Metabetaeus lohena* from these anchialine ponds before they become too saline, to possible newly excavated ponds that may be developed off-site. These shrimp should not be introduced into existing populated ponds to avoid any potential pathogenic impacts to the healthy ponds.~~

~~Public education on the unique ecology of the anchialine ponds and the need for preserving their ecology will reduce future human impacts in other healthy ponds.~~

~~Further recommended mitigation includes restoration to degraded anchialine ponds off the project site, preferably those located at the adjacent Kaloko-Honokōhau National Historical Park.~~

Testimony of Lorelei Nakagawa
73-1189 Loloa Dr.
Kailua, Kona HI 96740
To:

I write in support of against the Kona Kai Ola project. I am a seventh grade student attending West Hawaii Explorations Academy.

This project has the best of intentions but does not take into consideration its long-term impact upon the local population, our beautiful open shoreline view plane that is decreasing with each shoreline project approval. The hotel and time-share units are directed for the benefit of the short-term residents who will utilize those facilities.

The state of Hawaii's data book reveals that Hawaii County's growth rate of 35.4 percent average annual population growth rate from 200 to 2004, compared to the State's annual growth rate of 4.2 percent (based on a year 2000 Hawaii County population 148,677). Population has grown rapidly throughout West Hawaii. With the population of North Kona increasing from 4,832 in 1970 to 22,284 in 1990 and to 28,543 in 2000.

The prevalence of tourism has also increased the visitor share of the de facto population (those actually present on any give day) to about one-fourth of the resident population. Both the resident and defacto population are expected to continue rising, although not as rapidly, in the foreseeable future. In 2000, approximately 1,267,966 visitors traveled to the island of Hawaii, with approximately 87 percent primarily visiting the Kona area.

The point is that the steady stream of new residents drawn by Kona's attractions, and the employment and entrepreneurial opportunities of the tourism industry. Many permanent residents today are affluent, older (often retired), relative newcomers from the mainland.

This being a fact, does not lead one to assume that there will be an increase in the service sector workforce needed to fulfill the needs of the commercial establishments that this project will bring to Kona.

My alternative solution to the completion of this project is to move it mauka of the Queen Kaahumanu highway and see if this developer would want to complete this project. It appears that this developer does not want to reveal its source of financing for this project. Does this mean that the citizens of this County or the State of Hawaii have to foot the bill for this project?

The use of the existing entrance to Honokohau harbor will preclude the new marina's use as a "deep water harbor" for cruise ship use. The main channel is not wide enough nor deep enough to allow its use for cruise ships.

The profits from this project will not stay in Hawaii; just the taxes owed the state will be and certainty nothing else is for certain for the citizens of Kona.

Thank you for the opportunity to speak before you on this matter, which is of a grave concern to me and my future as a citizen of Kona. By the way in fourteen years from now I will be 26 years old and I will be in the local work force for four years after graduating from college. I think I will be overeducated and underpaid to be employed by this project.

Mahalo,

Lorelei Nakagawa

Lorelei Nakagawa

oceanit
innovation through engineering & scientific excellence

July 23, 2007

Lorelei Nakagawa
73-1189 Loloa Dr.
Kailua-Kona, HI 96740

Dear Ms. Nakagawa:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are given below.

Comment: Project does not consider our beautiful shoreline view plane that is decreasing with each shoreline project approval.

Response: Smart growth recognizes connections between development and quality of life, and natural beauty. It leverages new growth to improve the community. Smart growth principles that are applicable to Kona Kai Ola are as follows: preserve open space, farmland, natural beauty, and critical environmental areas. Kona Kai Ola will be designed to protect and preserve the area's scenic and open space resources. Consistent with the project's sustainability goals, 40 percent of the project site will be retained in open space. Further, Kona Kai Ola includes a 400-foot buffer zone along the shoreline that will be preserved as open space. Improvements within this buffer zone will be limited to lateral shoreline public trails, mauka-makai access trails from the project site, and cultural or environmental-related improvements related to existing features within the buffer zone. No buildings or structures shall be built within the 400-foot shoreline setback area, with the possible exception of structures that are directly related to native Hawaiian cultural resources in the buffer zone and that are requested by Jacoby Development, Inc. (JDI) cultural advisors.

Comment: The Hotel time share units are directed for the benefit of the short-term residents who will utilize these facilities.

Response: The development of Kona Kai Ola is broader than providing accommodations for tourists. The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, JDI will protect natural resources through the various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities such as parks, other recreational facilities, and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community. Land ownership will remain with the State.

Comment: Move the project mauka of the Queen Kaahumanu Highway

Response: The Department of Land and Natural Resources (DLNR) and the Department of Hawaiian Home Lands (DHHL) entered in to development agreement with JDI to develop facilities on the state land. There is no lane available to these two agencies immediately mauka of Kaahumanu Highway.

Comment: It appears that the developer does not want to reveal the source of financing for the project. Does this mean that the citizens of this County or State of Hawaii have to foot the bill for this project.

Response: JDI is not relying on any public funding for the development of the project.

Comment: The use of the existing entrance to Honokohau Harbor will preclude the new marina's use as a deep water harbor for cruise ship use.

Response: The Kona Kai Ola development project does not propose use of the new marina for cruise ships or to construct the harbor to a deep draft harbor.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Kona Kai Ola Harbor Development Comment

Concerning the Kona Kai Ola Harbor development my biggest concern is who the development is meant for.

Is it for tourists? Tourists come here for peace and quite, to escape the busyness and complexity of cities. They come here for the natural beauty that Hawaii has to offer; white sand beaches, waterfalls, exotic plants, and places of peace. Not man made lagoons filled with endangered species like green sea turtles. Nor congested roads and crowded shops which they have back home. Tourists that do want what the Jacoby Development, Inc. has to offer should visit California or Florida because what these developers are offering is not unique in any way.

Is it for locales? Do locales really want an estimated 1,500 vehicles added to the morning traffic and 3,400 vehicles added to the afternoon commute home? Or do locals want their kids attending over-crowded schools that already have enough drama? That is what thousands of new jobs will do to the roads and what affordable housing will do to schools.

Is it for the benefit of the county, which stand to make $187 million in taxes during the first 18 years and $14.5 million annually thereafter. With heavier traffic, over-crowded schools, increased pollution, and over-crowded beaches. The tax money will be spent to fix the problems that the development creates.

I cannot picture the Kona Kai Ola development being for tourists, locales, or even the county. That leaves the development company, Jacoby Development, Inc.. What will they gain? Millions and billions will Hawaii's beauty is destroyed. Should a company based in Atlanta really be in charge of Hawaii's fate when they will not even feel the ripples of there actions?

Hawaii is unique, running on Hawaiian time and less complex than the rest of the U.S., why destroy it with a large development like the Kona Kai Ola development Jacoby Development, Inc. has proposed?

Makena McCluskey,

Makena McCluskey

P.O. Box 1147

Kapaau, HI 96755

July 23, 2007

Makena McCluskey
P.O. Box 1147
Kapaau, HI 96755

Dear Ms. McCluskey:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are based on a paragraph designation.

Comment: Hawaii is unique, running on Hawaiian time and less complex than the rest of the U.S., why destroy it with a large development like Kona Kai Ola development, Jacoby Development, Inc. has proposed?

Response: We strongly disagree that the proposed development will destroy Hawaii or the way of life appreciated by its people. Nor will the beauty of Hawaii be destroyed. The project has numerous benefits for visitors, local people, and especially to those who live in Kona.

The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, Jacoby Development, Inc. (JDI) will protect natural resources through the various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities such as parks, other recreational facilities, and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community.

To mitigate traffic improvements, Kona Kai Ola will include various signalization improvements, and roadway improvements will be implemented. To connect Kona Kai Ola with the neighboring communities, Kona International Airport and Kailua-Kona Village, the project proposes to sponsor a regularly scheduled shuttle service, so that people could utilize Kona Kai Ola without having to use a car for access.

Such improvements will be privately-funded and ensure that the project minimizes its own impacts while improving existing conditions. Further, with development of Kona Kai Ola, the Kuakini Highway extension road is anticipated to be built on a more accelerated schedule than would occur without the Kona Kai Ola project.

A study of workforce housing requirements was prepared to evaluate secondary impacts. As agreements between the State and JDI prohibit residential development at Kona Kai Ola, workforce housing would need to be located off-site. The most suitable location for workforce housing units is the Villages at La'i'Opua community, a Department of Hawaiian Home Lands (DHHL) project, or within the Hawai'i Housing Finance and Development Corporation affordable housing development planned for Keahuolu. These are two State-owned undertakings directly across the highway in the same or adjacent ahupua'a. Locating workforce affordable housing units in these communities would substantially lessen the traffic impacts associated with a community subject workforce. Alternatively, the State lands adjacent to Waikoloa Village would be appropriate for workforce housing.

JDI will comply with all affordable housing requirements of applicable Hawaii County ordinances.

The developer is continuing to work with public agencies in developing new water sources, and the success of these efforts will not only benefit Kona Kai Ola, but also, adjacent communities that are also subject to an insufficient water supply.

The anticipated infrastructure improvements to the wastewater treatment plant are anticipated to actually improve the health and safety of the community by bringing an older facility up to higher operational standards. All structures will be built to current building and safety codes, while access to the shore and around the site will be improved.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Homelands
Jacoby Development, Inc.

Merjen Agayeva
01/19/07

Against to the Kona Kai Ola Harbor Development

This project is very interesting. This project makes sounds is good, but behind of the nice picture we have some dangerous things like to make the environment bad. The place of that planning development we have the historical memories, we have native plants, native culture and nature, there are in the ocean they can kill so much marine animals, which cannot reproduce again in a minimum 10 years. Some of that animals can lost that species and the plants, native plants, which will not grow again, and they will cannot plant them again, and to make reproduce that marine animals, which they will lost.

The KAHO organization is not agree with that project and they are right. That Developer wants to built 3 hotels; make the 4500 units to 2500 units. They would change land designation urban. They will propose art lagoons for sharks, turtles mantas.

Some community concerns: traffic, not enough people to fill jobs, housing, water, and sewage. They traffic began right now, it so bad traffic without that project. The housing is too bad and it will worst than it was.

Some facts: since 1996 boat sales 15.4%, and if this project will work that boat will increase.

Environmental concerns:

- 170 resident turtles about KAHO, and they can die.
- Impact for dolphins, turtles, whales propellers, noise, sewage and land pollutants, oils from boats.
- Numerous end species there: humpback whales, turtles, Hawaii monk seal, etc.
- Jacoby ELS says only 2 turtles stranding, but KAHO says 20 turtles.
- Catch the fish rate dropped 1 marlin per 10 trips since1995. Species in existence: green turtles humpback. At hawks Hawaii stilt, hawksbill turtles, spinner and bottle nose dolphin.
- Presently 22 arch line ponds (in healthy shape) bombing out Harbor affects these pools. (They want to take off H2O supply for pools and native plants).

1962 listed as a National historical landmark. Turtle stranding data: death, and stranding not acc votary reported lungs are on back. These if stick by a propeller, likely sinks and dies and is not counted.

Those things showed to us that this development project is not so good for all environments, and it will affect very bad to all Kona. We can make our concerns until 5th of February 2007. Lets make our choice and each person's vote will help to protect our life, environment.

oceanit
innovation through engineering & scientific excellence

July 23, 2007

Merjen Agayeva
c/o West Hawaii Explorations Academy
73-4460 Queen Kaahumanu Hwy, Ste. 105
Kailua-Kona, HI 96740

Dear Mr. Agayeva:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for comments on the Kona Kai Ola Draft Environmental Impact Statement. Our response to your comment is given below.

Comment: Traffic, not enough people to fill jobs, housing, water, and sewage.

Responses: To mitigate traffic impacts, Kona Kai Ola will include various signalization improvements, and roadway improvements will be implemented. To connect Kona Kai Ola with the neighboring communities, Kona International Airport and Kailua-Kona Village, the project proposes to sponsor a regularly scheduled shuttle service, so that people could utilize Kona Kai Ola without having to use a car for access. Further, the project includes the construction and realignment of Kealakehe Parkway makai of Queen Kaʻahumanu Highway and through the lands of Queen Liliʻuokalani Trust connecting with Kuakini Highway in Kailua-Kona. Another measure to enhance road connectivity in the ahupuaʻa is the improvement of the intersection of Kealakehe Parkway and Queen Kaʻahumanu Highway. These improvements will serve the project as well as the regional community.

Such improvements will be privately-funded and ensure that the project minimizes its own impacts while improving existing conditions. Further, with development of Kona Kai Ola, the Kuakini Highway extension road is anticipated to be built on a more accelerated schedule than would occur without the Kona Kai Ola project.

A study of workforce housing requirements was prepared to evaluate secondary impacts. As agreements between the State and Jacoby Development, Inc. (JDI) prohibit residential development at Kona Kai Ola, workforce housing would need to be located off-site. The most suitable location for workforce housing units is

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www.oceanit.com

the Villages at La‘i‘Opua community, a Department of Hawaiian Home Lands (DHHL) project, or within the Hawai‘i Housing Finance and Development Corporation affordable housing development planned for Keahuolu. These are two State-owned undertakings directly across the highway in the same or adjacent ahupua‘a. Locating workforce affordable housing units in these communities would substantially lessen the traffic impacts associated with a community subject workforce. Alternatively, the State Lands adjacent to Waikoloa Village would be appropriate for workforce housing.

JDI will comply with all affordable housing requirements applicable to Hawaii County ordinances.

The developer is continuing to work with public agencies in developing new water sources, and the success of these efforts will not only benefit Kona Kai Ola, but also, adjacent communities that are also subject to an insufficient water supply.

The anticipated infrastructure improvements to the wastewater treatment plant are anticipated to actually improve the health and safety of the community by bringing an older facility up to higher operational standards. All structures will be built to current building and safety codes, while access to the shore and around the site will be improved.

The environmental concerns that you have indicated have been studied in detail as a result of comments on the Draft Environmental Impact Statement (DEIS) and are included in the text and appendices of the Environmental Impact Statement (EIS).

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Letter of Testimony

Testimony of Micaela Pierce
School Address
In support of stopping the Kona Kai Ola development
To Jacoby development

My purpose of writing is to inform you about the things you are going to do to the environment. There is a national park next to where the site is and there are lots of endangered species that inhabit that area. If there is to be development than it should be made differently. Make it more environmentally suitable for everybody. When you make space for the development it will cut off the water supply to all the native plants in the national park and all pools will be dried up. Plus if more boats are added and another harbor is put it than it will stress the marine life even more. Outside the opening of the harbor there are dolphins that like to rest there. From all the boats coming in and out the dolphins will never be able to rest there again. Plus the noise disturbs everything under water. They all have very good hearing and it makes them stressed and it will make them have to leave their home. I think the lagoons are a bad idea. Especially if you keep big manta rays in cages. If you do that then the cages should be gigantic. Since manta rays are really big. If you were to have big animals in lagoons than they should be really big so that the animals can swim around and have room to move. If there is a need for workers than you should try to use the ones that are already on the islands. I don't think it is good to import people from the Philippines. Where will they live? I hope that everything will stay the way it is and then everybody will be happy. If the right thing was done and you knew than you would be happy too. At our school we are environmentalists. So we care about the effects this could have on the environment. There is enough development going on already and there shouldn't be anymore big things.

Micaela Pierce

Micaela Pierce

innovation through engineering & scientific excellence

July 23, 2007

Micaela Pierce
c/o West Hawaii Explorations Academy
73-4460 Queen Kaahumanu Hwy, Ste. 105
Kailua-Kona, HI 96740

Dear Ms. Pierce:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are given below.

The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, Jacoby Development, Inc. (JDI) will protect natural resources through the various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities such as parks, other recreational facilities, and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community.

Numerous studies were conducted to assess existing resources status, impacts from development, and possible actions to mitigate these impacts. Studies included impacts on marine animals, noise, nearshore impacts, and other impacts. The lagoon will be managed by aquaria experts who will minimize impacts to animals and visitors.

In response to the Draft Environmental Impact Statement (DEIS) comments and to further study the pools south of the entrance channel of Honokohau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design, in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys, and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2 of the Environmental Impact Statement (EIS) and is summarized in EIS Sections 3.9.2.1 and 3.9.2.2. In addition, further comment on the groundwater hydrology effects on anchialine pools was prepared by Waimea Water Services and is contained in Appendix G-3 of the EIS.

These additional studies indicated that with the construction of the new harbor basin, the anchialine pools makai of the proposed basin may not necessarily be negatively impacted by the construction of the proposed project.

In addition, these studies determined that there are mechanisms to mitigate potential impacts. Mitigation measures to facilitate the long term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. As a mitigation measure, bioretention, which is a Best Management Practice (BMP), is a highly appropriate application for the proposed development to prevent any nonpoint source pollution of groundwater. Another mitigation measure that may be included in the management plan is salinity adjustment of the anchialine pools to maintain healthy habitat for the anchialine ecosystem by surcharging man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water.

The excavation of the harbor south of the existing harbor will not have any significant impact on water bodies in the Kaloko-Honokohau National Park to the north of the existing harbor.

A complete marine acoustics study was completed in response to comments received on the DEIS. The report is included in Appendix T-2. The model results showed that the noise levels in the developed scenario did not exceed the Level A impacts to marine mammals. Level B impacts to marine mammals and sea turtles generally occur within a range of ten meters. Although noise impacts may occur during blasting the new marina, these impacts could be greatly minimized by using good blasting practices. These are addressed in detail in the EIS.

Management of habitats within lagoons is a question of aquaria technology and fish husbandry. The limiting criteria in aquaria is typically water quality, with habitat design more a matter of providing the correct physical habitat (sand, coral, rock, caves, etc.) in an ecologically balanced, aesthetically pleasing, fashion. The display type of animals has not been finalized at this time. The superb water quality, and low turn overtime in the lagoons will preclude the necessity of filtration. Professional aquarists and staff will manage the lagoon features and associated educational activities from the Marine Science Offices adjacent to the upper lagoon. Providing safety of visitors and operators from possible accidents with lagoons and animals will be given the top priority in lagoon management.

The EIS has been revised to include information from these additional studies, and Attachment 1 contains Section 3.9.2, Anchialine Pools.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

The conditions with the project constructed were found to be phosphorous limited. Several simulations were performed including and excluding the inflow from the marine exhibits which provides an additional nitrogen load and also varying the location of this inflow. It was found that the inflow from the marine exhibits can have a beneficial effect on flushing, especially when positioned within the existing harbor basin. However, its effect is significantly less than the effect due to the brackish groundwater inflow. When the exhibit inflow is excluded or positioned at the east end of the new marina, its effect is small in terms of flushing due to its high salinity. From a water quality perspective, since the loads from the exhibit inflow consist primarily of nitrogen, it does not cause increased algae growth. However, this exhibit inflow does raise the concentrations of ammonia and nitrate in the system.

Simulation results indicate that under the conditions when the post-expansion system receives an additional brackish inflow into the new 25-acre marina on the order of 30 mgd or more, water quality within the harbor system and in the surrounding waters remained similar to existing conditions. These conditions are expected to occur based on the findings reported by Waimea Water Services (2007), which states that the proposed marina would exhibit the same or similar flushing action as the existing marina.

An additional mitigation measure proposed by Waimea Water Services (2007), if sufficient inflow is not intercepted, consists of drilling holes in the bottom of the new marina to enhance this inflow and facilitate flushing within the proposed system.

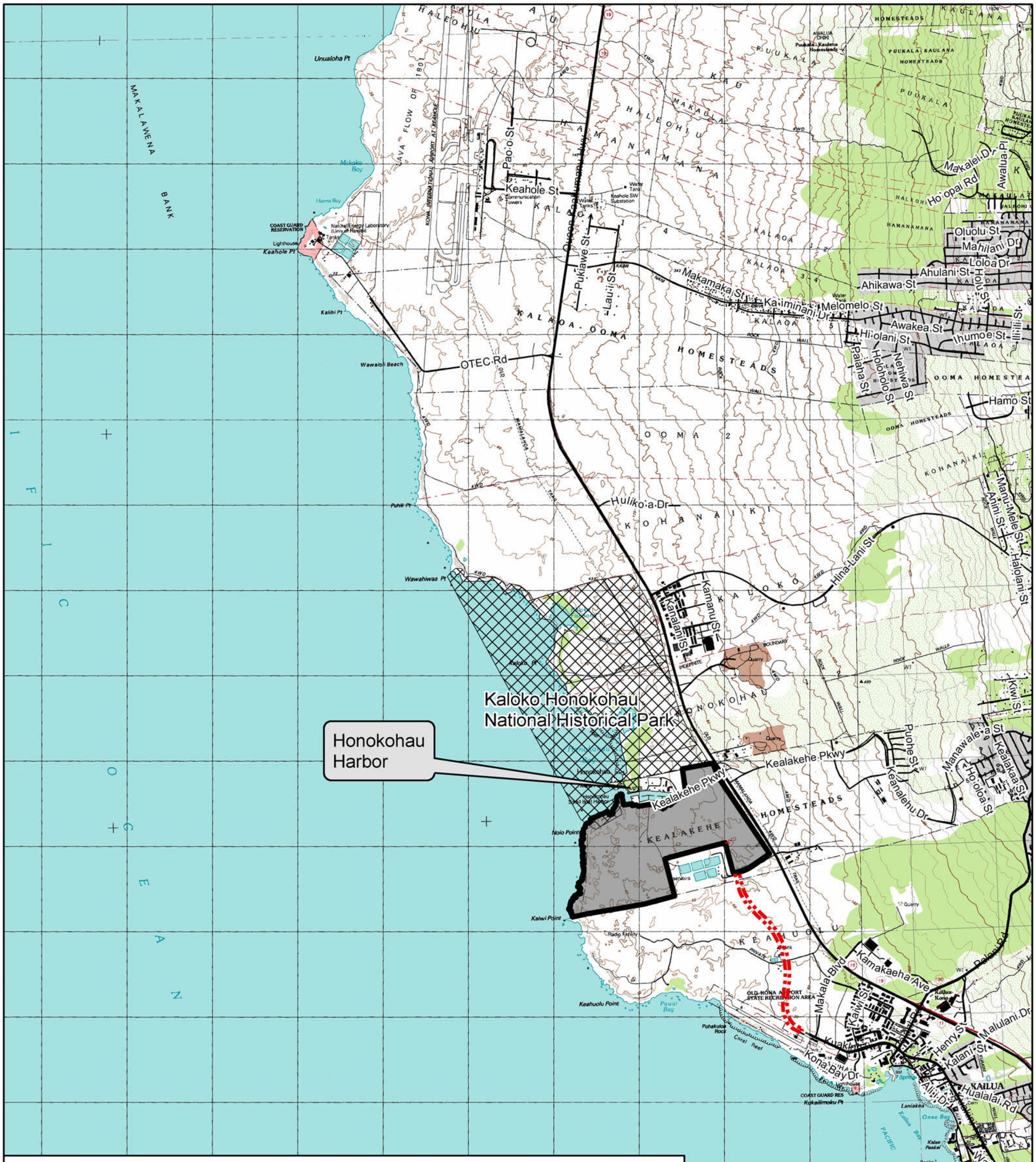
~~3.9.3~~3.9.2 Anchialine ~~Ponds~~ Pools

Two studies on anchialine pools were conducted in this EIS process. The anchialine ~~ponds~~ pools water quality studies and ~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute and is~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute in October 2006 and are included as Appendix ~~G~~H-1. That survey included pools located both north and south of Honokōhau Harbor. In response to DEIS comments and to further study the pools south of entrance channel of Honokōhau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2.

~~3.9.3.1~~3.9.2.1 Existing Conditions

Anchialine ~~ponds~~ pools exist in inland lava depressions near the ocean. Two anchialine ~~pond~~ pool complexes are located immediately to the north and south of the Honokōhau Harbor entrance channel. The complex to the north is located wholly within the designated boundaries of the Kaloko-Honokōhau National Historical Park as shown in Figure Q~~O~~. Many of the ~~ponds~~ pools in the southern complex are within the park administrative boundary as well. ~~Ponds~~ Pools in the northern complex show little evidence of anthropogenic impacts. Many contain typical vegetation and crustacean species in high abundance.

Figure R locates anchialine pools near the harbor entrance and pools~~Ponds~~ in the southern complex are depicted in Figure S.



Source: http://nrdata.nps.gov/kaho/kahodata/kaho_parkbndry_ply.zip

Figure Q: National Historical Park Service Legislative Boundary Map

Legend

- Project Site
- Proposed Parkway
- National Park Boundary

N W E S

0 2,500 5,000 Feet

oceanit
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JDI
JACOBY DEVELOPMENT, INC.

Source: Oceanic Institute

Figure R: Anchialine Pool Locations

N
W E
S

0 2,000 4,000 Feet

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JDI

JACOBY DEVELOPMENT, INC.

Source: Aquatic Resources Management And Design

Figure S: Anchialine Pool Locations in Southern Complex

N
W E
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oceanit

JDI
JACOBY DEVELOPMENT, INC.

The 2006 study identified 22 pools in the southern complex. The 2007 study found that three of the 22 pools are part of an estuary complex with direct connection to the ocean. While there were several signs of direct human use and disturbance, such as trash receptacles and toilet facilities, the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickleweed and mangrove. ~~are moderately to heavily impacted, with many containing exotic fish that exclude the anchialine crustaceans. The ponds also show evidence of human impact, including discarded bottles, cans, wrappers, diapers, toilet paper, etc. Water quality conditions within the ponds generally reflect the conditions of the underlying groundwater.~~

~~Figure P locates anchialine ponds near the harbor entrance. The study conducted as a part of this EIS show that the anchialine ponds south of the harbor entrance are moderately to heavily impacted by human activities and introduced fish populations. The study found that the nitrogen phosphorus concentrations in these ponds are significantly higher compared to the ponds north of the harbor entrance. The sources of these additional nutrients are not known. Continuous influx of nutrients will eventually degrade the water quality to levels that could alter the pond ecology.~~

Biota surveys in the two pond systems clearly indicate that counts of typical pond denizens show a remarkable difference between the northern and southern ~~ponds~~ pools. In the northern ~~ponds~~ pools the number of *Halocaridina rubra* ranged from a low of 20–25 to too numerous to count. The biota rich pond bottoms appeared red due to the *Halocaridina rubra* numbers. The only other species visible was the predatory shrimp *Metabetaeus lohena*. In contrast, only four out of the 22 ~~ponds~~ pools examined in the southern pond complex showed a decreased presence of *Halocaridina rubra* (6 to 200) individuals in the pond, and three ~~ponds~~ pools contained *Metabetaeus lohena*. Eight of the ~~ponds~~ pools contained numbers of introduced minnows which is an apparent predator of *Halocaridina rubra* and *Metabetaeus lohena*.

The 2007 study found three of the pools identified in the 2006 study were part of an estuary complex with direct connection to the ocean, and that the southern complex contained 19 anchialine pools. The study further found that a majority of the southern pools are degraded biologically and physically, primarily due to the effects of introduced fish and plant species. Six pools are currently devoid of alien fish, but they face a high level of threat due to the proximity of pools that have these species. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of 20m^2 would be eliminated due to the harbor construction.

The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 ppt. and that the anchialine biology would then perish. There is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and final determination of anchialine salinity following the harbor construction. The assessment that all anchialine pools will be barren with the construction of the harbor may be premature. *Halocaridina rubra* (opae ula) are routinely drawn from high salinity wells at 30-32 ppt.

Within the 19 pools, native and non-native fauna included 14 species comprised of 5 fish, 2 mollusca, and 6 crustacea. Algae within the pools primarily consisted of a mixed assemblage of diatoms and cyanobacteria, with several pools dominated by matted filamentous *Cladophora*, sp. The darker cave/overhang pools and high tide pools had epilithic *Hildenbrandia* sp. covering the rock substrate. Riparian vegetation was dominated by introduced species consisting of Pickleweed (*Batis maritima*), Mangrove (*Rhyzophora mangle*), and Christmasberry (*Shinus terebenthifolius*). Only two species of native plants Akulikuli (*Sesuvium portulacastrum*) and Makaloa (*Cyperus laevigatus*) existed near the pools and comprised only few small patches and a single tuft (respectively).

Most of the hypogeal anchialine shrimp have adapted to the presence of minnows by foraging in the pools at night. During daylight hours, only the adult shrimp appear to coexist at low population levels with the smaller *P. reticulata*, but the larger *G. affinis* and *Oreochromis* prevent the daytime appearance of hypogeal shrimp due to predation.

The average salinity in Kealakehe pools is relatively high at 13.5 ppt compared to most other pools along the West Hawai‘i coastline, having an average of approximately 7 ppt. This high salinity appears to be characteristic of this region, and is similar to the average of most pools within the adjacent ahupua’a of Honokōhau and Kaloko. The levels of nitrate-nitrogen levels are relatively high compared to other undeveloped areas, but fall in the range of some developed landscapes. Other water quality parameters, including pH and temperature, fall into normal ranges for anchialine pools.

This relatively high salinity is the likely reason aquatic insects were not found in any pools at Kealakehe. Though the rare damselfly *Megalagrion xanthomelas* has been observed and collected from Kaloko, a statewide assessment of its range has not found it to occur in water with salinity greater than 3ppt. However, there has been an unsubstantiated occurrence of the nymph in a pool of up to 8ppt (Polhemus, 1995).

Another species of concern is the hypogeal decapod shrimp *Metabetaeus lohena.* These shrimp are sometimes predatory on *H. rubra* but are more often opportunistic omnivores similar to *H. rubra.* Predusk and nocturnal sampling at high tide is clearly the optimal method to determine habitat range and population densities for this species. These shrimp were found in 13 of the 19 pools, 7 of which had *M. lohena* only at night. The occurrences of *H. rubra* were found in 16 of 19 sampled pools, 8 of which had ‘Ōpae‘ula observed only at night. Consequently, despite having numerous degraded anchialine resources at Kealakehe, there are opportunities for many of the pools to be restored and enhanced to a level where large populations of anchialine shrimp and other native species may return to inhabit the pools as they likely have in the past.

~~As mentioned earlier, the southern ponds also had elevated concentrations of nutrients indicating water quality degradation. These factors indicate that if no restoration or maintenance activities are instituted to reserve these ponds, these ecosystems will degrade beyond recovery.~~

~~3.9.3.2~~3.9.2.2 Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

The anchialine ~~ponds~~ pools that are located north of the existing harbor are not likely to be impacted because no development activities are proposed north of the existing harbor. It is highly unlikely that existing groundwater flows to the Kaloko-Honokōhau pond system to the north of the existing harbor will be impacted by the proposed marina to the south.

Of the 19 pools in the southern complex, three would be eliminated due to harbor construction. Regarding the remaining pools, the DEIS noted that t~~T~~he change in the local groundwater flow pattern in the vicinity of the proposed marina ~~will~~ would impact the anchialine ~~ponds~~ pools that are located between the proposed marina and the shoreline south of the harbor entrance. The 2006 study (Appendix H-1) noted that t~~T~~he salinity of the anchialine ~~ponds~~ pools ~~will~~ would increase due to reduction of brackish groundwater, and that ~~. Some ponds will be excavated to make the new harbor basin. T~~those ~~ponds~~ pools that are not excavated will revert to full salinity, causing the loss of their habitat. ~~and associated aquatic flora and fauna. However, current investigations indicate that these ponds are already enriched by nutrients and the density of associated aquatic fauna is very low. In addition, trash from visitors, and introduction of minnows has already degraded the pond ecology.~~ Even without the potential impacts from the proposed marina construction, the pond ecology might change irreversibly from the nutrient input, human indifference and expansion of non native fauna species.

Further studies conducted in response to DEIS comments (Appendix H-2, and Appendix G-3) indicate that the remaining pools may not increase in salinity to levels unhealthy for *H. rubra* and *M. lohena* and other anchialine pool fauna. In addition, these studies determined that there are realistic mechanisms employed elsewhere that would mitigate changes due to groundwater changes. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore.

Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented. The mitigation plan will be based on the following objectives:

Objective 1 To preserve, maintain, and foster the long-term health and native ecological integrity of anchialine pools at Kealakehe.

Objective 2 To protect and promote cultural practices and traditions surrounding anchialine resources at Kealakehe.

Objective 3 To provide education, interpretation, and interactive opportunities for the community to learn about and appreciate the anchialine resources.

Objective 4 To acquire a pond manager to implement the program, conduct monitoring, research, and reporting, and provide education to the community about anchialine and estuarine resources.

Mitigation measures to facilitate the long-term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on the environment can be measured. The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment and possible new pools.

As a mitigation measure, bioretention, which is a Best Management Practice (BMP) is a feasible application for the proposed development. There is a probability that nutrients and other potential pollutants will runoff landscaping and impermeable surfaces such as roadways and parking lots during medium or high rainfall events. Some of these pollutants could enter the groundwater table and into anchialine pools and ultimately the ocean. As an alternative to directing runoff into the ground through drywells, storm water should be directed into bioretention areas such as constructed surface or subsurface wetlands, vegetated filter strips, grass swales, and planted buffer areas. Storm water held and moved through these living filter systems are essentially stripped of most potential pollutants, and allowed to slowly infiltrate back to the groundwater table.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Another mitigation measure that may be included in the management plan is salinity adjustment. In the 2006 assessment regarding the impact to the southern pools from the proposed construction of the harbor, it was stated that this construction would cause the salinity in the anchialine pools to become equivalent to the ocean at 35ppt. It was then concluded that the anchialine biology would perish.

However, there is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and a final determination of anchialine salinity following the harbor construction. The dynamics of groundwater movement through a porous lava medium both seaward and laterally along the coastline is an inexact science. This is compounded by the variations in water density, including stratification of salinity within the proposed harbor and capillary movement of low-density surface water through the substrata.

The assessment that all anchialine pools will be barren with the construction of the harbor may therefore be premature. *H. rubra* are routinely drawn from high salinity wells at 30 – 32 ppt and survive in this salinity for years. Further, high populations *H. rubra* and *M. lohena* have thrived and reproduced in pool salinities of 27ppt. If the pools do become full strength seawater at 35ppt, there exists uncertainty on the long-term effects to anchialine organisms, since there are no long-term studies or examples of native anchialine ecosystems at 35ppt. Native anchialine pool vegetation also has relatively high salinity tolerance.

If the salinity were expected to rise to 35 ppt, possible mitigation in the management plan will include methods to surcharge man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water. If sufficient volume is used, it is theoretically possible to lower salinity in adjacent natural anchialine pools. This surcharge method has been successfully used to raise salinity in anchialine pools and cause the salinity rise in adjacent pools of at least up to 10 meters away. Surcharging with low salinity should work as well or better since the lower density water will essentially float atop the higher salinity water at the surface layer, and move throughout the complex of natural pools. Surcharging may also be a viable mitigation to dilute and more rapidly disperse any pollutants that may be detected in the pools.

Another mitigation measure includes the creation of new anchialine pools. There is significant opportunity to create new anchialine pools and greatly expand the native habitat and resource. It has been demonstrated at several projects in West Hawai'i that anchialine pools can be created and will be colonized with a full compliment of anchialine species endemic to the area. Anchialine pools are considered focal points of higher productivity relative to the subterranean groundwater habitat around them. Their productivity promotes an increase in population levels of anchialine species within the pools themselves and throughout the subterranean habitat surrounding them.

~~No realistic mechanisms are envisioned for re-injecting fresh water into these systems to maintain their ecological balance as an anchialine system. These ponds will be changed from a brackish water system to a marine system. But, those ponds in the area of the shoreline park and cultural park will be cleaned of vegetation and protected from other physical alteration. A buffer zone around these newly established marine ponds will be protected as well.~~

~~The anchialine pond shrimp (*Metabetaeus lohena)* and the orangeback damsel fly (*Megalagrion xanthomelas)* are listed as candidate endangered species in the Federal Register and were both recorded in surveys of these anchialine ponds done in 2004 by US Geological Survey Biological Resources Division and the NPS Inventory and Monitoring Program. Low numbers of *Metabetaeus lohena* were encountered in three of the 22 ponds surveyed in the southern pond complex. *Megalagrion xanthomelas* was not encountered in any of the southern pond complex ponds during the recent study. The low density of *Metabetaeus lohena* and the observed absence of *Megalagrion xanthomelas* may be due to the impacts from high nutrient input and general degradation of the ponds.~~

~~An attempt should be made to move as much of the existing population of *Metabetaeus lohena* from these anchialine ponds before they become too saline, to possible newly excavated ponds that may be developed off-site. These shrimp should not be introduced into existing populated ponds to avoid any potential pathogenic impacts to the healthy ponds.~~

~~Public education on the unique ecology of the anchialine ponds and the need for preserving their ecology will reduce future human impacts in other healthy ponds.~~

~~Further recommended mitigation includes restoration to degraded anchialine ponds off the project site, preferably those located at the adjacent Kaloko-Honokōhau National Historical Park.~~

Mya Beck
P.O. Box 333
Captain-Cook HI
96745

Big Island's Harbor Development

A big issue that is going on for the Big Island of Hawaii right now is proposed the Honuokau Harbor being developed. The plan is to add 700 more hotel rooms and 1,800 more share units when we already have 2,500 in Kailua. This project is going to coast 2.2 million dollars. The original idea was to just have more room for more boats but I think the whole idea was carried away. If you look at Oahu, it's packed. It reminds me of a mini New York. The air smells nasty, the stars are unseen, the sky and air is muggy, and there's millions of people pilled onto one little island. The Big Island still has its country side: beautiful beaches, clean air, blue skies, and gorgeous stars. Oahu can't get that back now that it's gone. It's important to keep this islands beauty. If we do this to the harbor, then traffic is going to be way more backed up than it is now. Also tourists are going to be, everywhere and they will probably kill what's left of the marine life at the harbor. Its already bad enough, the water is green and the marine life is low. If we do the whole development thing then everything's just going to get worse and not better.

I think that spending 2.2 million dollars on this project is just a waste. The state already doesn't have much money. For example look at our schools and roads on the Kona Side. They really aren't in good shape. Why don't we take the 2.2 million dollars and invest it into something better than building more buildings. We already have what we need. The schools could use that money or good organizations. I think that a good school education is way more important than having more hotel rooms and time shares.

Sincerely,
Mya Beck

July 23, 2007

Mya Beck
P.O.Box 333
Captain-Cook, HI 96745

Dear Ms. Beck:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are based on a paragraph designation.

Paragraph 1

There are alternatives that are being considered to reduce the extent of the harbor expansion and timeshare units. Some of the new thoughts are given below.

A comparison between impacts related to the proposed project concept and impacts related to Alternative 1 indicates that a reduction in the acreage and number of slips in the marina, as well as the reduction in hotel and timeshare units, would generate less environmental, social, and economic impacts. Although positive economic impacts would be reduced, Alternative 1 can be considered as a preferable alternative because of reduced environmental impacts. However, while it can be concluded that the 25-acre (400 slips) marina in Alternative 1 would be the preferred size, the Department of Land and Natural Resources (DLNR) agreement establishes the size of the marina at 45 acres and 800 slips. An amendment to the DLNR agreement is required in order to allow Alternative 1 to proceed. Hence, selection of Alternative 1 is an unresolved issue at this time.

To mitigate traffic impacts, Kona Kai Ola will include various signalization improvements, and roadway improvements will be implemented. To connect Kona Kai Ola with the neighboring communities, Kona International Airport and Kailua-Kona Village, the project proposes to sponsor a regularly scheduled shuttle service, so that people could utilize Kona Kai Ola without having to use a car for access. Further, the project includes the construction and realignment of

Kealakehe Parkway makai of Queen Ka‘ahumanu Highway and through the lands of Queen Lili‘uokalani Trust connecting with Kuakini Highway in Kailua-Kona. Another measure to enhance road connectivity in the ahupua‘a is the improvement of the intersection of Kealakehe Parkway and Queen Ka‘ahumanu Highway. These improvements will serve the project as well as the regional community.

Such improvements will be privately-funded and ensure that the project minimizes its own impacts while improving existing conditions. Further, with development of Kona Kai Ola, the Kuakini Highway extension road is anticipated to be built on a more accelerated schedule than it would occur without the Kona Kai Ola project.

Harbor circulation before and after development was modeled using a state of the art mathematical model. Results show that water quality will remain close to current conditions with the smaller harbor expansion.

Paragraph 2

No state funds will be used to develop any portion of the proposed development project. Funds used for the project will come entirely from private resources.

The development of Kona Kai Ola is broader than providing accommodations for tourists. The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, Jacoby Development, Inc. (JDI) will protect natural resources through the various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities such as parks, other recreational facilities, and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community.

The developer is continuing to work with public agencies in developing new water sources and the success of these efforts will not only benefit Kona Kai Ola, but also, adjacent communities that are also subject to an insufficient water supply.

The anticipated infrastructure improvements to the wastewater treatment plant are expected to actually improve the health and safety of the community by bringing an older facility up to higher operational standards. All structures will be built to current building and safety codes, while access to the shore and around the site will be improved.

The roadway system will also be improved beyond mitigation for project-related impacts. In Phase 1 of the project, JDI will not only provide access to the commercial parcel, but also address regional traffic issues through the improvements of the roadway system. JDI plans to improve the intersection of the Queen Ka‘ahumanu Highway and the Kealakehe WWTP Access Road. The Kealakehe WWTP Access Road is planned to be realigned and widened to an 80-foot road right-of-way (ROW) that will serve the Commercial Parcel No. 1 and eventually intersect with the proposed Kuakini Highway Extension to the west. Such improvements will ensure that the project minimizes its own impacts while improving existing conditions. Further, with development of Kona Kai Ola, the Kuakini Highway extension road is anticipated to be built on a more accelerated schedule than would occur without the Kona Kai Ola project.

The EIS has been revised, and Attachment 1 contains Section 2, Alternatives Analysis.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

2 Alternatives Analysis

~~In typical land development projects, the initial planning process includes the exploration of alternatives to development objectives. In the EIS process, these alternatives are presented with a disclosure of reasons for the dismissal of non-preferred alternatives.~~

~~Kona Kai Ola does not follow this same pattern of alternatives evaluation.~~ As discussed in Section 1.4, the proposed Kona Kai Ola project is the result of agreements between JDI and the State DLNR and DHHL. The agreements and leases between the State and JDI stipulate the parameters of development for this site in terms of uses, quantities and size of many features, resulting in a limited range of land uses. Unlike a private property project, JDI is required to meet the criteria outlined in the agreements, thereby affording less flexibility in options and uses. From the developer’s perspective, the agreements must also provide sufficient flexibility to allow for a development product that responds to market needs and provides a reasonable rate of return on the private investment.

The agreements between JDI and DLNR specify that the proposed harbor basin is to be 45 acres and accommodate 800 slips. This development proposal is the subject of this EIS. In response to DEIS comments, additional water quality studies and modeling were conducted. These studies determined that the water circulation in a 45-acre 800-slip marina would be insufficient to maintain the required standard of water quality. The models of water circulation suggest that a new 25-acre harbor basin could successfully maintain required water quality in the new harbor. Comments on the DEIS from DLNR, from other government agencies, the neighbors and the general community also called for the consideration of alternatives in the EIS, including a project with a smaller harbor basin and less density of hotel and time-share units.

In response to these comments on the DEIS, three alternatives are evaluated in this Final EIS and include Alternative 1, which is a plan with a 25-acre 400-slip harbor basin including a decrease in hotel and time-share units; Alternative 2, which is an alternative that had been previously discussed but not included in the proposed project, that includes an 800-slip harbor and a golf course; and Alternative 3, the no-project alternative. Each alternative is included in the EIS with an evaluation of their potential impacts. These project alternatives are presented to compare the levels of impacts and mitigation measures of the proposed project and alternative development schemes pursuant to requirements set forth in Chapter 343, HRS.

~~JDI is required to provide a new marina basin not less than 45 acres and a minimum of 800 new boat slips. Further, the agreements provide the following options for land uses at the project site:~~

- ~~Golf Course~~
- ~~Retail Commercial Facilities~~
- ~~Hotel Development Parcels~~
- ~~Marina Development Parcels~~
- ~~Community Benefit Development Parcels~~

~~JDI is not pursuing the golf course option and is proposing instead to create various water features throughout the project site. All other optional uses have been incorporated in Kona Kai Ola.~~

2.1 Project Alternatives

2.1.1 Alternative 1: 400-Slip Marina

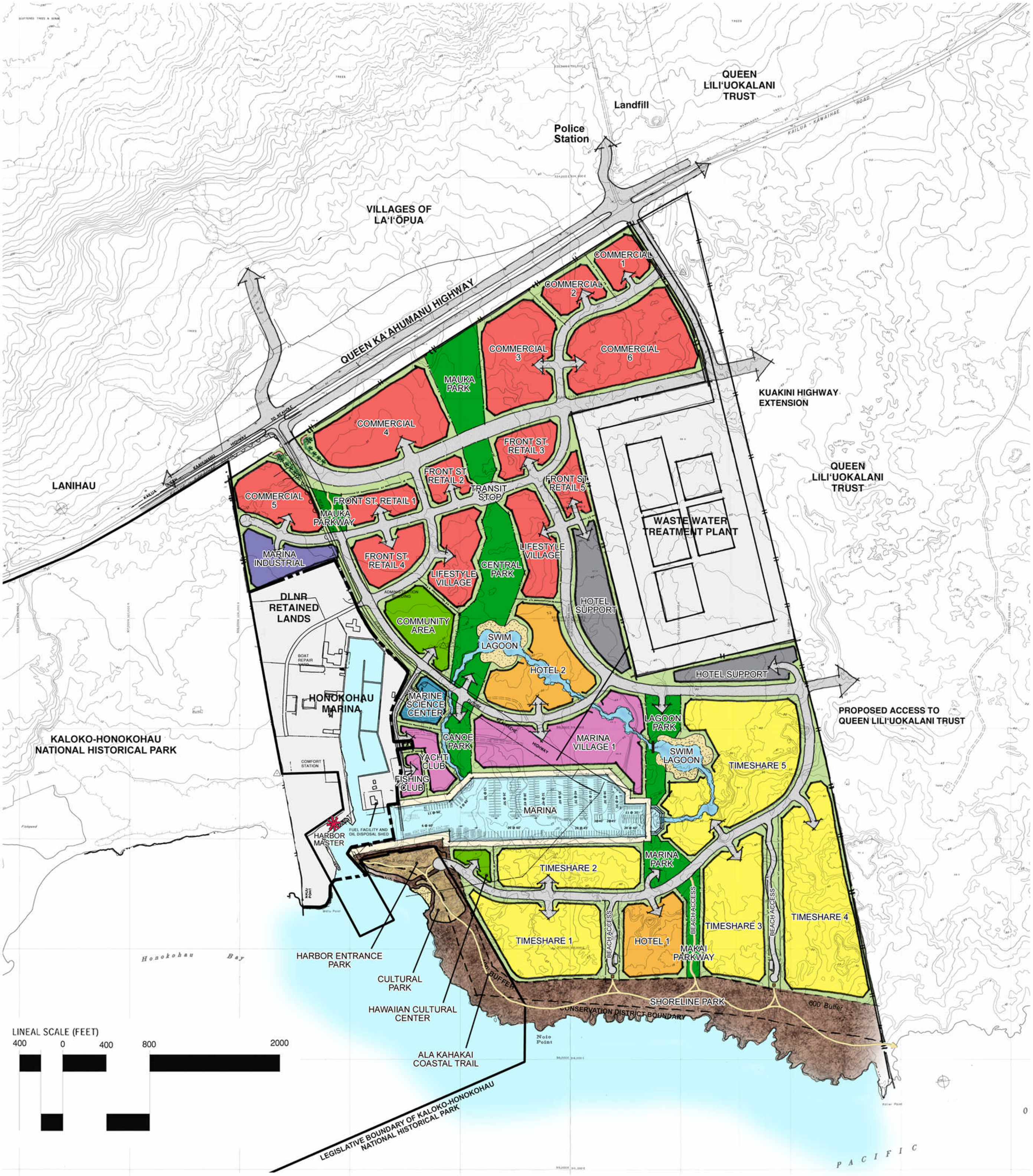
Studies conducted in response to DEIS comments found the construction and operation of an 800-slip marina may significantly impact the water quality within the marina and along the shoreline. Specifically, the Harbor Water Quality Modeling Study, as contained in Appendix U, found that the water circulation in a 45-acre 800-slip harbor was insufficient to maintain an acceptable level of water quality. Further, the existing harbor channel, which would serve both the existing and new harbors, could not adequately serve the increased boat traffic generated by an 800-slip marina during peak traffic. Mitigation measures to accommodate peak boat traffic included the widening of the existing channel, an action that would entail a complex process of Federal and State approvals and encounter significant environmental concern.

Concerns related to the proposed density of hotel and time-share units were also expressed in comments to the DEIS from members of the public, neighbors to the project site, especially the Kaniohale Community Association, and government agencies. Common themes in DEIS comments were related to impacts regarding traffic, project requirements of potable water and infrastructure systems, including sewer, drainage, utility and solid waste systems, and socioeconomic impacts.

In response to the water quality study results, and to the DEIS comments, an alternative plan was developed with a smaller marina with less boat slips, and a related decrease in hotel and time share units. Illustrated in Figure G, Alternative 1 reflects this lesser density project, and features a 400-slip marina encompassing 25 acres. For the purposes of the Alternative 1 analysis, JDI assumed 1,100 time-share units and 400 hotel rooms. Project components include:

- 400 hotel units on 34 acres
- 1,100 time-share units on 106 acres
- 143 acres of commercial uses
- 11 acres of marina support facilities
- 214 acres of parks, roads, open spaces, swim lagoons and community use areas

In addition, Alternative 1 would include the construction of a new intersection of Kealakehe Parkway with Queen Ka‘ahumanu Highway, and the extension of Kealakehe Parkway to join Kuakini Highway to cross the lands of Queen Lili‘uokalani Trust, and connecting with Kuakini Highway in Kailua-Kona. This is a significant off-site infrastructure improvement and is included in the agreements between the State and JDI.



Source: PBR HAWAII

Plan is conceptual only and subject to change

Figure G: Alternative 1: 400-Slip Marina

LEGEND

- TIME SHARE
- HOTEL
- RETAIL / COMMERCIAL
- MARINA RETAIL
- MARINA SUPPORT / COMMERCIAL
- MARINE SCIENCE CENTER
- COMMUNITY AREA / CULTURAL CENTER
- SWIM LAGOON
- MARINA
- UTILITIES
- PARKS & GREEN SPACE
- SHORELINE
- HARBOR ENTRANCE PARK / CULTURAL PARK

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JDI
JACOBY DEVELOPMENT, INC.

Like the proposed project, Alternative 1 would have a strong ocean orientation, and project components that support this theme would include various water features including seawater lagoons and a marine science center. The new Alternative 1 harbor would include a yacht club, fishing club, a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. The coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use. Additional Alternative 1 community areas would include facilities and space for community use, including programs of the Kona Kai Ola Community Foundation, which supports community programs in health care, culture, education, and employment training for the local community, especially to native Hawaiians. Like the original proposed plan, Alternative 1 includes 40 percent of the land in parks, roads, open spaces, swim lagoons and community use areas.

2.1.2 Alternative 2: Golf Course Feature

Alternative 2 was among the alternatives discussed at a community charrette in September 2003. It includes a golf course, which is a permitted use in the DLNR agreement and DHHL lease. As Figure H illustrates, an 18-hole championship golf course would occupy 222 acres on the southern portion of the project site. As with the proposed project, Alternative 2 includes an 800-slip marina on a minimum of 45 acres.

To support the economic viability of the project, other Alternative 2 uses include:

- Golf course clubhouse on three acres
- 1,570 visitor units on 88 acres fronting the marina
- 118 acres of commercial uses
- 23 acres of community uses

Community uses in Alternative 2 include an amphitheater, a canoe facilities park, a community health center, a Hawaiian cultural center and fishing village, a marine science center and employment training center. The sea water lagoon features contained in the proposed project and Alternative 1 are not included in this alternative.

2.1.3 Alternative 3: No Action

In Alternative 3, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.

~~The economic viability and sustainability of the project is determined by the density and uses proposed. Because JDI is obligated to develop an 800-slip marina for the State, complete road improvements, and provide various public enhancement features at its own expense, the density proposed for the income generating features of the development must be sufficient to provide an acceptable level of economic return for JDI. The market study, which is discussed in Section 4.6, reviewed various development schemes and determined that the currently proposed density and mix is the optimum to meet the anticipated financing and development cost obligations for the public features associated with the development.~~

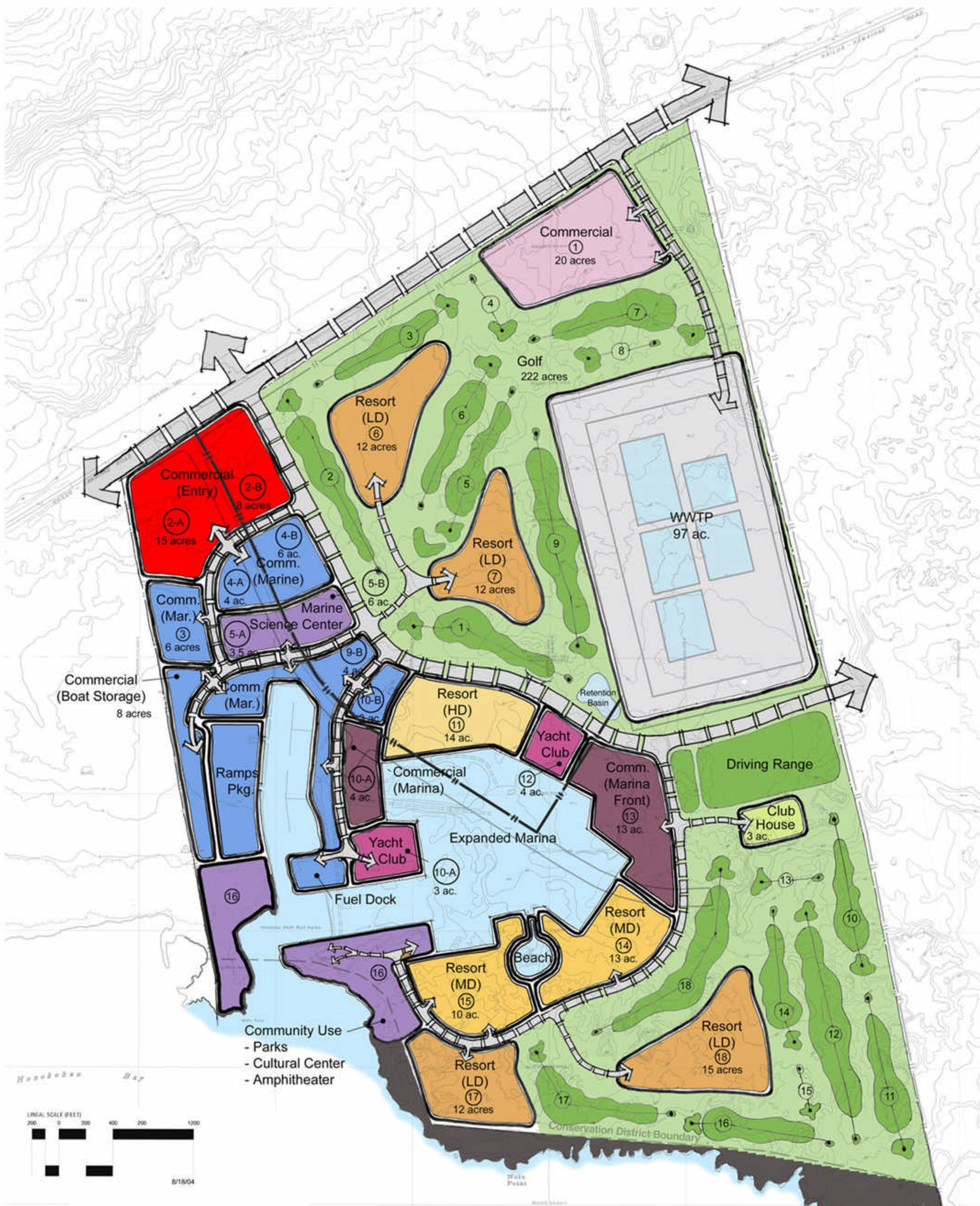

Figure H. Alternative 2: Golf Course Alternative

Legend

USE TYPE

ACRES

Jacoby Development, Inc.

2.2 Alternatives Analysis

As discussed in Section 2.1, the proposed Kona Kai Ola project (also referred to as "proposed project") is defined by development requirements related for a marina and the related uses that would be needed to generate a reasonable rate of return that covers development costs.

Beginning with Section 2.2.1, the alternative development concepts are comparatively assessed for potential impacts that may reasonably be expected to result from each alternative. Following is an overview of the primary observations of such assessment.

Alternative 1 includes half of the State-required boat slips and 60 percent of the proposed hotel and time-share units and, due to the decreased density, this alternative would generate significantly less environmental and socio-economic impacts. A harbor water quality model found the reduction of the volume of the new marina basin by about half (approximately 25 acres) significantly improved the water circulation and quality. Further, the reduced number of boat slips would generate less boat traffic, thereby reducing congestion and the need to mitigate impacts further by the widening of the existing harbor channel.

A project with fewer hotel and time-share units and increased commercial space with a longer (14 years) absorption period would change the mix of employment offered by the project, and slightly increase the overall employment count. The public costs/benefits associated with Alternative 1 would change, compared to the proposed project, with a general increase in tax collections, and a general decrease in per capita costs. Detailed discussion of Alternative 1 potential economic impacts are provided in Section 4.6.6. Comparisons of levels of impact are presented throughout this FEIS.

While this analysis might indicate that the 25-acre marina in Alternative 1 would be the more prudent choice, the DLNR agreement establishes the minimum size and slip capacity of the marina at 45 acres and 800 slips, respectively. Amendments to the DLNR agreement would be required in order to allow Alternative 1 to proceed as the preferred alternative. Hence, selection of the preferred alternative is an unresolved issue at the writing of this FEIS.

Alternative 2, the golf course alternative, was not previously considered to be the preferred alternative primarily because market conditions at the time of project development might not likely support another golf course. Further, DHHL has a strategy goal to have more revenue-generating activities on the commercial lease lands within the project area. In addition, concerns have been expressed as to environmental impacts of coastal golf courses, including the potential adverse impact on Kona's water supply if potable water is used for golf course irrigation.

While Alternative 3, the no-project alternative, would not generate adverse impacts related to development of these lands associated with the construction and long-term operations, it would also not allow for an expanded public marina that would meet public need and generate income for the public sector. Further, the no-project alternative would foreclose the opportunity to create a master-planned State-initiated development that would result in increased tax revenue, recreation options and community facilities. Crucial privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities, and public access would not be contributed.

~~Hence, the only valid alternative to the proposed project is the no-action alternative. In this alternative, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.~~

~~The no-project alternative would therefore not generate adverse impacts associated with the construction and long-term operations would not occur.~~

~~Likewise, the creation of a master-planned state-initiated development, resulting in increased employment, tax revenue, recreation options and community facilities, would not be created. Privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities and public access would not be contributed.~~

Further, the creation of revenue-producing businesses on the DHHL property to fund homestead programs would not occur, resulting in fewer potential benefits for Hawaiians.

Hence, the agreements and leases between the State and JDI indicate that the no-action alternative is not in the public interest~~has been rejected at this time~~.

2.2.1 Impact Comparison

Grading and Excavation

The proposed project requires grading and excavation. Both actions may impact groundwater due to rainfall runoff during construction. Alternative 1 would require a significantly smaller excavation for the marina basin and would therefore carry a lesser risk of potential adverse effects on water quality. Alternative 2 would require the same basin excavation as the proposed project, and would also include extensive grading and filling to build the golf course, the latter of which would generate additional impacts. Alternative 3 would result in no change to the geography, topography and geology.

Further discussion on grading and excavation is contained in Section 3.3.

Natural Drainage

Most precipitation infiltrates into the porous ground at the site, and no significant sheet flow is likely. Alternative 1 would generate similar levels of impacts on natural drainage as those of the proposed project and thus require similar mitigation measures. The golf course in Alternative 2 would not be as porous since the site would be graded, soil would be placed, and grass and other landscaping would be grown. Sheet flow and runoff can occur on a golf course, and drainage patterns might change. Alternative 3 would result in no change to the existing natural drainage pattern. Further discussion on natural drainage is contained in Section 3.4.

Air Quality

Air quality will be affected by construction activities, as well as pollutants from vehicular, industrial, natural, and agricultural sources. Alternative 1 would generate less construction air quality impacts than the proposed project due to the reduced amount of intensive groundwork associated with the smaller marina basin and fewer long-term impacts by reducing traffic 35 and 40 percent during, respectively, AM and PM peak traffic times. Construction of Alternative 2 would result in fugitive dust and exhaust from equipment and is expected to generate the same level of air quality impact as the proposed project. Alternative 3 would result in no change to existing air quality. Further discussion on air quality is contained in Section 3.5.

Terrestrial Environment

To provide additional habitat for shorebirds and some visiting seabirds, the project proposes to construct a brackishwater pond area suitable for avian fauna, including stilts, coots and ducks. While habitat expansion is beneficial, there is also a possibility that these species may be exposed to activity that may harm them. Alternative 1 would not include a brackish water pond, but will include 5 acres of seawater features, which is 74 percent less than the 19 acres of seawater features in the proposed project. While this would reduce beneficial impacts, it would also decrease exposure to potentially harmful activity. Alternative 2 does not include the brackish water pond features, but would include drainage retention basins that would attract avian fauna and expose them to chemicals used to maintain golf course landscaping. While Alternative 3 would result in no increase in potentially harmful activity, it would also not provide additional habitat for avian fauna. Further discussion on the terrestrial environment is contained in Section 3.7.

Groundwater

Groundwater at the project site occurs as a thin basal brackish water lens. It is influenced by tides and varies in flow direction and salt content. The existing Honokōhau Harbor acts as a drainage point for local groundwater. Any impact to groundwater flow from the proposed harbor is likely to be localized. The proposed marina basin will not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance.

There will be differences in the flow to the marina entrance between the proposed project and Alternative 1. Alternative 1, being smaller in size, will have less impact on groundwater flow than the proposed marina. Alternative 2 will have a similar impact to groundwater quality as the proposed project. Alternative 2 may also impact water quality by contributing nutrients and biocides to the groundwater from the golf course. Alternative 3 would result in no change in existing groundwater conditions. Further discussion on groundwater is contained in Section 3.8.1.

Surface Water

There are no significant natural freshwater streams or ponds at the site, but there are brackish anchialine pools. Surface water at the project site will be influenced by rainfall. Runoff typically percolates rapidly through the permeable ground. The proposed project will include some impermeable surfaces, which together with building roofs, will change runoff and seepage patterns.

Alternative 1 is a lower density project that is expected to have proportionally less impact on surface water and runoff patterns and less potential impact on water quality than the proposed project. Alternative 2 would have more impact on surface water quality than the proposed project due to fertilizers and biocides carried by runoff from the golf course. Alternative 3 would result in no change to surface water conditions. Further discussion on surface water is contained in Section 3.8.2.

Nearshore Environment and Coastal Waters

The potential adverse impacts to the marine environment from the proposed project are due to the construction of an 800-slip marina and the resulting inflow of higher salinity seawater and inadequate water circulation, both of which are anticipated to impair water quality to the extent of falling below applicable standards. One possible mitigation measure is to significantly reduce the size of the marina expansion.

The reduced marina size (from 45 to 25 acres) and reduced lagoon acreage in Alternative 1 are expected to result in a proportionate reduction in seawater discharging into the new harbor and increased water circulation. Alternative 2 includes the same marina basin size and is therefore subject to the same factors that are expected to adversely affect water quality.

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water quality in the proposed harbor depends on several components. These include salinity, nutrients, and sediments that come from the ocean, rainfall runoff, water features with marine animals, and dust. The smaller project offered as Alternative 1 is expected to produce a reduced amount of pollutants and reduce the risk of adverse impact upon water quality.

It is notable that the 45-acre marina basin planned in the proposed project and Alternative 2 only becomes viable from a water quality impact standpoint if the additional brackish groundwater inflow into the new marina exceeds 60 mgd. The resulting flushing from such inflow would be expected to better maintain water quality. However, it is unclear whether 60 mgd of brackish groundwater would be available. As proposed in Alternative 1, reduction of the volume of the new marina basin by 45 percent will significantly improve the flushing and water quality because the lower volume can be flushed by the available groundwater flow.

In addition, there could be higher rainfall runoff from the Alternative 2 golf course into the harbor, because the grassed golf course will be less porous than the natural surface. The golf course will also require relatively high levels of fertilizer, biocides, and irrigation, all of which could contribute to adverse water quality impacts.

Further discussion on nearshore environment and coastal waters is contained in Section 3.9.1.

Anchialine Pools

Anchialine pools are located north of Honokōhau Harbor, and south of the harbor on the project site. The marine life in these pools is sensitive to groundwater quality, and changes due to construction and operation of the project could degrade the viability of the pool ecosystem. In the southern complex, 3 anchialine pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction in the proposed project and Alternatives 1 and 2.

Predicting the extent of change in groundwater flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is therefore extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Due to the uncertainty of changes in groundwater flow and quality due to marina construction, the variability in impacts between the proposed project and Alternatives 1 and 2 is unknown at this time. Alternative 3 would result in no change in groundwater flow. While this would eliminate the potential for adverse impacts, Alternative 3 would also continue the pattern of existing degradation related to human activity and the introduction of alien species. Further discussion on anchialine pools is contained in Section 3.9.2.

Marine Fishing Impacts

The proposed marina will increase the number of boats in the area and it is reasonable to assume that a portion of these new boats will engage in fishing activities. The increase in boats in the area would be primarily related to the marlin and tuna / pelagic fishery, coral reefs due to extractive fisheries, and SCUBA activities. The pressure on fish and invertebrate stocks is expected to increase with or without the marina. Harbor expansion provides the opportunity to address existing conditions to consolidate, focus, and fund management and enforcement activities at one location.

Compared to the proposed project, Alternative 1 would result in a 21 percent decrease in boat traffic, thereby lessening the potential for marine fishing impacts. The level of impacts in Alternative 2 would be similar to that of the proposed project. Alternative 3 would result in no change in existing marine fishing conditions, and no opportunity to address already existing pressure on fish and invertebrate stocks. Further discussion on marine fishing impacts is contained in Section 3.9.3.

Cultural and Archaeological Resources

The proposed project will integrate cultural and archaeological resources in the overall development. Archaeological sites recommended for preservation will be preserved, and cultural practices will be encouraged. Kona Kai Ola includes a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. Proposed is a 400-foot shoreline setback that would serve as a buffer between the ocean and developed areas. This coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use.

Alternative 1 would contain all of the cultural archaeological features and the shoreline setback area would be 400 feet in the northern portion of the site and increase to 600 feet in the southern portion. Alternative 2 would preserve cultural and archaeological resources, but does not include a 400-foot shoreline setback. Alternative 3 would result in no change to existing cultural and archaeological resources and no addition of cultural and community facilities and activities. Further discussion on cultural and archaeological resources is contained in, respectively, Sections 4.1 and 4.2.

Noise

Project-generated noise is due to construction equipment and blasting, boats, marina activities, vehicle traffic, and the Kealakehe Wastewater Treatment Plant operations. Alternative 1 would generate less noise impacts due to reduced construction activities, fewer boats, less traffic and less on-site activity. Alternative 2 would also generate less noise due to reduced traffic and less on-site activity, but noise related to the excavation of the marina basin and an increase in the number of boats would be similar to that of the proposed project. Further discussion on noise impacts is presented in Section 4.4.

Socioeconomic Impacts

The proposed project will generate an increase in de facto population of an estimated 5,321 persons due to the increase in hotel and time-share units. The estimated de facto population increase in Alternative 1 is 37 percent less, at 3,363 persons, than the proposed project. The de facto population increase in Alternative 2 is similar to Alternative 1.

Employment in the commercial components will nearly double in Alternative 1, from a stabilized level of 1,429 full-time equivalent (FTE) positions in the proposed project to 2,740 in the Alternative 1.

Under Alternative 1, the total operating economic activity at Kona Kai Ola will increase due to the added commercial space more than off-setting the fewer visitor units, moving upward from $557.6 million per year to circa $814.3 million annually. The total base economic impact resulting from development and operation of Alternative 1 will similarly be higher by between 35 and 45 percent than that of the proposed project.

Alternative 1, which has a reduced marina size of 25 acres, and fewer hotel and time-share units, would have a meaningful market standing, create significant economic opportunities, and provide a net benefit to State and County revenues. From a market perspective, a smaller Kona Kai Ola would still be the only mixed use community in the Keahole to Kailua-Kona Corridor offering competitive hotel and time-share product.

The estimated absorption periods for marketable components of Alternative 1 are generally shorter than those for the same components in the proposed project. Marina slips under Alternative 1 are estimated to be absorbed within 2 years after groundbreaking, as compared with 9 years for absorption of slips in the proposed project. Hotel rooms under Alternative 1 are estimated to be absorbed within 4 years after groundbreaking, as compared with 7 years under the proposed project. Time-share units would be absorbed within 10 years under Alternative 1, while 15 years are projected under the proposed project. Due to the planned increase in commercial facilities under Alternative 1, the absorption period of commercial space is estimated at 14 years, as compared with 8 years for absorption of such facilities under the proposed project.

The State and County will still both receive a net benefit (tax receipts relative to public expenditures) annually on a stabilized basis under the Alternative 1. The County net benefits will be some $12.2 million per year under the Alternative 1 versus $14.9 million under the proposed project. The State net benefits will increase under the Alternative 1 to about $37.5 million annually, up substantially from the $11.4 million in the proposed project.

Due to the lower de facto population at build-out, the effective stabilized public costs for both the State and County will decline meaningfully under the Alternative 1, dropping from $7.7 million annually for the County and $36.5 million for the State, to $4.9 million and $23 million per year, respectively.

Alternative 3 would result in no increase in de facto population and improvement to economic conditions. Further discussion on social and economic impacts are contained in, respectively, Sections 4.5 and 4.6.

Vehicular Traffic

The proposed project will impact the nearby road network that currently is congested during peak traffic times. The proposed project includes roadway improvements that would reduce the impact and improve roadway conditions for the regional community.

Alternative 1 includes the same roadway system improvements as the proposed project, yet would reduce vehicular traffic by 35 percent when compared to the proposed project. Alternative 2 would have similar traffic conditions and roadway improvements as Alternative 1. Alternative 3 would result in no increase in traffic and no roadway improvements.

Marina Traffic Study

The increase in boat traffic due to the proposed 800-slip marina would cause entrance channel congestion during varying combinations of existing and new marina peak traffic flow. Worst case conditions of active sport fishing weekend and summer holiday recreational traffic result in traffic volumes exceeding capacity over a short afternoon period. Mitigation to address boat traffic in the proposed project include widening the entrance channel, traffic control, implementation of a permanent traffic control tower, or limiting vessel size.

Alternative 1 would result in a 21 percent reduction in boat traffic congestion under average existing conditions and ten percent reduction during peak existing conditions. The reduction to 400 slips also reduces the impacts of congestion at the entrance channel, thereby reducing the need for any modifications to the entrance channel.

Alternative 2 would have the same level of boat traffic as the proposed project. Alternative 3 would not meet the demand for additional boat slips and would not generate additional boat traffic. Further discussion on marina traffic is contained in Section 4.8.

Police, Fire and Medical Services

The proposed project will impact police, fire and medical services due to an increase in de facto population and increased on-site activity. Alternatives 1 and 2 would have similar levels of impact as the proposed project due to increased on-site activity. Further discussion on police, fire and medical services are contained, respectively, in Sections 4.10.1, 4.10.2 and 4.10.3.

Drainage and Storm Water Facilities

The proposed project will increase drainage flows, quantities, velocities, erosion, and sediment runoff.

Alternative 1 involves a reduction of the project density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces associated with hotel and time-share development and to the creation of more open space. However, roadway areas will increase by about 30 percent in Alternative 1. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings. The golf course in Alternative 2 may also change drainage characteristics from those of the proposed project and may not reduce impacts. Alternative 3 would result in no change in existing conditions and no improvements to drainage infrastructure. Further discussion on drainage and storm water facilities is contained in Section 4.10.5

Wastewater Facilities

The proposed development is located within the service area of the Kealakehe WWTP and a sewer system will be installed that connects to the WWTP. The sewer system will be comprised of a network of gravity sewers, force mains, and pumping stations which collect and convey wastewater to the existing Kealakehe WWTP. Project improvements will incorporate the usage of recycled / R1 water. Improvements implemented by the proposed project will also accommodate the needs of the regional service population.

Alternative 1 would generate approximately 10 percent less wastewater flow than the proposed project. Wastewater flow in Alternative 2 is undetermined. Alternative 3 would result in no additional flow, as well as no improvements that will benefit the regional community. Further discussion on wastewater facilities is contained in Section 4.10.6.

Potable Water Facilities

The proposed project average daily water demand is estimated at 1.76 million gallons per day. Existing County sources are not adequate to meet this demand and source development is required. The developer is working with DLNR and two wells have been identified that will produce a sustainable yield that will serve the project. These wells will also serve water needs beyond the project.

Alternative 1 would result in net decrease of about five percent of potable water demand. Alternative 2 may have a lower water demand than the proposed project as long as potable water is not used for irrigation. Alternative 3 would result in no additional flow, as well as no source development that will benefit the regional community. Further discussion on potable water facilities is contained in Section 4.10.8.

Energy and Communications

Regarding Alternative 1, preliminary estimates for electrical, telecommunications, and cable resulted in a net demand load that remains similar to the proposed project. Further discussion on energy and communications is contained in Section 4.10.9.1.

The proposed project will increase the demand for electrical energy and telecommunications. The demand would be reduced in Alternative 1 because the number of boat slips and units would decrease. Similarly, Alternative 2 would have fewer units than the proposed project and therefore reduce energy demands. Further reduction in energy demand for either alternative could be achieved by using seawater air conditioning (SWAC) and other energy reduction measures, as planned by the developer. Further discussion on energy and telecommunications is contained in Section 4.10.9.2.

Water Features and Lagoons

The proposed project includes a brackishwater pond, lagoons, and marine life exhibits supplied by clean seawater. The water features in Alternative 1 would significantly decrease by 74 percent from 19 acres in the proposed project to five acres in Alternative 1. This decrease in water features would result in a corresponding decrease in water source requirements and seawater discharge. Alternative 2 does not include the seawater features. Alternative 3 would result in no additional demand for water source requirements and seawater discharge.

2.2.2 Conformance with Public Plans and Policies

State of Hawai‘i

Chapter 343, Hawai‘i Revised Statutes

Compliance with this chapter is effected, as described in Section 5.1.1 in regard to the proposed project and the alternatives discussed.

- State Land Use Law, Chapter 205, Hawai‘i Revised Statutes

  The discussion in Section 5.1.2 is directly applicable to Alternative 1, the proposed project. Alternative 1 will involve a setback of 400 feet that increases to 600 feet along the southern portion of the project site’s shoreline area. Alternative 2 does not provide for such a setback, but may still require approvals from DLNR for cultural, recreational, and community uses and structures within the Conservation district.

- Coastal Zone Management Program, Chapter 205A, Hawai‘i Revised Statutes

  Recreational Resources:

  In addition to the discussion of consistency with the associated objective and policies, as described in Section 5.1.3, the reduction from the proposed project’s 800-slip marina to a 400-slip marina under Alternative 1 will still expand the region’s boating opportunities and support facilities. The existing harbor entrance will still be utilized under this alternative; however, potential risks relating to boat traffic and congestion in the marina entrance area will be reduced significantly. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities, and marine science center remain important recreational components under Alternative 1.

Alternative 2 includes a golf course component, which would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Alternative 2, like the proposed project, will expand the region’s boating opportunities and support facilities through its 800-slip marina. However, the potential adverse impacts of increased boat traffic from the size of the marina are significant enough to offset the benefits of increased boating opportunities.

Coastal Ecosystems:

The discussion in Section 5.1.3 is directly applicable to Alternative 1.

Alternative 1 not only reduces the number of slips proposed by 50 percent, but it also reduces the size of the marina from 45 acres to 25 acres. The 25-acre marina will increase the body of water within the existing harbor, but to a significantly lesser extent than the proposed project’s estimated increase, which is also applicable to the 45-acre size that is proposed for the marina under Alternative 2.

The findings of the Harbor Water Quality Modeling Study conclude that a reduction in the size of the harbor expansion is an alternative that will mitigate the risk of significant impacts upon water quality within the marina and existing harbor. Accordingly, the reduction in both the number of slips and the size of the marina basin under Alternative 1, in combination with proper facilities design, public education, and enforcement of harbor rules and regulations, would result in fewer long-term impacts to water quality and coastal ecosystems. Short-term (construction-related) impacts would likely remain the same although the reduction in the total acreage of excavation is expected to result in a shorter duration of such impacts.

In addition to its 800-slip marina and potential adverse impacts upon water quality and the marine environment, Alternative 2 includes a golf course component, which has the potential to impact coastal ecosystems by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Economic Uses

Although reduced in the number of slips, the smaller marina under Alternative 1 will nevertheless serve public demand for more boating facilities in West Hawai‘i and is consistent with the objective and policies and discussion set forth in Section 5.1.3. The economic impacts of Alternative 2, while comparable to those of the proposed project’s marina development, are notably marginal as to the golf course component, based on the marketability analysis that indicates a condition of saturation within the region.

Coastal Hazards

The discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Tsunami risks mainly affect the large shoreline setback area that is proposed for the project and Alternative 1. Alternative 2 projects a transient accommodation site that is partially within the tsunami hazard zone and thus carries a higher hazard risk. However, the essential requirement for these alternatives, as well as the proposed project, is a well-prepared and properly implemented evacuation plan.

Beach Protection

Discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Alternative 1 and, to a lesser extent, Alternative 2, will retain the shoreline area in its natural condition.

Similar to the proposed project, Alternative 1 provides for a shoreline setback of considerable width within which no structure, except for possible culturally-related structures, would be allowed. Alternatives 1 and 2 will thus be designed to avoid erosion of structures and minimize interference with natural shoreline processes.

Marine Resources

The discussion in Section 5.1.3 is also applicable to Alternative 1 which is described to be an alternative that is specifically projected to mitigate anticipated adverse impacts on water quality and the marine environment that might otherwise result from the original harbor design and scale, which is also incorporated in Alternative 2 . The reduced marina size under Alternative 1 is projected to meet water quality standards and enable greater compliance with the objective and policies addressed in this section.

Alternative 2 includes a golf course component and thus the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Hawai'i State Plans, Chapter 226, Hawai'i Revised Statutes

Section 226-4 (State goals), 5 (Objectives and policies for population, and 6 (Objective and policies for economy in general):

The discussion in Section 5.1.4 is applicable to Alternatives 1 and 2, in addition to the proposed project. These development concepts generally conform to the goals, objectives, and policies set forth in these sections because they will provide some degree of economic viability, stability, and sustainability for future generations. Kona Kai Ola will convert essentially vacant land into a mixed-use development with a distinctive marina and boating element, providing a wide range of recreational, business, and employment opportunities to the community.

Section 226-8 Objective and policies for the economy – the visitor industry:

Alternatives 1 and 2 will be consistent with the State's economic objective and policies relating to the tourism industry for the same reasons that are discussed in regard to the proposed project in Section 5.1.4. They will incorporate JDI's commitment to sustainability principles in the planning and design of the development concepts in Alternatives 1 and 2. Although the total hotel and time-share unit count is reduced to approximately 1,500 in Alternatives 1 and 2, the transient accommodations component of these alternatives will still further the State's objective and policies for increased visitor industry employment opportunities and training, foster better visitor understanding of Hawai'i's cultural values, and contribute to the synergism of this mixed-use project concept that addresses the needs of the neighboring community, as well as the visitor industry.

Section 226-11 Objectives and policies for the physical environment: land-based, shoreline and marine resources:

Alternative 1 is expected to involve less potential adverse impacts upon these environmental resources than the proposed project. Likewise, and Alternative 2 would have less adverse impact because of its reduction in the size of the marina and in the total hotel and time-share unit count. Alternative 1 carries less potential risk to water quality and related impacts upon the marine environment and anchialine pool ecosystems. Although approximately three anchialine pools are expected to be destroyed, the great majority of pools will be preserved within and outside of the proposed 400-foot shoreline setback.

The golf course component in Alternative 2 has the potential to impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the marina basin and nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools by introducing the chemicals into the pond systems.

Section 226-12 Objective and policies for the physical environment: scenic, natural beauty, and historic resources:

The discussion in Section 5.1.4 is directly applicable to Alternative 1 and describes the compliance with the objective and policies addressed.

The golf course component of Alternative 2 would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area.

Just as with the proposed project, Alternatives 1 and 2 would also be designed to blend with the natural terrain and to honor and protect the cultural history, resources, and practices of these lands.

Section 226-13 Objectives and policies for the physical environment: land, air and water quality:

As stated above, because of the reduction in both the number of slips and the size of the marina basin, with proper facilities design, public education and enforcement of harbor rules and regulations, Alternative 1 is anticipated to cause fewer long-term impacts to water quality than either the proposed project or Alternative 2. Based on the findings of the Harbor Water Quality Modeling Study, water quality resulting from a reduced marina basin size as proposed under Alternative 1 is expected to be similar to existing conditions.

As previously noted, Alternative 2 has the potential to adversely impact water quality by increasing the nutrient loading in surface runoff and groundwater by introducing pesticides, herbicides and other chemicals common in golf course development and maintenance into the marina basin and nearshore waters surrounding the project site.

Section 226-14 Objectives and policies for facility systems - general:

Alternatives 1 and 2 will conform to the objective and policies of this section on the grounds that are discussed in regard to the proposed project in Section 5.1.4. The master-planning and phasing of the project concepts under these alternatives will be coordinated with associated public and private infrastructural planning and related private and public infrastructural financing. The cost of the marina construction and project-related infrastructure is to be borne by the developer, resulting in considerable savings for the public. In addition, the projected lease revenue from these public lands will provide additional public benefits by establishing a revenue stream for capital improvements and maintenance of a range of State facilities.

Section 226-15 Objectives and policies for facility systems - solid and liquid wastes:

In addition to the developer's commitment to sustainable development design, the project will involve upgrades to the County of Hawaiʻi's Kealakehe Wastewater Treatment Plant to meet current needs, as well as the project's future needs. This commitment is applicable to Alternatives 1 and 2, as well as the proposed project that is discussed in Section 5.1.4.

Section 226-16 Objectives and policies for facility systems – water:

The discussion of water conservation methods and the need to secure additional potable water sources in Section 5.1.4 is also applicable to Alternative 1 and demonstrates conformity to the objective and policies for water facilities. Alternative 2 involves greater irrigation demands in regard to its golf course component and greater potable water demands for human consumption than those for Alternative 1. Alternative 2 is expected to face more serious challenges in securing adequate and reliable sources of water.

Section 229-17 Objectives and policies for facility systems – transportation:

Alternatives 1 and 2 will conform to this objective and policies because they will present water transportation opportunities, including the possible use of transit water shuttles to Kailua-Kona, as described in regard to the proposed project in Section 5.1.4.

Section 226-18 Objectives and policies for facility systems – energy:

Alternatives 1 and 2 conform to these objective and policies through the use of energy efficient design and technology and commitment to the use and production of renewable energy to serve the project's needs. Solar energy production, solar hot water heating, and the use of deep cold seawater for cooling systems are currently identified as means of saving substantial electrical energy costs for the community and the developer.

Section 226-23 Objectives and policies for socio-cultural advancement – leisure:

Alternative 1 conforms to this objective and related policies for the reasons offered in Section 5.1.4 in regard to the proposed project. Alternative 1 will be of greater conformity with the policy regarding access to significant natural and cultural resources in light of the 400-600 foot shoreline setback that has been designed for this alternative.

Although it does not propose the considerable shoreline setback that is planned for Alternative 1, Alternative 2 is consistent with this objective and related policies in incorporating opportunities for shoreline-oriented activities, such as the walking trails. In addition, the golf course component adds a more passive recreation alternative to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Section 226-25 Objectives and policies for socio-cultural advancement-culture:

The discussion in Section 5.1.4 is relevant to Alternatives 1 and 2 and demonstrate their conformity the objective and policies of this section.

Both alternatives involve the preservation and protection of cultural features that have been identified by the Cultural Impact Assessment and archaeological studies for the project area. Both provide for public shoreline access, and both will continue the policy of close consultation with the local Hawaiian community and cultural and lineal descendants in the planning of cultural resource preservation and protection.

Section 226-103 Economic priority guidelines:

Alternatives 1 and 2 conform to these guidelines for the same reasons that are set forth in Section 5.1.4. They involve private investment in a public project that will create economic diversification through a mix of marina, industrial, commercial, visitor, and cultural facilities. This presents a wide range of entrepreneurial opportunities, long-term employment opportunities, and job training opportunities.

Section 226-104 Population growth and land resources priority guidelines:

As described in Section 5.1.4, the policy support for the proposed project also extends to the similar development concepts considered in Alternatives 1 and 2. Those alternatives conform to the guidelines of this section because they involve an urban development under parameters and within geographical bounds that are supported by the County's General Plan, a preliminary form of the Kona Community Development Plan, the County's Keahole to Kailua Regional Development Plan, and the reality of being located along the primary commercial/industrial corridor between Keahole Airport and Kailua-Kona. As with the proposed project, the development concepts of Alternatives 1 and 2 are essentially alternatives for the implementation and "in-filling" of the urban expansion area in North Kona.

DHHL Hawai'i Island Plan

This 2002 plan projects DHHL's Honokōhau makai lands for commercial use. As compared to the proposed project and Alternative 2, Alternative 1 presents an expanded commercial component that provides greater compliance with the plan, while addressing certain beneficiaries' concerns about the scale of the marina originally required in the Project. Alternative 2 also conforms to the recommended commercial uses in the makai lands but to a lesser degree than Alternative 1 because of its more limited commercial component. Like the proposed project, its marina size and number of slips raise environmental issues, as more specifically discussed in Part 3, and community concerns.

County of Hawai'i General Plan

HCGP Section 4 – Environmental Quality Goals, Policies and Courses of Action:

Alternative 1 is consistent with this section. It presents a reduction in both the number of slips and the size of the marina basin that, in combination with proper facilities design, public education and enforcement of harbor rules and regulations, would result in very few long term impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions.

Alternative 2 is the least consistent with this section. In addition to the potential significant impacts of its 800 slip marina basin, its golf course component has the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides and other chemicals common in golf course use and management into the nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools beyond their current conditions by introducing such substances into the pool systems.

HCGP Section 7 – Natural Beauty Goals and Policies:

Alternative 2 conforms to some degree with this section. Its golf course component would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area, as demonstrated in other makai golf courses within the region.

HCGP Section 8 – Natural Resources and Shoreline:

Alternative 1 is most consistent with the goals and policies of this section. It would require considerably less marina excavation than the proposed project and Alternative 2 and would reduce the potential risk of long-term adverse impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions with the degree of reduction in marina basin size that is proposed under Alternative 1. This reduction is also expected to reduce potential impacts upon anchialine pools and their ecosytems, as well as shoreline and marine resources that are affected by water quality. Alternative 1 also retains the shoreline preservation and protection concepts that are proposed in and described for the Project.

HCGP Section 10 – Public Facilities Goals and Policies:

The discussion in Section 5.2.1. in relation to the proposed project is applicable to Alternatives 1 and 2. Improvements to public facilities are are integral to the Kona Kai Ola development. The provision of additional boat slips and numerous road improvements, including a makai extension of Kuakini Highway south to Kailua-Kona are incorporated into plans for the project's development. In light of these elements, Alternatives 1 and 2 are consistent with the goals and policies of this section.

HCGP Section 11 – Public Utility Goals, Policies:

As with the proposed project, Alternatives 1 and 2 are consistent with the goals and policies of this section, based on the relevant grounds set forth in Section 5.2.1. The developer is committed to design, fund, and develop environmentally sensitive and energy efficient utility systems to the extent possible, as described previously in Part 5. Its master planning provides for the coordinated development of such systems with the objective of achieving significant savings for the public. As previously-mentioned example, the project development involves the upgrading of the Kealakehe Wastewater Treatment Plant.

HCGP Section 12 – Recreation:

Alternative 1 is consistent with the goals, policies, and courses of action for North Kona in this section.

Although the number of slips is reduced under Alternative 1, the region's boating opportunities and support facilities will still be expanded. The existing marina entrance would still be utilized under this alternative. However, concerns relating to increased activity leading to increased congestion in the marina entrance area would be mitigated to a certain extent. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities and marine science center remain important components of Alternative 1.

The golf course component of Alternative 2 would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola. Alternative 2 is also considered to be consistent with this section.

HCGP Section 13 and 13.2 – Transportation:

The reduced marina component under Alternative 1 will still provide transportation opportunities and provide for possible use of transit water shuttles to Kailua-Kona, although to a lesser degree than under the proposed project and Alternative 2 . However, in each scenario, internal people-movers are planned, and numerous roadway improvements are planned for coordination with public agencies, including but not limited to the construction of the Kuakini Highway extension between Honokōhau and Kailua-Kona. Accordingly, both Alternatives 1 and 2 are consistent with the goals, policies, and courses of action for North Kona under these sections of the General Plan.

HCGP Section 14.3 – Commercial Development:

For the reasons presented in the discussion under Section 226-104 of the State Plan, the planned commercial component under Alternatives 1 and 2 are consistent with this section.

HCGP Section 14.8 – Open Space:

Alternatives 1 and 2 are consistent with the goals and policies of this section. Alternative 1 provides a considerable (400-600 foot) shoreline setback along the entire ocean frontage of the project site as a means of protecting the area's scenic and open space resources, as well as natural and cultural resources. Although it does not incorporate the shoreline setback planned in Alternative 1, Alternative 2 provides a golf course component would contribute to the amount of open space that is currently proposed and allow additional view corridors to be created.

Community Development Plans

Community development plans are being formulated for different regions in the County in order to supplement the County's General Plan. The Kona Kai Ola project is located in the Kona Community Development Plan (CDP) area. Maps associated with the preliminary work phases

of the Kona CDP include the Kona Kai Ola project site within the "Preferred Urban Growth" boundary of the North Kona district. The Kona CDP process is guided by a Steering Committee composed of a broad cross-section of the community. The Steering Committee will eventually complete its work and recommend the CDP's adoption.

After the DEIS was published, the Kona CDP has progressed to the development of plans for the major urban growth corridor north of Kailua-Kona. The Kona CDP has produced a draft plan showing a transit oriented development that includes a midlevel public transit corridor along the mauka residential elevation, and a makai transit corridor that runs along a proposed new frontage road just makai and parallel to Queen Kaahumanu Highway. The development plan for Alternative 1 includes the Kuakini Highway as part of this proposed frontage road and transit line from Kailua Kona to the Kealakehe area, along with a transit stop at Kona Kai Ola. The Alternative 1 plan also includes a road that could be extended to be part of the proposed frontage road should it be approved and implemented. In addition, the Kona CDP has continued to emphasize the principles of smart growth planning with mixed use urban areas where people can live, work, play and learn in the same region. Kona Kai Ola has been specifically designed to be consistent with this policy in order to provide a stable employment base close to where people live in the mauka residential areas already planned for DHHL and HHFDC lands.

It should be noted that currently and over the years, the 1990 Keāhole to Kailua Development Plan (K-to-K Plan) guides land use actions by the public and private sectors. It is intended to carry out the General Plan goals and policies related to the development of the portion of North Kona area, including the Kona Kai Ola site. The "Preferred Growth Plan" of the Keāhole to Kailua Development Plan identifies the project site as a new regional urban center to include commercial, civic, and financial business related uses, an expanded "Harbor Complex," a shoreline road, and a shoreline park. The proposed project and the development concepts in Alternatives 1 and 2 are therefore consistent with the recommendations in the Keāhole to Kailua Development Plan.

Hawai'i County Zoning

As shown on Figure AA, the project site is zoned "Open". Under Section 25-5-160 of the Hawai'i County Code, "The O (Open) district applies to areas that contribute to the general welfare, the full enjoyment, or the economic well-being of open land type use which has been established, or is proposed. The object of this district is to encourage development around it such as a golf course and park, and to protect investments which have been or shall be made in reliance upon the retention of such open type use, to buffer an otherwise incompatible land use or district, to preserve a valuable scenic vista or an area of special historical significance, or to protect and preserve submerged land, fishing ponds, and lakes (natural or artificial tide lands)".

Some of the proposed uses at Kona Kai Ola are permitted uses in the Open zone such as:

- Heiau, historical areas, structures, and monuments;
- Natural features, phenomena, and vistas as tourist attractions;
- Private recreational uses involving no aboveground structure except dressing rooms and comfort stations;

- Public parks;
- Public uses and structures, as permitted under Section 25-4-11.

In addition to those uses permitted outright, the following uses are permitted after issuance of a use permit:

- Yacht harbors and boating facilities; provided that the use, in its entirety, is compatible with the stated purpose of the O district.
- Uses considered directly accessory to the uses permitted in this section shall also be permitted in the O district.

The proposed time-share and hotel units and commercial uses would not be consistent with the zoning designation of "Open". Project implementation therefore requires rezoning of portions of the project to the appropriate zoning category or use permits for certain uses.

Special Management Area

As shown in Figure AB, the entire project area up to the highway is within the coastal zone management zone known as the Special Management Area ("SMA"). At the County level, implementation of the CZM Program is through the review and administering of the SMA permit regulations. Kona Kai Ola complies with and implements the objectives and policies of the Coastal Zone Management (CZM) Program, and a full discussion is provided in Section 5.1.3. The development concepts in the proposed project and Alternatives 1 and 2 will be subject to applicable SMA rules and regulations.

Kona Kai Ola Harbor Development

To Whom It May Concern:

In West Hawaii Today on April 22, 2006 the Kona Kai Ola development by the harbor is described as a "green" and "pristine" utopia. But, it seems as if it will have a significant impact upon fragile marine life living at the entrance of the harbor, anchialine ponds within the boundaries of the future site, the infrastructure, and the future of the environment. Numerous skeptics have looked into the intentions of Kona Kai Ola's design for the land and the community, and have found evidence to indicate that this project should not be allowed to proceed.

It mentions in the paper that there will be 490 acres of a waterfront, commercial village, which will have water access. This village will be in the near Kaloko Honokohau National Historic Park. In 1978, the National Park was authorized by the United States Congress to preserve the legacy of the traditional Hawaiian activities and culture. The commission recommended the Kaloko Honokohau National Historic Park and bordering waters be preserved for Hawaii's future generations and as part of the nation's vital national parks.

The National Park includes 7.5 acres of lands on the northern side of Honokohau Harbor and 15.5 acres of State of Hawaii lands to the south of Honokohau Harbor. Unfortunately, the National Park Service has been unable to lease the authorized lands on the southern side of the harbor. These lands include the current project, the Kona Kai Ola Development.

There are also some extremely important cultural sites and archeological features, as well as 22 anchialine pools. Only three of the twenty cultural sites will survive the development of this resort. The development will cut off the water supply to the 22 anchialine pools. There are two types of opai ula - red shrimp- which only live in anchialine pools. The National Park Service is responsible for protecting sites such as the fisherman's heiau, which encompasses two great upright stone slabs which rise above the height of the pavement in its seaward retaining wall which is surrounded by a picturesque scene and ancient house sites.

This proposed project will result in the destruction of these cultural sites and all the pristine and healthy anchialine pools.

The Park contains two large, 15 acre, fishponds, more than 130 known anchialine pools and 596 acres of marine waters. Significant water withdrawals from the water tables near these sites could have major direct and cumulative impacts on them. Increased water withdrawals will likely raise the salinity of the groundwater in the area and may interfere with species dependent on these habitats such as the anchialine pool species, and the endangered water birds. The water birds such as the Hawaiian stilt and the Hawaiian coot depend upon the brackish wetland for breeding.

There are several candidate endangered species which inhabit the pools; including the orangeblack Hawaiian damselfly and the anchialine pool shrimp. These threatened and endangered species in and near the development should be accounted for.

The hawksbill and green sea turtles, Hawaiian bottlenose dolphins, Hawaiian spinner dolphins and the Hawaiian monk seal are very much vulnerable to increased boat traffic, noise, and added pollutants. The spinner dolphins rest during the daytime near the entrance of the harbor, and boat traffic is during the day also. The noise from the boats will wake up the dolphins and they won't get the needed amount of rest to function properly. Hawksbill sea turtles are regularly sighted at the dive sites at the harbor entrance. Monk seals have also been observed in the Park several times since 2001. There are also two turtle-cleaning stations just outside the harbor. The Humpback whales' global population has reduced by 250,000 or 90%. They have very sensitive hearing, and can get distracted underwater.

There are currently 170 resident turtles at Kaloko National Historic Park that always return. The largest impacts upon the turtles are propellers on boats, noise pollution, land-based pollutants (sewage), ocean pollutants, and oil and gasoline from boats. Most of these impacts are from boats. There have been 20 turtle strandings in the past five years from fishing line, and boat strikes. These will definitely heighten with the added boat capacity in the harbor.

The environment of the park will be changed dramatically from the introduction of alien marine invasive marine and terrestrial species. Invasive species are a major problem in Hawaii because of its fragile and balanced Hawaiian ecosystem. Every invasive species alters the ecosystem dramatically because of their ability to adapt to many different climates and physical environments. Because of Hawaii's preferable climate, invasive species thrive here. Invasive species almost always have adaptations to protect themselves. Endemic Hawaiian species are very fragile, so invasive species can easily kill them off.

There are presently 250 slips in the harbor. An additional 800 slips in an expansion of no less than 45 acres is a 300% increase in the current harbor capacity; making over 1000 slips. From 1996-2004, Hawaii's boat registrations have decreased by 15.4%. This new expansion would be useless to Hawaii.

The only people who would be able to use the harbor would be tourists (because of the $11 fine per foot), not local residents. It seams as if the wealthy people are being catered to.

There is already over-fishing in Hawaii. The catch rate of many marine species has decreased within the past few years.

Pollution from oil spills and added sewage will pollute the ocean and the ground will absorb the chemicals. The air quality in Kailua will become less pure because of the added traffic and added population. This will harm the health of endangered and native species and the health of the development's visitors, their employees, and the locals.

The plan for the development is to have about 2,500 hotel and timeshare units. There are currently 4,500 units in Kailua-Kona. This new development will increase the amount of timeshare and hotel units by more than 50%. The project will also increase the need for workers. There is already a shortage for workers in Hawaii. These workers will need resources; water, food, and shelter. This will only decrease the resources in Hawaii.

There is a plan to create artificial lagoons for manta rays, sharks, and lagoons for people to swim in. How will all these large organisms be taken care of and how will they adapt to their small living environments.

This development will bring the traffic down to the heart of Kailua-Kona, from the airport. Because of the traffic increasing, the roads will have to widen even more, and the traffic might even come to an utter halt.

Water rights are limited and immigrant workers, employees, and guests will need water and food. The development will also need adequate sewage facilities.

The land where the resort and development is planned to stand is on land owned by the state of Hawaii. Hawaii's residents should have a say in what happens to this land. I think that it would be in everyone's interest not to have a development that is created simply for tourists and people who don't live in Hawaii. This land should be dedicated to Hawaii. Maybe the land should be used for restoring the native Hawaiian dry-land forest, or have a small community center used for special events.

The location of the plan for the development is truly an amazing and beautiful location, but I hope that you can take this moment to look into the future of Hawaii. This is not just one development, it is like a ripple affect. One development creates the requirement for more housing, and more housing creates needs for more resources, which ultimately becomes a city. How will that affect the fragile environment of Hawaii? Once there is a city, there isn't any chance to bring back the pristine environment of Hawaii.

Tourists and locals will soon loose interest in the once "paradise" of Hawaii and the island will be alone to ponder its once blissful future.

I hope that you will take these statements into consideration, and weigh whether this development is really worth all this damage to the environment and community. Think of a looking-glass, it's ultimately up to you to create the view on the other side.

Thank you

Sincerely,

Roya Sabri

Roya Sabri

July 23, 2007

Roya Sabri
c/o West Hawaii Explorations Academy
73-4460 Queen Kaahumanu Hwy, Ste. 105
Kailua-Kona, HI 96740

Dear Ms. Sabri:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are given below.

Comment: Kona Kai Ola Development by the harbor seems to be inconsistent with the "green" and "pristine" utopia description in West Hawaii Today, on April 22, 2006.

Response: Jacoby Development, Inc. (JDI) has made a corporate commitment to environmental sustainability in all its work. In Kona Kai Ola, JDI intends to incorporate the latest environmental design and technology to create an energy efficient, low environmental impact, sustainable development at Kona Kai Ola. The vision for the project is to develop a project that has minimal impact on the environment by striving to significantly reduce water consumption, waste disposal, energy use and carbon dioxide emissions (green).

One key to measuring the sustainability of the project's design and operation is to use the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. The LEED Green Building Rating System is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings. LEED gives building developers and operators the tools they need to have an immediate and measurable impact on their buildings' performance (LEED 2006). JDI has experience with the LEED certification process from its other projects both for individual buildings, and for large campus infrastructure as well. JDI intends to pursue, at a minimum, Silver LEED certification for its development of the Kona Kai Ola project. JDI will make all attempts to make this development "green".

Comment: The project will have a significant impact on marine life near the entrance to the harbor.

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Response: We acknowledge your comments that impacts to the nearby reefs and nearshore habitats may occur before and after the expansion of the harbor. However, the Environmental Impact Statement (EIS) finds that, while impacts are already occurring, the proposed project provides opportunities to address existing impacts and mitigate future impacts. A water quality model evaluation was conducted to predict impacts of alternative developments on quality of water that exit the harbor. Results are included in Appendix U. These show that the changes in water quality are not significant and also that the less dense water that exits the harbor will stay in the upper layer and not significantly impact coral reefs and benthic marine life.

Comment: The development will have a significant effect on anchialine ponds.

Response: The Draft Environmental Impact Statement (DEIS) presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 parts per thousand (ppt) and that the anchialine biology would then perish.

In response to DEIS comments and to further study the pools south of the entrance channel of Honokohau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design, in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2 of the EIS and is summarized in EIS Sections 3.9.2.1 and 3.9.2.2. In addition, further comment on the groundwater hydrology effects on anchialine pools was prepared by Waimea Water Services and is contained in Appendix G-3 of the EIS.

These additional studies indicated that with the construction of the new harbor basin, the anchialine pools makai of the proposed basin may not necessarily be negatively impacted by the construction of the proposed project.

In addition, these studies determined that there are mechanisms to mitigate potential impacts. Mitigation measures to facilitate the long term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. As a mitigation measure, bioretention, which is a Best Management Practice (BMP), is a highly appropriate application for the proposed development to prevent any nonpoint source pollution of groundwater. Another mitigation measure that may be included in the management plan is salinity adjustment of the anchialine pools to maintain healthy habitat for the anchialine ecosystem by surcharging man-made anchialine pools created adjacent to, or in the vicinity of, natural pools with low salinity well water.

We would like to correct your assumption of groundwater withdrawal from the area. No groundwater withdrawal from north of the existing harbor is proposed in the development. Groundwater withdrawal from south of the existing harbor, if any, will interrupt flow into the harbor and not to the pools in the park to the north of the harbor.

<u>Comment</u>: *The development will result in significant impacts to infrastructure.*

<u>Response</u>: We note your concerns about traffic impacts related to Kona Kai Ola. To mitigate traffic impacts, Kona Kai Ola will include various signalization improvements, and roadway improvements will be implemented. To connect Kona Kai Ola with the neighboring communities, Kona International Airport and Kailua-Kona Village, the project proposes to sponsor a regularly scheduled shuttle service, so that people could utilize Kona Kai Ola without having to use a car for access. Further, the project includes the construction and realignment of Kealakehe Parkway makai of Queen Ka‘ahumanu Highway and through the lands of Queen Lili‘uokalani Trust connecting with Kuakini Highway in Kailua-Kona. Another measure to enhance road connectivity in the ahupua‘a is the improvement of the intersection of Kealakehe Parkway and Queen Ka‘ahumanu Highway. These improvements will serve the project as well as the regional community.

Such improvements will be privately-funded and ensure that the project minimizes its own impacts while improving existing conditions. Further, with development of Kona Kai Ola, the Kuakini Highway extension road is anticipated to be built on a more accelerated schedule than would occur without the Kona Kai Ola project.

<u>Comment</u>: *The hawkbill and green sea turtles, Hawaiian Bottle nosed dolphins, Hawaii spinner dolphins, and the Hawaiian monk seal are very much vulnerable to increased boat traffic, noise, and pollutants.*

<u>Response</u>: A complete marine acoustics study was completed in response to comments received on the DEIS. The report is included in Appendix T-2. The model results showed that the noise levels in the developed scenario did not exceed the Level A impacts to marine mammals. Level B impacts to marine mammals and sea turtles generally occur within a range of ten meters. Although noise impacts may occur during blasting the new marina, these impacts could be greatly minimized by using good blasting practices. These are addressed in detail in the EIS.

<u>Comment</u>: *The environment of the park will be changed dramatically from the introduction of alien marine invasive and terrestrial species.*

<u>Response</u>: We agree that invasive marine and terrestrial species are harmful to the environment in Hawaii. However, the development project will not be importing invasive terrestrial of marine invasive species. The problem of introducing invasive species through ballast water and hull growths is not likely to be a problem because of the limited range of the boats.

<u>Comment</u>: *From 1996-2004, Hawaii's boat registrations have decreased by 15.4%. This new expansion would be useless to Hawaii. The only people who*

would be able to use the harbor will be tourists (because of the $11 fine per foot), not local residents.

Response: The vision for Kona Kai Ola is an environmentally sustainable marina-focused development featuring a mix of uses including visitor and resident-serving commercial enterprises, hotels and time-share units, marina services, open space and community-benefiting facilities, including public infrastructure improvements in a pedestrian friendly setting surrounding the marina and seawater lagoons.

Second, there is an existing demand for additional boat slips and marina facilities. This concern is often expressed in our community outreach program. By meeting this demand through the Kona Kai Ola project, the State is acting in the public interest.

Comment: There is already over-fishing in Hawaii. The catch rate of many marine species has decreased within the past few years.

Response: Both tuna and marlin fisheries have been shown to be in general decline according to private, State, and national fisheries statistics. There are several hypothesized causes for these declines relating primarily to international fisheries. The ability of the State to manage these pelargic fisheries is limited by the national and international fishing policies. Limiting the number of slips available within itself would not provide effective control over fisheries pressure because the need is market driven. Fisheries managers need to take a serious look at management strategies for the future. Attempting to preserve fisheries resources only by limiting harbor facilities is not likely to have any long term positive effects on the fisheries resources.

The EIS finds that an increase in the harbor size offers the opportunity to consolidate, focus, and fund management and enforcement activities at one centralized location. The pressure on fish and invertebrate stocks, as well as on populations of marine mammals and sea turtles, can be expected to increase as Kona population increases, regardless of harbor improvement. The following changes can be made by the Department of Land and Natural Resources (DLNR), paid for, at least in part, by the additional revenues to DLNR from the Kona Kai Ola project. These changes are in the management authority of the DLNR Division of Aquatic Resources and the DLNR Division of Boating and Recreation.

Increasing the enforcement and management staff, providing slip and office space for personnel and equipment, increasing the number of mooring buoys at dive sites, increasing educational materials for divers and fishermen, restricting size and catch restrictions, are some of the steps that will mitigate impacts on fisheries.

In addition, the increased knowledge of fisheries knowledge has spawned an atmosphere of stewardship in the general charter-boat fishing community. With catch and release programs reaching upward of 40 percent of the Kona catch back to the ocean, there is an awareness that the value of catching the fish is greater the value of selling it. The EIS recommends that facilities and programs foster continued stewardship, fisheries science, tracking of all fish catch, and educational programs be implemented in the design of the new marina facilities.

Comment: Pollution from oil spills and added sewage will pollute the ocean and the ground will absorb the chemicals.

Response: Pollution from contaminants from boats and potential possibility of oil spills is a concern in all of Hawaii, not just for Honokohau Harbor. This issue has been addressed in the EIS in Section 3.9.1.3, including a list of mitigation actions. These include boater education, enforcement of good housekeeping practices on boats and docks, and environmentally sensitive hull cleaning practices.

Comment: There is already a shortage of workers in Hawaii. The workers will need resources; water, food, and shelter. This will only decrease the resources in Hawaii.

Response: A study of workforce housing requirements was prepared to evaluate secondary impacts. As agreements between the State and JDI prohibit residential development at Kona Kai Ola, workforce housing would need to be located off-site. The most suitable location for workforce housing units is the Villages at La‘i‘Opua community, a Department of Hawaiian Home Lands (DHHL) project, or within the Hawai‘i Housing Finance and Development Corporation affordable housing development planned for Keahuolu. These are two State-owned undertakings directly across the highway in the same or adjacent ahupua‘a. Locating workforce affordable housing units in these communities would substantially lessen the traffic impacts associated with a community subject workforce. Alternatively, the State lands adjacent to Waikoloa Village would be appropriate for workforce housing.

JDI will comply with all affordable housing requirements applicable to Hawaii County ordinances.

The developer is continuing to work with public agencies in developing new water sources, and the success of these efforts will not only benefit Kona Kai Ola, but also, adjacent communities that are also subject to an insufficient water supply.

Comment: There is a plan to create artificial lagoons for manta rays, sharks, and lagoons for people to swim in. How will these large organisms be taken care of and how will they adapt to their small living quarters.

Response: Management of habitats within lagoons is a question of aquaria technology and fish husbandry. The limiting criteria in aquaria is typically water quality, with habitat design more a matter of providing the correct physical habitat (sand, coral, rock, caves, etc.) in an ecologically balanced, aesthetically pleasing, fashion. The display type of animals has not been finalized at this time. The superb water quality, and low turn overtime in the lagoons will preclude the necessity of filtration. Professional aquarists and staff will manage the lagoon features and associated educational activities from the Marine Science offices adjacent to the upper lagoon.

Comment: I think that it would be in everyone's interest not to have a development that is created simply for tourists and people who don't live in Hawaii.

Response: The development of Kona Kai Ola is broader than providing accommodations for tourists. The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, JDI will protect natural resources through the various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities such as parks, other recreational facilities, and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community. Land ownership will remain with the State.

The EIS has been revised to include information from these additional studies. Attachment 1 contains Section 3.9.2, Anchialine Pools, and Attachment 2 contains Section 3.9.13, Zone of Mixing.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

The conditions with the project constructed were found to be phosphorous limited. Several simulations were performed including and excluding the inflow from the marine exhibits which provides an additional nitrogen load and also varying the location of this inflow. It was found that the inflow from the marine exhibits can have a beneficial effect on flushing, especially when positioned within the existing harbor basin. However, its effect is significantly less than the effect due to the brackish groundwater inflow. When the exhibit inflow is excluded or positioned at the east end of the new marina, its effect is small in terms of flushing due to its high salinity. From a water quality perspective, since the loads from the exhibit inflow consist primarily of nitrogen, it does not cause increased algae growth. However, this exhibit inflow does raise the concentrations of ammonia and nitrate in the system.

Simulation results indicate that under the conditions when the post-expansion system receives an additional brackish inflow into the new 25-acre marina on the order of 30 mgd or more, water quality within the harbor system and in the surrounding waters remained similar to existing conditions. These conditions are expected to occur based on the findings reported by Waimea Water Services (2007), which states that the proposed marina would exhibit the same or similar flushing action as the existing marina.

An additional mitigation measure proposed by Waimea Water Services (2007), if sufficient inflow is not intercepted, consists of drilling holes in the bottom of the new marina to enhance this inflow and facilitate flushing within the proposed system.

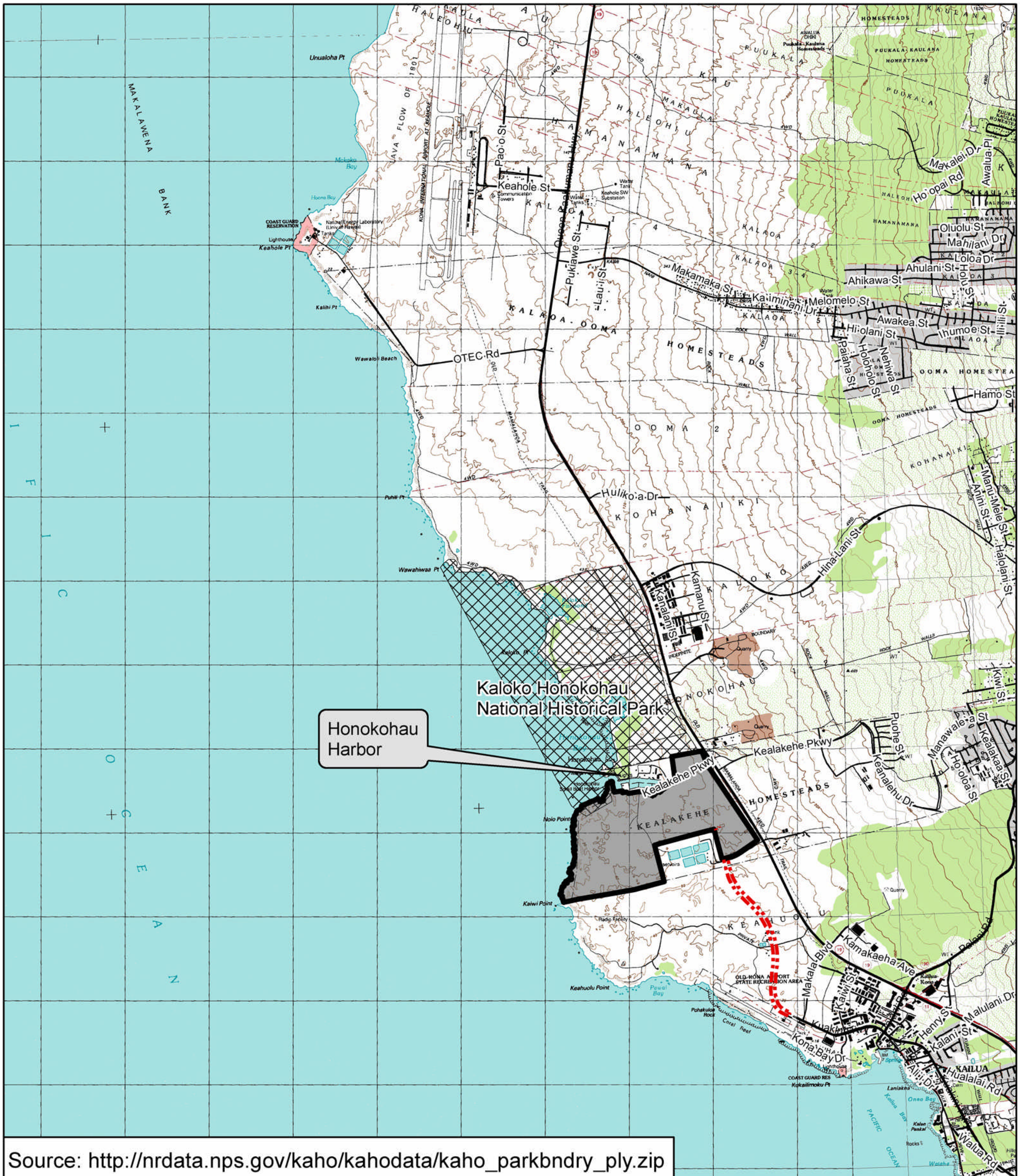
~~3.9.3~~3.9.2 Anchialine ~~Ponds~~ Pools

Two studies on anchialine pools were conducted in this EIS process. The anchialine ~~ponds~~ pools water quality studies and ~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute and is~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute in October 2006 and are included as Appendix ~~G~~H-1. That survey included pools located both north and south of Honokōhau Harbor. In response to DEIS comments and to further study the pools south of entrance channel of Honokōhau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2.

~~3.9.3.1~~3.9.2.1 Existing Conditions

Anchialine ~~ponds~~ pools exist in inland lava depressions near the ocean. Two anchialine ~~pond~~ pool complexes are located immediately to the north and south of the Honokōhau Harbor entrance channel. The complex to the north is located wholly within the designated boundaries of the Kaloko-Honokōhau National Historical Park as shown in Figure Q~~O~~. Many of the ~~ponds~~ pools in the southern complex are within the park administrative boundary as well. ~~Ponds~~ Pools in the northern complex show little evidence of anthropogenic impacts. Many contain typical vegetation and crustacean species in high abundance.

Figure R locates anchialine pools near the harbor entrance and pools~~Ponds~~ in the southern complex are depicted in Figure S.



Source: http://nrdata.nps.gov/kaho/kahodata/kaho_parkbndry_ply.zip

Figure Q: National Historical Park Service Legislative Boundary Map

Legend

- Project Site
- Proposed Parkway
- National Park Boundary

N E S W

0 2,500 5,000 Feet

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JDI
JACOBY DEVELOPMENT, INC.

Source: Oceanic Institute

Figure R: Anchialine Pool Locations

N
W
E
S

0 2,000 4,000 Feet

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Source: Aquatic Resources Management And Design

Figure S: Anchialine Pool Locations in Southern Complex

N
W E
S

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The 2006 study identified 22 pools in the southern complex. The 2007 study found that three of the 22 pools are part of an estuary complex with direct connection to the ocean. While there were several signs of direct human use and disturbance, such as trash receptacles and toilet facilities, the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickleweed and mangrove. ~~are moderately to heavily impacted, with many containing exotic fish that exclude the anchialine crustaceans. The ponds also show evidence of human impact, including discarded bottles, cans, wrappers, diapers, toilet paper, etc. Water quality conditions within the ponds generally reflect the conditions of the underlying groundwater.~~

~~Figure P locates anchialine ponds near the harbor entrance. The study conducted as a part of this EIS show that the anchialine ponds south of the harbor entrance are moderately to heavily impacted by human activities and introduced fish populations. The study found that the nitrogen phosphorus concentrations in these ponds are significantly higher compared to the ponds north of the harbor entrance. The sources of these additional nutrients are not known. Continuous influx of nutrients will eventually degrade the water quality to levels that could alter the pond ecology.~~

Biota surveys in the two pond systems clearly indicate that counts of typical pond denizens show a remarkable difference between the northern and southern ~~ponds~~ pools. In the northern ~~ponds~~ pools the number of *Halocaridina rubra* ranged from a low of 20–25 to too numerous to count. The biota rich pond bottoms appeared red due to the *Halocaridina rubra* numbers. The only other species visible was the predatory shrimp *Metabetaeus lohena*. In contrast, only four out of the 22 ~~ponds~~ pools examined in the southern pond complex showed a decreased presence of *Halocaridina rubra* (6 to 200) individuals in the pond, and three ~~ponds~~ pools contained *Metabetaeus lohena*. Eight of the ~~ponds~~ pools contained numbers of introduced minnows which is an apparent predator of *Halocaridina rubra* and *Metabetaeus lohena*.

The 2007 study found three of the pools identified in the 2006 study were part of an estuary complex with direct connection to the ocean, and that the southern complex contained 19 anchialine pools. The study further found that a majority of the southern pools are degraded biologically and physically, primarily due to the effects of introduced fish and plant species. Six pools are currently devoid of alien fish, but they face a high level of threat due to the proximity of pools that have these species. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction.

The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 ppt. and that the anchialine biology would then perish. There is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and final determination of anchialine salinity following the harbor construction. The assessment that all anchialine pools will be barren with the construction of the harbor may be premature. *Halocaridina rubra* (opae ula) are routinely drawn from high salinity wells at 30-32 ppt.

Within the 19 pools, native and non-native fauna included 14 species comprised of 5 fish, 2 mollusca, and 6 crustacea. Algae within the pools primarily consisted of a mixed assemblage of diatoms and cyanobacteria, with several pools dominated by matted filamentous *Cladophora*, sp. The darker cave/overhang pools and high tide pools had epilithic *Hildenbrandia* sp. covering the rock substrate. Riparian vegetation was dominated by introduced species consisting of Pickleweed (*Batis maritima*), Mangrove (*Rhyzophora mangle*), and Christmasberry (*Shinus terebenthifolius*). Only two species of native plants Akulikuli (*Sesuvium portulacastrum*) and Makaloa (*Cyperus laevigatus*) existed near the pools and comprised only few small patches and a single tuft (respectively).

Most of the hypogeal anchialine shrimp have adapted to the presence of minnows by foraging in the pools at night. During daylight hours, only the adult shrimp appear to coexist at low population levels with the smaller *P. reticulata*, but the larger *G. affinis* and *Oreochromis* prevent the daytime appearance of hypogeal shrimp due to predation.

The average salinity in Kealakehe pools is relatively high at 13.5 ppt compared to most other pools along the West Hawai‘i coastline, having an average of approximately 7 ppt. This high salinity appears to be characteristic of this region, and is similar to the average of most pools within the adjacent ahupua’a of Honokōhau and Kaloko. The levels of nitrate-nitrogen levels are relatively high compared to other undeveloped areas, but fall in the range of some developed landscapes. Other water quality parameters, including pH and temperature, fall into normal ranges for anchialine pools.

This relatively high salinity is the likely reason aquatic insects were not found in any pools at Kealakehe. Though the rare damselfly *Megalagrion xanthomelas* has been observed and collected from Kaloko, a statewide assessment of its range has not found it to occur in water with salinity greater than 3ppt. However, there has been an unsubstantiated occurrence of the nymph in a pool of up to 8ppt (Polhemus, 1995).

Another species of concern is the hypogeal decapod shrimp *Metabetaeus lohena.* These shrimp are sometimes predatory on *H. rubra* but are more often opportunistic omnivores similar to *H. rubra.* Predusk and nocturnal sampling at high tide is clearly the optimal method to determine habitat range and population densities for this species. These shrimp were found in 13 of the 19 pools, 7 of which had *M. lohena* only at night. The occurrences of *H. rubra* were found in 16 of 19 sampled pools, 8 of which had ‘Ōpae‘ula observed only at night. Consequently, despite having numerous degraded anchialine resources at Kealakehe, there are opportunities for many of the pools to be restored and enhanced to a level where large populations of anchialine shrimp and other native species may return to inhabit the pools as they likely have in the past.

~~As mentioned earlier, the southern ponds also had elevated concentrations of nutrients indicating water quality degradation. These factors indicate that if no restoration or maintenance activities are instituted to reserve these ponds, these ecosystems will degrade beyond recovery.~~

~~3.9.3.2~~3.9.2.2 Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

The anchialine ~~ponds~~ pools that are located north of the existing harbor are not likely to be impacted because no development activities are proposed north of the existing harbor. It is highly unlikely that existing groundwater flows to the Kaloko-Honokōhau pond system to the north of the existing harbor will be impacted by the proposed marina to the south.

Of the 19 pools in the southern complex, three would be eliminated due to harbor construction. Regarding the remaining pools, the DEIS noted that t~~T~~he change in the local groundwater flow pattern in the vicinity of the proposed marina ~~will~~ would impact the anchialine ~~ponds~~ pools that are located between the proposed marina and the shoreline south of the harbor entrance. The 2006 study (Appendix H-1) noted that t~~T~~he salinity of the anchialine ~~ponds~~ pools ~~will~~ would increase due to reduction of brackish groundwater, and that ~~. Some ponds will be excavated to make the new harbor basin. T~~those ~~ponds~~ pools that are not excavated will revert to full salinity, causing the loss of their habitat. ~~and associated aquatic flora and fauna. However, current investigations indicate that these ponds are already enriched by nutrients and the density of associated aquatic fauna is very low. In addition, trash from visitors, and introduction of minnows has already degraded the pond ecology.~~ Even without the potential impacts from the proposed marina construction, the pond ecology might change irreversibly from the nutrient input, human indifference and expansion of non native fauna species.

Further studies conducted in response to DEIS comments (Appendix H-2, and Appendix G-3) indicate that the remaining pools may not increase in salinity to levels unhealthy for *H. rubra* and *M. lohena* and other anchialine pool fauna. In addition, these studies determined that there are realistic mechanisms employed elsewhere that would mitigate changes due to groundwater changes. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore.

Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented. The mitigation plan will be based on the following objectives:

Objective 1 To preserve, maintain, and foster the long-term health and native ecological integrity of anchialine pools at Kealakehe.

Objective 2 To protect and promote cultural practices and traditions surrounding anchialine resources at Kealakehe.

Objective 3 To provide education, interpretation, and interactive opportunities for the community to learn about and appreciate the anchialine resources.

Objective 4 To acquire a pond manager to implement the program, conduct monitoring, research, and reporting, and provide education to the community about anchialine and estuarine resources.

Mitigation measures to facilitate the long-term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on the environment can be measured. The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment and possible new pools.

As a mitigation measure, bioretention, which is a Best Management Practice (BMP) is a feasible application for the proposed development. There is a probability that nutrients and other potential pollutants will runoff landscaping and impermeable surfaces such as roadways and parking lots during medium or high rainfall events. Some of these pollutants could enter the groundwater table and into anchialine pools and ultimately the ocean. As an alternative to directing runoff into the ground through drywells, storm water should be directed into bioretention areas such as constructed surface or subsurface wetlands, vegetated filter strips, grass swales, and planted buffer areas. Storm water held and moved through these living filter systems are essentially stripped of most potential pollutants, and allowed to slowly infiltrate back to the groundwater table.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Another mitigation measure that may be included in the management plan is salinity adjustment. In the 2006 assessment regarding the impact to the southern pools from the proposed construction of the harbor, it was stated that this construction would cause the salinity in the anchialine pools to become equivalent to the ocean at 35ppt. It was then concluded that the anchialine biology would perish.

However, there is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and a final determination of anchialine salinity following the harbor construction. The dynamics of groundwater movement through a porous lava medium both seaward and laterally along the coastline is an inexact science. This is compounded by the variations in water density, including stratification of salinity within the proposed harbor and capillary movement of low-density surface water through the substrata.

The assessment that all anchialine pools will be barren with the construction of the harbor may therefore be premature. *H. rubra* are routinely drawn from high salinity wells at 30 – 32 ppt and survive in this salinity for years. Further, high populations *H. rubra* and *M. lohena* have thrived and reproduced in pool salinities of 27ppt. If the pools do become full strength seawater at 35ppt, there exists uncertainty on the long-term effects to anchialine organisms, since there are no long-term studies or examples of native anchialine ecosystems at 35ppt. Native anchialine pool vegetation also has relatively high salinity tolerance.

If the salinity were expected to rise to 35 ppt, possible mitigation in the management plan will include methods to surcharge man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water. If sufficient volume is used, it is theoretically possible to lower salinity in adjacent natural anchialine pools. This surcharge method has been successfully used to raise salinity in anchialine pools and cause the salinity rise in adjacent pools of at least up to 10 meters away. Surcharging with low salinity should work as well or better since the lower density water will essentially float atop the higher salinity water at the surface layer, and move throughout the complex of natural pools. Surcharging may also be a viable mitigation to dilute and more rapidly disperse any pollutants that may be detected in the pools.

Another mitigation measure includes the creation of new anchialine pools. There is significant opportunity to create new anchialine pools and greatly expand the native habitat and resource. It has been demonstrated at several projects in West Hawai'i that anchialine pools can be created and will be colonized with a full compliment of anchialine species endemic to the area. Anchialine pools are considered focal points of higher productivity relative to the subterranean groundwater habitat around them. Their productivity promotes an increase in population levels of anchialine species within the pools themselves and throughout the subterranean habitat surrounding them.

~~No realistic mechanisms are envisioned for re-injecting fresh water into these systems to maintain their ecological balance as an anchialine system. These ponds will be changed from a brackish water system to a marine system. But, those ponds in the area of the shoreline park and cultural park will be cleaned of vegetation and protected from other physical alteration. A buffer zone around these newly established marine ponds will be protected as well.~~

~~The anchialine pond shrimp (*Metabetaeus lohena)* and the orangeback damsel fly (*Megalagrion xanthomelas)* are listed as candidate endangered species in the Federal Register and were both recorded in surveys of these anchialine ponds done in 2004 by US Geological Survey Biological Resources Division and the NPS Inventory and Monitoring Program. Low numbers of *Metabetaeus lohena* were encountered in three of the 22 ponds surveyed in the southern pond complex. *Megalagrion xanthomelas* was not encountered in any of the southern pond complex ponds during the recent study. The low density of *Metabetaeus lohena* and the observed absence of *Megalagrion xanthomelas* may be due to the impacts from high nutrient input and general degradation of the ponds.~~

~~An attempt should be made to move as much of the existing population of *Metabetaeus lohena* from these anchialine ponds before they become too saline, to possible newly excavated ponds that may be developed off-site. These shrimp should not be introduced into existing populated ponds to avoid any potential pathogenic impacts to the healthy ponds.~~

~~Public education on the unique ecology of the anchialine ponds and the need for preserving their ecology will reduce future human impacts in other healthy ponds.~~

~~Further recommended mitigation includes restoration to degraded anchialine ponds off the project site, preferably those located at the adjacent Kaloko-Honokōhau National Historical Park.~~

Attachment 2

A detailed analysis of the change in flow velocities through the harbor entrance is described within the 3D model shown in Appendix U. It was found that tidally averaged velocities through the harbor entrance may increase by 3-4 cm/s post-expansion. This is due to the increased tidal prism, the addition of the exhibit water, and the increased flow of brackish groundwater into the system.

3.9.1.2 Methodologies and Studies

Three studies were conducted to evaluate project impacts on nearshore and coastal waters. Oceanit completed a Zone of Mixing study that was presented in the DEIS and is contained in Appendix ~~H~~I. This study was tasked with determining the mixing and dispersion of flows emerging from the harbor into the adjacent shallow nearshore waters. To accomplish this, data from previous studies were reviewed and field research was conducted to measure stratification and currents adjacent to the harbor entrance and out into the ocean. A "Zone of Mixing" area was determined outside of which there is no discernable influence to water quality from the existing harbor effluent. This information was used to assess impact from modifications to groundwater inflow from marina expansion, and the seawater effluent flow from the marine water features.

~~The model analysis for mixing and water flow through the existing harbor and the proposed marina included existing water exchange between harbor and ocean and the future water exchange resulting from the expanded marina area and the discharge from the marine water features. The model results include three dimensional water flow patterns as well as water quality distribution details.~~

A Wave Penetration Study was prepared by Moffat and Nichol to determine wave characteristics within the existing harbor and the proposed expansion basin. This study was presented in the DEIS and is contained in Appendix J.

In response to DEIS comments, a Harbor Water Quality Modeling Study was prepared by Moffat and Nichol and is presented in Appendix U of this FEIS.

3.9.1.3 Zone of Mixing ~~Anticipated Impacts and Recommended Mitigation~~

~~Oceanit completed a Zone of Mixing study that is contained in Appendix H. This study was tasked with determining the mixing and dispersion of flows emerging from the harbor into the adjacent shallow nearshore waters. To accomplish this, data from previous studies were reviewed and field research was conducted to measure stratification and currents adjacent to the harbor entrance and out into the ocean. A "Zone of Mixing" area was determined outside of which there is no discernable influence to water quality from the existing harbor effluent. This information was used to assess impact from modifications to groundwater inflow from marina expansion, and the seawater effluent flow from the marine water features.~~

The model analysis for mixing and water flow through the existing harbor and the proposed marina included existing water exchange between harbor and ocean and the future water exchange resulting from the expanded marina area and the discharge from the marine water features. The model results include three-dimensional water flow patterns as well as water quality distribution details.

The three-dimensional model was extended outside of the harbor entrance in order to examine relative changes from baseline conditions. Due to the lack of available data regarding specific brackish discharge events along the coastline, the model is not calibrated outside of the harbor entrance, and any changes predicted in this region are only referred to in terms of relative changes (in relation to model predicted existing conditions). This analysis is shown in Appendix I. It was found that the significance of the additional brackish groundwater inflow into Kona Kai Ola Marina also has an effect on the surrounding surface waters of Honokōhau Bay. The concentrations of nutrients in low flow scenarios are less than existing conditions due to the lack of additional nutrients to the system. However, with higher brackish inflow, the relative growth of algae is more contained while nutrient concentrations relatively increase. Relative nitrogen concentrations in the bottom layers can be maintained in scenarios without additional exhibit flow included, however with the additional saline flow, there is more of a nitrogen load in the bottom layers.

Anticipated Impacts and Mitigation Measures

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water for the water features will be pumped from 100 to 300 foot depth. The total amount of water supplied to the water features will be 75 million gallons per day. The rate of pumping is designed to achieve an approximate 4 hour residence time within the ponds (pers. comm. Cloward H2O, 2007) and to prevent build up of pollutants from users and marine animals. ~~The water for the water features will be pumped from 100 to 300 foot depth. The total amount of water supplied to the water features will be 75 million gallons per day. The rate of pumping is designed to achieve rapid turnover of water within the ponds and to prevent build up of pollutants from marine animals and users. Currently, the nutrient concentrations at the existing marina entrance are very high (1,200ug/l of total dissolved nitrogen (TDN) and 83 ug/l of total dissolved phosphorus (TDP)). The intake water for the features has low levels of nutrients (185 ug/l TDN and 5.6 ug of TDP).~~

The anticipated impacts and mitigation measures discussed below assume construction of an 800-slip harbor. One possible mitigation measure would be to reduce the size of the harbor expansion. Any modification of the final design size of the marina would require modification of contract language with the DLNR. In that Alternative 1 would include a smaller marina and smaller seawater lagoons, the latter of which would represent a 74 percent decrease from 19 acres in the proposed project to five acres in Alternative 1, there would be a proportionate reduction in seawater discharging into the new harbor.

The intake water for the features has low levels of nutrients (185 µg/l TDN and 5.6 µg of TDP). This amount will be modified by the generation of nutrients by marine animals. This quantity was modeled via calculations performed by ClowardH2O (pers. comm., 2007). Through modeling, this level of nutrient input was found to have an effect on both ammonia and nitrate concentrations outside of the harbor. However, the modeled input did not contribute significantly to eutrophication potential due to the limiting nature of phosphorous within the system. These processes and sensitivity tests are described at length in Appendix U.

Although the total amount of nutrients that will be generated per day will increase from the nutrient output of marine animals and users, the concentration of the nutrients will be lower due to the large amount of water available for mixing within the basin. The overall impact will be a reduction of nutrient concentration in the outflowing water.

The boats used in the marina will be small, and spills could occur from boats or while fuelling. These amounts in a majority of cases will be relatively small. The entrance to the marina is relatively narrow and in case of a fuel spill, the traffic will be stopped and a containment boom will be installed to contain the spill within the basin.

Adequate numbers of containment booms, absorption units and oil removal facilities will be at the fueling station and also provided to an identified emergency response station. Personnel will be trained to respond in case of a spill. In addition, the local fire station, police and civil defense and other agencies will be informed in case of a larger spill.

The proposed new marina would significantly increase the size of the water body, but would utilize the existing marina entrance for access to the ocean. This will increase the tidal prism in addition to the extra anticipated inflows to the new marina. It would be expected to intercept additional groundwater, adding these flows to the existing harbor outflow in addition to being the outfall location for the exhibit flows. Model results presented in Appendix U show that the increase in depth-averaged velocities through the harbor entrance can be as great as 4 cm/s under typical conditions,

The proposed marina basin will therefore not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance. There will be an expanded zone of mixing between the brackish effluent and the surrounding ocean waters due to the concentration of flows at the harbor mouth. The addition of effluent water from the marine water features will result in an additional increase outflow across the marina entrance from 30 mgd to an expected value of greater than 135 mgd after development of the marine water features. ~~to the south will intercept additional groundwater, adding these flows to the existing harbor outflow. The proposed marina will therefore not result in any significant increase in groundwater flow to the coastline, but rather a concentration of the existing flows to the harbor entrance. There will be an expanded zone of mixing between the brackish effluent and the surrounding ocean waters due to the concentration of flows at the harbor mouth. The addition of effluent water from the marine water features will result in an additional increase outflow across the marina entrance from 4 mgd at present to 79 mgd after development of the marine water features. The effluent from the marine water features will contain low amounts of nutrients because of the high flow through. The large amount of water will dilute any pollutants that enter the harbor basin from groundwater or surface water. This will improve the water quality and will be a positive impact on the nearshore environment.~~

Despite its proximity to the WWTP, sewers do not service the existing adjacent State harbor or surrounding private structures. All sewage from existing facilities is treated in on-site septic systems with resulting effluent flowing to groundwater that almost certainly flows directly to the existing harbor. Under post-development conditions all of these flows would be connected to the Kona Kai Ola sewage system resulting in a positive impact by eliminating this existing pollutant load into the harbor. Sewage from facilities at the existing marina will be connected to the Kona Kai Ola sewage system. Sumps, connection lines and pumping facilities will be constructed to move the sewage from the present septic tank systems directly to the larger collection system. The work needed for this conversion will be included in the sewage infrastructure design and construction.

~~Hydrogeological studies have concluded that the expansion of the marina does not increase the groundwater flux through the harbor mouth into the ocean significantly. The groundwater from the brackish aquifer already converges to the existing harbor and does not show flow across the planned marina basin area into the ocean.~~

~~It is estimated that the average groundwater discharge is 3 to 4 million gallons per day (mgd). The salinity of the water that discharges from the brackish aquifer is about 12 percent of seawater or about 4.3 parts per thousand (ppt). In addition, 52,000 gallons per minute of surface seawater (36 ppt) will be pumped from the nearshore area for use in the marine lagoon features. This amounts to approximately 75 mgd. This water eventually is discharged into the harbor basin and into the ocean. This water is not expected to reach the existing marina basin because the proposed basin connects to the existing one very close to the common entrance. Therefore the impacts to the existing marina environment from the additional discharge are expected to be negligible.~~

At present, the salinity of the water column remains entirely saline in the bottom layers with more brackish influences near the surface (about 30 ppt). Model results displayed in detail within Appendix U show that salinity differences near the harbor entrance are completely confined to the surface layers and are at maximum about 0.5 ppt less than the current conditions of about 30 ppt (surface). Salinity at the marina entrance, at 10 foot depth is not affected by the brackish water discharge. The benthic flora and fauna close to the marina entrance and at less than 10 feet water depth face variations of salinity from 34.5 ppt to 36.0 ppt.

~~At present the depth averaged salinity of the water exiting the existing basin is about 33.5 ppt close to the marina entrance. The brackish water stays at the surface and shows its influence for distance of about 2,000 feet. Salinity at the marina entrance, at 10 foot depth is not affected by the brackish water discharge. The benthic flora and fauna close to the marina entrance and at less than 10 feet water depth face variations of salinity from 34.5 ppt to 36.0 ppt.~~

~~A straight forward mass balance calculation shows the following changes to the existing flow and salinity. The average outflow from the harbor will increase from 4 mgd to 79 mgd. The salinity of the water will change from an average of 33.5 ppt to about 34.4 ppt. The water will still be less dense, and the depth of impact will be limited to the surface 3 to 4 feet. The benthic flora and fauna will face a smaller variation in salinity that will discourage opportunistic biota dominance and lead to a healthier and more diverse benthic community. This is a positive impact on the benthic environment. The increase in the outflow will cause a very slight increase in water velocities, but this is well below the existing velocity variations in the entrance channel vicinity.~~

Construction of a new marina basin will have ~~short~~ short-term negative impacts on coastal marine resources. Direct construction impacts are likely to be small. Marina construction will be accomplished with a berm separating the construction area from adjacent marine waters, minimizing the discharge of sediment from excavation and dredging. Excess sediment remaining in excavated marina will be removed before the land bridge is removed in order to minimize any temporary sediment plume. When the final land bridge is removed, a temporary sediment plume is anticipated. Silt curtains will be used to ~~minimize the~~prevent suspended sediment entering ocean waters.

Although the runoff at the site is small due to the dry climate and the high porosity of the land, during high rainfall, some runoff might reach the harbor basin as overland sheet flow. The new marina will serve as a collection point for materials utilized or generated at the development site, either through direct runoff or by interception of groundwater flow. There is the potential that fertilizers, pesticides, petroleum products, road wastes, etc, could be discharged from the mouth of Honokōhau Harbor into the coastal marine environment. Structural Best Management Practices (BMPs) will be designed and installed to remove as much of pollutants as possible from the run off during such unusual conditions.

Small boat harbors have been found to be consistent sources of certain types of pollutants to the surrounding environment. These pollutants in general include:

- Heavy metals (zinc, copper, tin, lead) associated with bottom paint or sanding of painted surfaces during maintenance activities;
- Petroleum product release from fueling operations, and bilge discharges exacerbated by the large number of boats and range of operator skills;
- Trash and debris from boat operations and surrounding harbor activities;
- Sewage from intentional or accidental releases from on-board waste systems;
- Biological waste from fish cleaning;
- Waste streams from land-side boat washing and maintenance activities;

Most of the impacts can be minimized through the use of Best Management Practices (BMPs), which are a combination of activities, education and devices that help prevent or reduce water pollution. A "Clean Marina Program" similar to the International Blue Flag Marina Program or the Clean Marinas California Program will be implemented at the new marina and include key elements such as promoting and enforcing:

- Boater education signage, literature and programs
- Emergency and spill response plans
- Safe fuel, hazardous material, sewage and bilge water handling practices
- Use of sewage marina pump out, waste and oil recycling facilities
- Environmentally sensitive boat maintenance and cleaning practices
- Environmentally sensitive hull cleaning practices
- Good housekeeping practices on boats and docks
- Use of fish cleaning stations / receptacles and fish waste composting

- Enforcement of harbor rules and regulations

3.9.1.4 Wave Impacts to the Existing Honokōhau Harbor

The wave climate within the existing Honokōhau Harbor and the proposed marina was analyzed using a numerical model that is further discussed in Appendix J~~I~~. A wave measurement study was conducted to determine the wave response of the existing harbor to outside wave climate. A directional wave gage at a depth of sixty feet directly in front of the existing harbor entrance and a non directional wave gage inside the existing harbor basin were installed to measure wave climates simultaneously. The results of the wave measurements were provided for wave transformation model calibration.

Results of the wave climate analysis with and without the expansion were used to predict wave agitation impacts to the existing harbor. The model was operated for waves with a 9-second period and swells of 13-second period as the dominating waves for the offshore area.

Anticipated Impacts and Proposed Mitigation

Wave climate in the existing harbor from the proposed marina construction depended on the period of the incoming waves. There was a slight decrease in the wave height in the existing basin for outside waves of a 9-second period. For longer period swells, there was no significant change in the wave height in the basin.

For waves with a 9-second period, the wave height at the inner end of the outer basin attenuated to 40 percent of the incident wave. There was no additional wave attenuation due to the presence of the proposed marina. Within the existing harbor inner basin, the wave height attenuated to about 20 percent of the incident wave. The wave height in the inner harbor decreased by about 10 percent with the construction of the proposed marina.

For longer period swells, the wave height in the outer basin remained at 50 percent attenuation. In the inner basin, the wave height reduced to about 20 to 30 percent of the incident wave. There was no significant change in the wave height in the inner basin from marina construction.

The analysis shows that under short storm wave conditions, the proposed marina construction causes a positive impact by reducing the wave height by 10 percent in the existing marina. However, under swell conditions there is no change in wave agitation in the mooring area of the existing harbor with the proposed marina. Overall, the impact of construction of the proposed marina basin is positive since the existing harbor will experience less wave agitation. This may be due to the fact that the amount of wave energy entering through the harbor entrance remains the same, while additional water area and frictional surfaces (both sides and bottom) provide for greater wave dissipation after the expansion. No mitigation is ~~recommended~~ proposed due to the project's positive effect.

3.9.1.5 Harbor Water Quality

A three dimensional hydrodynamic and water quality model of Honokōhau Harbor and its surrounding waters was developed using the Delft3D modeling suite and is described in detail in Appendix U. The model was driven at its offshore boundaries by tidal predictions, and calibrated to reproduce available measurements of water levels, currents, salinity and temperature.

Honokohau Harbor Development

Savannah Onufer-Estrada

My opinion on this Kona Kai Ola project is that I am strongly against it. They say it will bring money in for the island but will also cause a lot of traffic on our two lane highway. Besides the fact of money and traffic there are major environmental issues as well. There will be coastal runoff into our preserved oceans; it will kill many of the sea animals and corals that have been living there for over hundreds of years. Soon our island will become dirty and crowded and that's what our community doesn't want.

It's stupid. If they want to build more hotel and timeshared like this they should build them up higher, not right on the ocean because it will cause a lot of coastal runoff, which will kill everything in our ocean. It will also make a lot of tourists come here and cause more traffic on our two lane highway. So I would have to wake up earlier than I would usually do to come to school in the morning.

Savannah Onufer-Estrada

Savannah Onufer-Estrada

P.O. Box 2395 Kealakekua, HI, 96750

innovation through engineering & scientific excellence

July 23, 2007

Savannah Onufer-Estrada
P.O. Box 2395
Kealakekua, HI 96750

Dear Ms. Onufer-Estrada:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are based on a paragraph designation.

Paragraph 1

Kona Kai Ola development project has studied impacts form traffic, pollution, and numerous other environmental impacts, and has developed measures for mitigation. Some of these are included below. The Environmental Impact Statement (EIS) addresses all these impacts in detail.

To mitigate traffic impacts, Kona Kai Ola will include various signalization improvements, and roadway improvements will be implemented. To connect Kona Kai Ola with the neighboring communities, Kona International Airport and Kailua-Kona Village, the project proposes to sponsor a regularly scheduled shuttle service, so that people could utilize Kona Kai Ola without having to use a car for access. Further, the project includes the construction and realignment of Kealakehe Parkway makai of Queen Ka‘ahumanu Highway and through the lands of Queen Lili‘uokalani Trust connecting with Kuakini Highway in Kailua-Kona. Another measure to enhance road connectivity in the ahupua‘a is the improvement of the intersection of Kealakehe Parkway and Queen Ka‘ahumanu Highway. These improvements will serve the project as well as the regional community.

Such improvements will be privately-funded and ensure that the project minimizes its own impacts while improving existing conditions. Further, with development of Kona Kai Ola, the Kuakini Highway extension road is anticipated to be built on a more accelerated schedule than would occur without the Kona Kai Ola project.

Regarding runoff, as discussed in EIS Section 4.10.5, Drainage and Storm Water Facilities, the proposed project will increase the proportion of impervious surfaces on the subject property through paving and reconfiguring the topography, thereby adding to total runoff. Roadways in the new developed configuration will be dedicated to the County of Hawai‘i, so the storm drainage system will be required to conform to the Department of Public Works Storm Drainage Standards. Mitigation measures to address runoff impacts include the use of drywells, which will require an Underground Injection Well Permit from the Department of Health, Safe Drinking Water Branch, and recommendations from a hydrogeologist will be sought to assist with the design of the drywell system.

Further, bioretention, which is a Best Management Practice (BMP), will be utilized in series to incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, the level and reliability of pollutant removal is raised. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Paragraph 2

We strongly disagree with your comment that Kona Kai Ola Development is stupid. In fact, the development has many positive impacts on the community.

The development of Kona Kai Ola is broader than providing accommodations for tourists. The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, Jacoby Development, Inc. (JDI) will protect natural resources through the various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities such as parks, other recreational facilities, and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community.

The developer is continuing to work with public agencies in developing new water sources and the success of these efforts will not only benefit Kona Kai Ola, but also, adjacent communities that are also subject to an insufficient water supply.

The anticipated infrastructure improvements to the wastewater treatment plant are expected to actually improve the health and safety of the community by bringing an older facility up to higher operational standards. All structures will be built to current building and safety codes, while access to the shore and around the site will be improved.

The EIS has been revised, and Attachment 1 contains Section 4.10.5, Drainage and Storm Water Facilities.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

State officials recently announced that land was being set aside in Kealakehe mauka of the project site for a Kona Medical Center.

Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

Kona Kai Ola may impact medical facilities because of the increase in de facto population due to additional visitors, and a likely increase of resident population due to employment-related in-migration. Although residential use is not a permitted use on the leased lands, JDI is planning to construct worker housing on a nearby site that will be leased at below market rents. The extent of in-migration due to employment is undetermined at this time.

The anticipated population growth for the region has stimulated plans for the development of future medical facilities. Potential impacts on existing medical facilities will be mitigated by the addition of new facilities. In the Villages of La‘i ‘Ōpua located immediately mauka of Kona Kai Ola, a site is designated for Hospital use, and allocations have been made utility needs.

4.10.4 Public Educational Facilities

The Kealakehe Intermediate School located in Kailua-Kona educates students in grades six through eight and had a fall enrollment of 1,052 during the 2004-2005 school year. Kealakehe High School is located near to the intermediate school, and serves grades 9 through 12. The high school’s fall enrollment during the 2004-2005 school year was 1,450.

Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

Since there are no permanent residences permitted at the site, there will be no direct impact on area schools. Although residential use is not a permitted use on the leased lands, JDI is planning to construct worker housing on a nearby site that will be leased at below market rents. A separate analysis of impacts on public education facilities will need to be done for the workforce housing that is to be part of this project, and built off-site and potentially mauka of the project site. No mitigations are ~~recommended~~ proposed at this time.

4.10.5 Drainage and Storm Water Facilities

The development of Kona Kai Ola may increase drainage flows, quantities, velocities, erosion and sediment run-off. This ~~DEIS~~ FEIS takes into consideration storm runoff generated from the proposed streets. Each individual development parcel will address its own storm runoff as required. The storm drainage facilities designed for the site will take advantage of the porosity of the existing rocky landscape and the minimal slope, through the use of grading and dry wells, per County requirements. Storm run-off that discharges into the drywell system will tend to migrate towards the manmade lagoons. The lagoons will therefore be lined to prevent influence of such storm runoff. The Hawai‘i County Public Works Department generally requires that on-site storm drainage facilities be sized to exceed pre-development drainage quantities, and be designed to result in quantities of storm water leaving the site, not exceeding those quantities entering the site.

Unlike the DLNR property, roadways within the DHHL property cannot be dedicated to the County of Hawai'i in fee. To obtain a license agreement for maintenance with the County, the entire storm water system will be designed to conform to the Hawai'i County Public Works Storm Drainage Standards.

Anticipated Impacts and ~~Recommended~~ Proposed Mitigation

The proposed project will increase the proportion of impervious surfaces on the subject property through paving and reconfigure the topography, thereby adding to total runoff. This will necessitate the development of an appropriate drainage system to handle the increased and altered drainage patterns. Roadways in the new developed configuration will be dedicated to the County of Hawai'i, so the storm drainage system will be required to conform to the Department of Public Works Storm Drainage Standards.

Due to the rocky and porous nature of the soils, the County allows the use of drywells. Drywells typically vary in depth from 10 to 30 feet depending upon the permeability of the underlying soil or rock. Drywells will typically consist of a catch basin type design, with an opening at the curb and gutter. The depth of the catch basin structure will vary depending upon the depth of the rock. During the design of the drywell system, the percolation rates at proposed drywell locations will be determined.

~~Recommended~~ Proposed mitigation measures are as follows:

- The proposed development is located makai of the Underground Injection Well (UIC) line. Since drywells are considered injection wells, the developer is required to secure a UIC Well Permit, from the Department of Health (DOH), Safe Drinking Water Branch.
- Groundwater migration in the area is a concern especially with the construction of natural lagoons within the proposed development. Therefore, the recommendations from a hydrogeologist should be sought to assist with the design of the drywell system.
- All construction activities will comply with the County's grading permit requirements and the State's fugitive dust regulations.
- A National Pollutant Discharge Elimination System (NPDES) permit will be obtained before construction begins and the project will comply with all NPDES permit requirements including implementation and monitoring of all DOH-approved Best Management Practices.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Specific design plans will be determined during the permitting process when final designs are developed. It is the intent of JDI to stipulate low impact development techniques as part of the general design guidelines. The Best Management Practices (BMPs) will be very site specific and must be incorporated with the building and landscape design. BMPs will be incorporated to minimize runoff volume and peak flow, minimize the quantity of pollutants in runoff or flows to groundwater, and maximize re-use of storm water for natural irrigation. Specific BMPs will be reviewed as part of the application for the National Pollutant Discharge Elimination System (NPDES) permit which will be required prior to the County's issuance of a grading permit.

Alternative 1 would result in the lowering of the density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces and the creation of more open space. However, roadway areas have increased by about 30 percent. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings.

4.10.6 Waste ~~W~~water Facilities

A *North Kona Sewer Master Plan* is being developed for the County of Hawai‘i Department of Environmental Management (DEM) to address future sewer improvements necessary to serve projected development in the North Kona region of the Island of Hawai‘i. This sewer master plan would then be used to develop an Implementation Study to support the establishment of an “Improvement District” for North Kona by the County Council (NKSMP 2006). Kona Kai Ola is being designed to be consistent with the North Kona Sewer Master Plan and will participate in any subsequent improvement district.

The proposed development is located within the service area of the Kealakehe WWTP. The Kealakehe WWTP is a County owned and operated wastewater treatment plant which has been in operation since March 1993. The WWTP currently receives about 1.8 million gallons of wastewater per day and treats it to R-2 reuse level. The Kealakehe WWTP has a design capacity of 5.3 million gallons per day (mgd) when operating all five of its lagoons. This capacity is considered the 20-year design which was initiated in year 2000. A sixth lagoon was included in the original design but was never constructed. The space for the sixth lagoon remains vacant and undeveloped. Activating the sixth lagoon increases plant capacity to 7.8 mgd. (CP&E 2006)

Wastewater is delivered to the WWTP through an existing 30-inch gravity sewer and 24-inch force main. The 30-inch sewer delivers wastewater from the mauka properties across Queen Ka‘ahumanu Highway, while the 24-inch force main transports wastewater from the Kailua-Kona area. Wastewater is discharged into aerated lagoons. The effluent pump station receives the treated wastewater from the lagoons, treats it with chlorine, and pumps it into a temporary sump located across Queen Ka‘ahumanu Highway for overland disposal.

Tony Eaton
Waikoloa, Hawaii

February 2, 2007

Mr. Scott Condra
Jacoby Development, Inc.
171 17th Street, NW Suite 1550
Atlanta, GA 30363

Subject: DEIS- Kona Kai Ola, Kealakehe, North Kona District, Island of Hawaii

Dear Mr. Condra,

I believe that the harbor development shouldn't go forward. There are many bad parts to this issue. First I will list the good parts. How this could help is it can improve the economy. People can get new jobs. It would remove fountain grass, which is an alien species.

The bad stuff is the are going to cover 22 native anchialine ponds, which have the opi ola shrimp. That shrimp is native to Hawaii and is endangered. The noise is going to disturb the turtles at the National Park. More slips are going to be added and boating is going down. The run-off from the development can end up in the ocean, which will kill the coral. This is all I have to say about this issue.

Tony Eaton

July 23, 2007

Tony Eaton
c/o West Hawaii Explorations Academy
73-4460 Queen Kaahumanu Hwy., Ste. 105
Kailua-Kona, HI 96740

Dear Mr. Eaton:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are given below.

We agree with you that the Kona Kai Ola development including the harbor expansion will result in economic benefits to Kona and Hawaii. It will open up opportunities for employment, provide money for infrastructure improvements, and generate income to the County and the State of Hawaii.

In response to the Draft Environmental Impact Statement (DEIS) comments and to further study the pools south of the entrance channel of Honokohau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design, in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2 of the Environmental Impact Statement (EIS) and is summarized in EIS Sections 3.9.2.1 and 3.9.2.2. In addition, further comment on the groundwater hydrology effects on anchialine pools was prepared by Waimea Water Services and is contained in Appendix G-3 of the EIS.

The DEIS identified 22 anchialine pools. Further studies determined that three of these pools are actually part of an estuary complex with direct connection to the ocean. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of 20 m^2 would be eliminated due to the harbor construction.

While the second survey confirmed the presence of direct human use and disturbance, such as trash receptacles and toilet facilities, it found that the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickelweed and mangrove.

The additional studies indicate that the remaining pools may not increase in salinity to levels unhealthy for anchialine pool fauna. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult, if not impossible, even with numerous boreholes and intense sampling. The tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally, but is not quantified at this time.

Hence, the additional studies found that changes in groundwater quality may, or may not, impact biological communities in the anchialine and estuarine environment. In either case, the developer is committed to practicing good stewardship over the pools to be preserved and eliminating or reducing alien species to the extent practicable. The developer recognizes it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Mitigation measures to facilitate the long term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on these environments, can be measured.

The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment, and possible new pools. These measures are described in detail in EIS Section 3.9.2, Anchialine Pools.

Every effort will also be made to protect, preserve and improve the anchialine pools to the south of the harbor. Two additional studies were conducted in response to DEIS comments, including your comments, and these additional studies are summarized in EIS Section 3.9.2 and presented in Appendices G-3 and H-2.

These additional studies indicated that with the construction of the new harbor basin, the anchialine pools makai of the proposed basin may not necessarily be negatively impacted by the construction of the proposed project.

In addition, these studies determined that there are mechanisms to mitigate potential impacts. Mitigation measures to facilitate the long term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. As a mitigation measure, bioretention, which is a Best Management Practice (BMP), is a highly appropriate application for the proposed development to prevent any nonpoint source pollution of groundwater. Another mitigation measure that may be included in the management plan is salinity adjustment of the anchialine pools to maintain healthy habitat for the anchialine ecosystem by surcharging man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water.

A complete marine acoustics study was completed in response to comments received on the DEIS to assess noise impacts on marine life. The report is included in Appendix T-2. The model results showed that the noise levels in the developed scenario did not exceed the Level A impacts to marine mammals. Level B impacts to marine mammals and sea turtles generally occur within a range of ten meters. Although noise impacts may occur during blasting the new marina, these impacts could be greatly minimized by using good blasting practices. These are addressed in detail in the EIS

Regarding runoff, as discussed in EIS Section 4.10.5, Drainage and Storm Water Facilities, the proposed project will increase the proportion of impervious surfaces on the subject property through paving and reconfiguring the topography, thereby adding to total runoff. Roadways in the new developed configuration will be dedicated to the County of Hawaiʻi, so the storm drainage system will be required to conform to the Department of Public Works Storm Drainage Standards. Mitigation measures to address runoff impacts include the use of drywells, which will require an Underground Injection Well Permit from the Department of Health, Safe Drinking Water Branch, and recommendations from a hydrogeologist will be sought to assist with the design of the drywell system.

Further, bioretention, which is a Best Management Practice (BMP), will be utilized in series to incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, the level and reliability of pollutant removal is raised. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

The EIS has been revised to include information from these additional studies. Attachment 1 contains Section 3.9.2, Anchialine Pools, and Attachment 2 contains Section 4.10.5, Drainage and Storm Water Facilities.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

The conditions with the project constructed were found to be phosphorous limited. Several simulations were performed including and excluding the inflow from the marine exhibits which provides an additional nitrogen load and also varying the location of this inflow. It was found that the inflow from the marine exhibits can have a beneficial effect on flushing, especially when positioned within the existing harbor basin. However, its effect is significantly less than the effect due to the brackish groundwater inflow. When the exhibit inflow is excluded or positioned at the east end of the new marina, its effect is small in terms of flushing due to its high salinity. From a water quality perspective, since the loads from the exhibit inflow consist primarily of nitrogen, it does not cause increased algae growth. However, this exhibit inflow does raise the concentrations of ammonia and nitrate in the system.

Simulation results indicate that under the conditions when the post-expansion system receives an additional brackish inflow into the new 25-acre marina on the order of 30 mgd or more, water quality within the harbor system and in the surrounding waters remained similar to existing conditions. These conditions are expected to occur based on the findings reported by Waimea Water Services (2007), which states that the proposed marina would exhibit the same or similar flushing action as the existing marina.

An additional mitigation measure proposed by Waimea Water Services (2007), if sufficient inflow is not intercepted, consists of drilling holes in the bottom of the new marina to enhance this inflow and facilitate flushing within the proposed system.

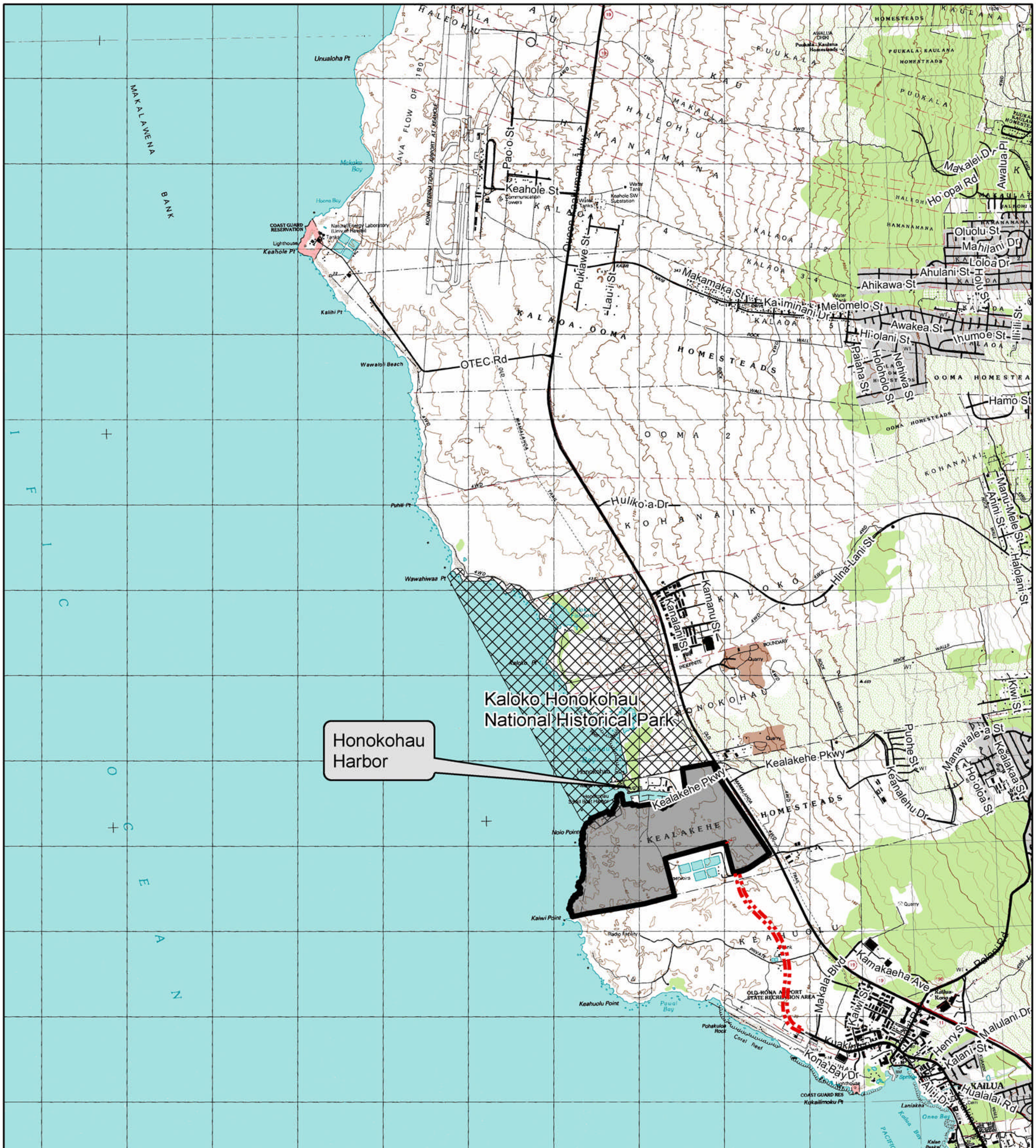
~~3.9.3~~3.9.2 Anchialine ~~Ponds~~ Pools

Two studies on anchialine pools were conducted in this EIS process. The anchialine ~~ponds~~ pools water quality studies and ~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute and is~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute in October 2006 and are included as Appendix ~~G~~H-1. That survey included pools located both north and south of Honokōhau Harbor. In response to DEIS comments and to further study the pools south of entrance channel of Honokōhau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2.

~~3.9.3.1~~3.9.2.1 Existing Conditions

Anchialine ~~ponds~~ pools exist in inland lava depressions near the ocean. Two anchialine ~~pond~~ pool complexes are located immediately to the north and south of the Honokōhau Harbor entrance channel. The complex to the north is located wholly within the designated boundaries of the Kaloko-Honokōhau National Historical Park as shown in Figure Q~~O~~. Many of the ~~ponds~~ pools in the southern complex are within the park administrative boundary as well. ~~Ponds~~ Pools in the northern complex show little evidence of anthropogenic impacts. Many contain typical vegetation and crustacean species in high abundance.

Figure R locates anchialine pools near the harbor entrance and pools~~Ponds~~ in the southern complex are depicted in Figure S.



Source: http://nrdata.nps.gov/kaho/kahodata/kaho_parkbndry_ply.zip

Figure Q: National Historical Park Service Legislative Boundary Map

Legend

- Project Site
- Proposed Parkway
- National Park Boundary

0 2,500 5,000 Feet

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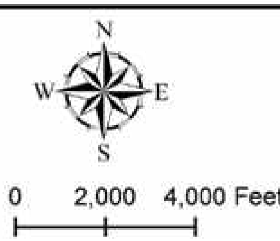
Source: Oceanic Institute

Figure R: Anchialine Pool Locations



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Source: Aquatic Resources Management And Design

Figure S: Anchialine Pool Locations in Southern Complex

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The 2006 study identified 22 pools in the southern complex. The 2007 study found that three of the 22 pools are part of an estuary complex with direct connection to the ocean. While there were several signs of direct human use and disturbance, such as trash receptacles and toilet facilities, the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickleweed and mangrove. ~~are moderately to heavily impacted, with many containing exotic fish that exclude the anchialine crustaceans. The ponds also show evidence of human impact, including discarded bottles, cans, wrappers, diapers, toilet paper, etc. Water quality conditions within the ponds generally reflect the conditions of the underlying groundwater.~~

~~Figure P locates anchialine ponds near the harbor entrance. The study conducted as a part of this EIS show that the anchialine ponds south of the harbor entrance are moderately to heavily impacted by human activities and introduced fish populations. The study found that the nitrogen phosphorus concentrations in these ponds are significantly higher compared to the ponds north of the harbor entrance. The sources of these additional nutrients are not known. Continuous influx of nutrients will eventually degrade the water quality to levels that could alter the pond ecology.~~

Biota surveys in the two pond systems clearly indicate that counts of typical pond denizens show a remarkable difference between the northern and southern ~~ponds~~ pools. In the northern ~~ponds~~ pools the number of *Halocaridina rubra* ranged from a low of 20–25 to too numerous to count. The biota rich pond bottoms appeared red due to the *Halocaridina rubra* numbers. The only other species visible was the predatory shrimp *Metabetaeus lohena*. In contrast, only four out of the 22 ~~ponds~~ pools examined in the southern pond complex showed a decreased presence of *Halocaridina rubra* (6 to 200) individuals in the pond, and three ~~ponds~~ pools contained *Metabetaeus lohena*. Eight of the ~~ponds~~ pools contained numbers of introduced minnows which is an apparent predator of *Halocaridina rubra* and *Metabetaeus lohena*.

The 2007 study found three of the pools identified in the 2006 study were part of an estuary complex with direct connection to the ocean, and that the southern complex contained 19 anchialine pools. The study further found that a majority of the southern pools are degraded biologically and physically, primarily due to the effects of introduced fish and plant species. Six pools are currently devoid of alien fish, but they face a high level of threat due to the proximity of pools that have these species. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction.

The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 ppt. and that the anchialine biology would then perish. There is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and final determination of anchialine salinity following the harbor construction. The assessment that all anchialine pools will be barren with the construction of the harbor may be premature. *Halocaridina rubra* (opae ula) are routinely drawn from high salinity wells at 30-32 ppt.

Within the 19 pools, native and non-native fauna included 14 species comprised of 5 fish, 2 mollusca, and 6 crustacea. Algae within the pools primarily consisted of a mixed assemblage of diatoms and cyanobacteria, with several pools dominated by matted filamentous *Cladophora*, sp. The darker cave/overhang pools and high tide pools had epilithic *Hildenbrandia* sp. covering the rock substrate. Riparian vegetation was dominated by introduced species consisting of Pickleweed (*Batis maritima*), Mangrove (*Rhyzophora mangle*), and Christmasberry (*Shinus terebenthifolius*). Only two species of native plants Akulikuli (*Sesuvium portulacastrum*) and Makaloa (*Cyperus laevigatus*) existed near the pools and comprised only few small patches and a single tuft (respectively).

Most of the hypogeal anchialine shrimp have adapted to the presence of minnows by foraging in the pools at night. During daylight hours, only the adult shrimp appear to coexist at low population levels with the smaller *P. reticulata*, but the larger *G. affinis* and *Oreochromis* prevent the daytime appearance of hypogeal shrimp due to predation.

The average salinity in Kealakehe pools is relatively high at 13.5 ppt compared to most other pools along the West Hawai‘i coastline, having an average of approximately 7 ppt. This high salinity appears to be characteristic of this region, and is similar to the average of most pools within the adjacent ahupua’a of Honokōhau and Kaloko. The levels of nitrate-nitrogen levels are relatively high compared to other undeveloped areas, but fall in the range of some developed landscapes. Other water quality parameters, including pH and temperature, fall into normal ranges for anchialine pools.

This relatively high salinity is the likely reason aquatic insects were not found in any pools at Kealakehe. Though the rare damselfly *Megalagrion xanthomelas* has been observed and collected from Kaloko, a statewide assessment of its range has not found it to occur in water with salinity greater than 3ppt. However, there has been an unsubstantiated occurrence of the nymph in a pool of up to 8ppt (Polhemus, 1995).

Another species of concern is the hypogeal decapod shrimp *Metabetaeus lohena.* These shrimp are sometimes predatory on *H. rubra* but are more often opportunistic omnivores similar to *H. rubra.* Predusk and nocturnal sampling at high tide is clearly the optimal method to determine habitat range and population densities for this species. These shrimp were found in 13 of the 19 pools, 7 of which had *M. lohena* only at night. The occurrences of *H. rubra* were found in 16 of 19 sampled pools, 8 of which had ‘Ōpae‘ula observed only at night. Consequently, despite having numerous degraded anchialine resources at Kealakehe, there are opportunities for many of the pools to be restored and enhanced to a level where large populations of anchialine shrimp and other native species may return to inhabit the pools as they likely have in the past.

~~As mentioned earlier, the southern ponds also had elevated concentrations of nutrients indicating water quality degradation. These factors indicate that if no restoration or maintenance activities are instituted to reserve these ponds, these ecosystems will degrade beyond recovery.~~

~~3.9.3.2~~3.9.2.2 Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

The anchialine ~~ponds~~ pools that are located north of the existing harbor are not likely to be impacted because no development activities are proposed north of the existing harbor. It is highly unlikely that existing groundwater flows to the Kaloko-Honokōhau pond system to the north of the existing harbor will be impacted by the proposed marina to the south.

Of the 19 pools in the southern complex, three would be eliminated due to harbor construction. Regarding the remaining pools, the DEIS noted that t~~T~~he change in the local groundwater flow pattern in the vicinity of the proposed marina ~~will~~ would impact the anchialine ~~ponds~~ pools that are located between the proposed marina and the shoreline south of the harbor entrance. The 2006 study (Appendix H-1) noted that t~~T~~he salinity of the anchialine ~~ponds~~ pools ~~will~~ would increase due to reduction of brackish groundwater, and that ~~. Some ponds will be excavated to make the new harbor basin. T~~those ~~ponds~~ pools that are not excavated will revert to full salinity, causing the loss of their habitat. ~~and associated aquatic flora and fauna. However, current investigations indicate that these ponds are already enriched by nutrients and the density of associated aquatic fauna is very low. In addition, trash from visitors, and introduction of minnows has already degraded the pond ecology.~~ Even without the potential impacts from the proposed marina construction, the pond ecology might change irreversibly from the nutrient input, human indifference and expansion of non native fauna species.

Further studies conducted in response to DEIS comments (Appendix H-2, and Appendix G-3) indicate that the remaining pools may not increase in salinity to levels unhealthy for *H. rubra* and *M. lohena* and other anchialine pool fauna. In addition, these studies determined that there are realistic mechanisms employed elsewhere that would mitigate changes due to groundwater changes. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore.

Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented. The mitigation plan will be based on the following objectives:

Objective 1 To preserve, maintain, and foster the long-term health and native ecological integrity of anchialine pools at Kealakehe.

Objective 2 To protect and promote cultural practices and traditions surrounding anchialine resources at Kealakehe.

Objective 3 To provide education, interpretation, and interactive opportunities for the community to learn about and appreciate the anchialine resources.

Objective 4 To acquire a pond manager to implement the program, conduct monitoring, research, and reporting, and provide education to the community about anchialine and estuarine resources.

Mitigation measures to facilitate the long-term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on the environment can be measured. The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment and possible new pools.

As a mitigation measure, bioretention, which is a Best Management Practice (BMP) is a feasible application for the proposed development. There is a probability that nutrients and other potential pollutants will runoff landscaping and impermeable surfaces such as roadways and parking lots during medium or high rainfall events. Some of these pollutants could enter the groundwater table and into anchialine pools and ultimately the ocean. As an alternative to directing runoff into the ground through drywells, storm water should be directed into bioretention areas such as constructed surface or subsurface wetlands, vegetated filter strips, grass swales, and planted buffer areas. Storm water held and moved through these living filter systems are essentially stripped of most potential pollutants, and allowed to slowly infiltrate back to the groundwater table.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Another mitigation measure that may be included in the management plan is salinity adjustment. In the 2006 assessment regarding the impact to the southern pools from the proposed construction of the harbor, it was stated that this construction would cause the salinity in the anchialine pools to become equivalent to the ocean at 35ppt. It was then concluded that the anchialine biology would perish.

However, there is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and a final determination of anchialine salinity following the harbor construction. The dynamics of groundwater movement through a porous lava medium both seaward and laterally along the coastline is an inexact science. This is compounded by the variations in water density, including stratification of salinity within the proposed harbor and capillary movement of low-density surface water through the substrata.

The assessment that all anchialine pools will be barren with the construction of the harbor may therefore be premature. *H. rubra* are routinely drawn from high salinity wells at 30 – 32 ppt and survive in this salinity for years. Further, high populations *H. rubra* and *M. lohena* have thrived and reproduced in pool salinities of 27ppt. If the pools do become full strength seawater at 35ppt, there exists uncertainty on the long-term effects to anchialine organisms, since there are no long-term studies or examples of native anchialine ecosystems at 35ppt. Native anchialine pool vegetation also has relatively high salinity tolerance.

If the salinity were expected to rise to 35 ppt, possible mitigation in the management plan will include methods to surcharge man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water. If sufficient volume is used, it is theoretically possible to lower salinity in adjacent natural anchialine pools. This surcharge method has been successfully used to raise salinity in anchialine pools and cause the salinity rise in adjacent pools of at least up to 10 meters away. Surcharging with low salinity should work as well or better since the lower density water will essentially float atop the higher salinity water at the surface layer, and move throughout the complex of natural pools. Surcharging may also be a viable mitigation to dilute and more rapidly disperse any pollutants that may be detected in the pools.

Another mitigation measure includes the creation of new anchialine pools. There is significant opportunity to create new anchialine pools and greatly expand the native habitat and resource. It has been demonstrated at several projects in West Hawai‘i that anchialine pools can be created and will be colonized with a full compliment of anchialine species endemic to the area. Anchialine pools are considered focal points of higher productivity relative to the subterranean groundwater habitat around them. Their productivity promotes an increase in population levels of anchialine species within the pools themselves and throughout the subterranean habitat surrounding them.

~~No realistic mechanisms are envisioned for re-injecting fresh water into these systems to maintain their ecological balance as an anchialine system. These ponds will be changed from a brackish water system to a marine system. But, those ponds in the area of the shoreline park and cultural park will be cleaned of vegetation and protected from other physical alteration. A buffer zone around these newly established marine ponds will be protected as well.~~

~~The anchialine pond shrimp (*Metabetaeus lohena)* and the orangeback damsel fly (*Megalagrion xanthomelas)* are listed as candidate endangered species in the Federal Register and were both recorded in surveys of these anchialine ponds done in 2004 by US Geological Survey Biological Resources Division and the NPS Inventory and Monitoring Program. Low numbers of *Metabetaeus lohena* were encountered in three of the 22 ponds surveyed in the southern pond complex. *Megalagrion xanthomelas* was not encountered in any of the southern pond complex ponds during the recent study. The low density of *Metabetaeus lohena* and the observed absence of *Megalagrion xanthomelas* may be due to the impacts from high nutrient input and general degradation of the ponds.~~

~~An attempt should be made to move as much of the existing population of *Metabetaeus lohena* from these anchialine ponds before they become too saline, to possible newly excavated ponds that may be developed off-site. These shrimp should not be introduced into existing populated ponds to avoid any potential pathogenic impacts to the healthy ponds.~~

~~Public education on the unique ecology of the anchialine ponds and the need for preserving their ecology will reduce future human impacts in other healthy ponds.~~

~~Further recommended mitigation includes restoration to degraded anchialine ponds off the project site, preferably those located at the adjacent Kaloko-Honokōhau National Historical Park.~~

Attachment 2

State officials recently announced that land was being set aside in Kealakehe mauka of the project site for a Kona Medical Center.

Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

Kona Kai Ola may impact medical facilities because of the increase in de facto population due to additional visitors, and a likely increase of resident population due to employment-related in-migration. Although residential use is not a permitted use on the leased lands, JDI is planning to construct worker housing on a nearby site that will be leased at below market rents. The extent of in-migration due to employment is undetermined at this time.

The anticipated population growth for the region has stimulated plans for the development of future medical facilities. Potential impacts on existing medical facilities will be mitigated by the addition of new facilities. In the Villages of La'i 'Ōpua located immediately mauka of Kona Kai Ola, a site is designated for Hospital use, and allocations have been made utility needs.

4.10.4 Public Educational Facilities

The Kealakehe Intermediate School located in Kailua-Kona educates students in grades six through eight and had a fall enrollment of 1,052 during the 2004-2005 school year. Kealakehe High School is located near to the intermediate school, and serves grades 9 through 12. The high school's fall enrollment during the 2004-2005 school year was 1,450.

Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

Since there are no permanent residences permitted at the site, there will be no direct impact on area schools. Although residential use is not a permitted use on the leased lands, JDI is planning to construct worker housing on a nearby site that will be leased at below market rents. A separate analysis of impacts on public education facilities will need to be done for the workforce housing that is to be part of this project, and built off-site and potentially mauka of the project site. No mitigations are ~~recommended~~ proposed at this time.

4.10.5 Drainage and Storm Water Facilities

The development of Kona Kai Ola may increase drainage flows, quantities, velocities, erosion and sediment run-off. This ~~DEIS~~ FEIS takes into consideration storm runoff generated from the proposed streets. Each individual development parcel will address its own storm runoff as required. The storm drainage facilities designed for the site will take advantage of the porosity of the existing rocky landscape and the minimal slope, through the use of grading and dry wells, per County requirements. Storm run-off that discharges into the drywell system will tend to migrate towards the manmade lagoons. The lagoons will therefore be lined to prevent influence of such storm runoff. The Hawai'i County Public Works Department generally requires that on-site storm drainage facilities be sized to exceed pre-development drainage quantities, and be designed to result in quantities of storm water leaving the site, not exceeding those quantities entering the site.

Unlike the DLNR property, roadways within the DHHL property cannot be dedicated to the County of Hawaiʻi in fee. To obtain a license agreement for maintenance with the County, the entire storm water system will be designed to conform to the Hawaiʻi County Public Works Storm Drainage Standards.

Anticipated Impacts and ~~Recommended~~ Proposed Mitigation

The proposed project will increase the proportion of impervious surfaces on the subject property through paving and reconfigure the topography, thereby adding to total runoff. This will necessitate the development of an appropriate drainage system to handle the increased and altered drainage patterns. Roadways in the new developed configuration will be dedicated to the County of Hawaiʻi, so the storm drainage system will be required to conform to the Department of Public Works Storm Drainage Standards.

Due to the rocky and porous nature of the soils, the County allows the use of drywells. Drywells typically vary in depth from 10 to 30 feet depending upon the permeability of the underlying soil or rock. Drywells will typically consist of a catch basin type design, with an opening at the curb and gutter. The depth of the catch basin structure will vary depending upon the depth of the rock. During the design of the drywell system, the percolation rates at proposed drywell locations will be determined.

~~Recommended~~ Proposed mitigation measures are as follows:

- The proposed development is located makai of the Underground Injection Well (UIC) line. Since drywells are considered injection wells, the developer is required to secure a UIC Well Permit, from the Department of Health (DOH), Safe Drinking Water Branch.
- Groundwater migration in the area is a concern especially with the construction of natural lagoons within the proposed development. Therefore, the recommendations from a hydrogeologist should be sought to assist with the design of the drywell system.
- All construction activities will comply with the County's grading permit requirements and the State's fugitive dust regulations.
- A National Pollutant Discharge Elimination System (NPDES) permit will be obtained before construction begins and the project will comply with all NPDES permit requirements including implementation and monitoring of all DOH-approved Best Management Practices.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Specific design plans will be determined during the permitting process when final designs are developed. It is the intent of JDI to stipulate low impact development techniques as part of the general design guidelines. The Best Management Practices (BMPs) will be very site specific and must be incorporated with the building and landscape design. BMPs will be incorporated to minimize runoff volume and peak flow, minimize the quantity of pollutants in runoff or flows to groundwater, and maximize re-use of storm water for natural irrigation. Specific BMPs will be reviewed as part of the application for the National Pollutant Discharge Elimination System (NPDES) permit which will be required prior to the County's issuance of a grading permit.

Alternative 1 would result in the lowering of the density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces and the creation of more open space. However, roadway areas have increased by about 30 percent. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings.

4.10.6 Waste~~ W~~water Facilities

A *North Kona Sewer Master Plan* is being developed for the County of Hawai‘i Department of Environmental Management (DEM) to address future sewer improvements necessary to serve projected development in the North Kona region of the Island of Hawai‘i. This sewer master plan would then be used to develop an Implementation Study to support the establishment of an “Improvement District” for North Kona by the County Council (NKSMP 2006). Kona Kai Ola is being designed to be consistent with the North Kona Sewer Master Plan and will participate in any subsequent improvement district.

The proposed development is located within the service area of the Kealakehe WWTP. The Kealakehe WWTP is a County owned and operated wastewater treatment plant which has been in operation since March 1993. The WWTP currently receives about 1.8 million gallons of wastewater per day and treats it to R-2 reuse level. The Kealakehe WWTP has a design capacity of 5.3 million gallons per day (mgd) when operating all five of its lagoons. This capacity is considered the 20-year design which was initiated in year 2000. A sixth lagoon was included in the original design but was never constructed. The space for the sixth lagoon remains vacant and undeveloped. Activating the sixth lagoon increases plant capacity to 7.8 mgd. (CP&E 2006)

Wastewater is delivered to the WWTP through an existing 30-inch gravity sewer and 24-inch force main. The 30-inch sewer delivers wastewater from the mauka properties across Queen Ka‘ahumanu Highway, while the 24-inch force main transports wastewater from the Kailua-Kona area. Wastewater is discharged into aerated lagoons. The effluent pump station receives the treated wastewater from the lagoons, treats it with chlorine, and pumps it into a temporary sump located across Queen Ka‘ahumanu Highway for overland disposal.

Una Burns
POB 752
Na'alehu, HI 96772

February 2, 2007

Mr. Scott Condra
Jacoby Development, Inc.
171 17th Street, NW Suite 1550
Atlanta, GA 30363

Subject: DEIS- Kona Kai Ola, Kealakehe, North Kona District, Island of Hawaii

Dear Mr. Condra,

I am concerned citizen of the Big Island of Hawaii, and I am submitting comments on the above-referenced subject. I am a teacher at a local school West Hawaii Explorations Academy (WHEA), and I am very concerned about the proposed development, Kona Kai Ola, which is South of the Kaloko-Honokohau National Park. I think the proposal is inappropriate for the site, and for Kona for many reasons.

The negative impacts to the proposed site of harbor expansion and land are numerous, and make it clear to me that expansion should not occur. As you must know, the site itself was designated as a National Historic Landmark in 1962. There are numerous archeological features including trail segments and heiau on the site. There are 22 anchiline pools that are home to native candidate endangered species; Megalagrion xanthomelas orangeblack Hawaiian damselfly, and Metabetaeus lohena, red shrimp. The opai ula that live in the pools are ethnobotanically important, as they were used by Hawaiians for fishing. According to Sallie Beavers, NPS biologist, per. Comm.., many of the pools at the site are in good condition. Blasting the land to expand the harbor will cut off the fresh water supply to the pools, and to the native plants in the coastal areas. That should not happen. Offering to restore anchiline pools in the Kaloko-Honkohau National Park as a mitigation for destroying 22 pools is not an equitable nor acceptable idea.

There are many endangered species that live in the Kaloko-Honkohau area on land and in the ocean. This is a pristine site for breeding Humpback whales, Megaptera novaeangliae, threatened Green sea turtles, Chelonia mydas, Bottlenose dolphin, Tursiops truncates, spinner dolphin, Stenella longirostris, endangered Hawaiian monk seal, Monachus schauinslandi, endandered Hawksbill turtles, endangered Hawaiian stilt, Himantopus mexicanus knudseni endangered Hawaiian coot, Fulica alai, Hawaiian hoary bat, Lasiurus cinereus semotus, and too many bird species, marine invertebrates, and fishes to list. These animals would be negatively impacted by blasting, non-point source pollution from industrial parks, fertilizers, and noise. Noise alone would greatly disturb the turtles and other marine life on a daily basis. The sensitive hearing of these animals cannot withstand the increased noise that would go along with 800 new slips in the harbor. A mesh barrier is a death trap for all marine species that go near it.

There are over 170 resident Green sea turtles at Kaloko-Honokohau National Park. That means that the turtles sleep at the National Park and are there daily. The turtles would be seriously threatened by the huge increase in boats entering and leaving the harbor. Furthermore, propellers are a serious danger to turtles. Turtle lungs are at the top of the carapace, and if a turtle is struck its lungs are in danger of being punctured. Turtle deaths and strandings are under-reported in Hawaii because the Island does not have a dedicated patrol for stranded turtles. In addition, turtles that are struck and killed by propellers would most likely sink or be eaten, thus the true numbers of turtle deaths are unknown. According to KAHO Stranding Data, there were 20 strandings at the National Park between 2000 and 2006. Only three turtles survived. The huge proposed increase in the harbor would certainly be grave for the turtles. There are two turtle cleaning stations at the mouth of the harbor entrance, "turtle pai" and "turtle heaven". It is also the place frequented by spinner dolphin. The spinner dolphin rest just outside of the harbor entrance.

The increase in boats crossing the Hawaiian Islands Humpback Whale National Marine Sanctuary is unacceptable. There are 4500 to 6500 whales migrating to Hawaii every year to give birth to their young. With whale hunting continuing in many parts of the world despite hunting moratoriums, it is critical that Hawaii remain a safe place for the whales to winter. There are many people in the community who do not want to see changes in Hawaii degrade the good health of its natural resources. The danger for whale strikes is too great with the intended increased number of boats. The over 300% expansion of the harbor is not only inappropriate, but unnecessary. According to the National Marine Manufacturers Association website, State Registrations of Boats from 1996-2004 shows that Hawaii has a -15% drop in boat sales during that period. What is the justification for such a huge increase in harbor slips? Furthermore, the intended cost of $11 per foot for slips is overpriced for the local community. People who are currently towing their boats would have to continue to trailer them rather than dock them in the harbor. The high cost of slip fees clearly reflects an intention to focus on the wealthy part-timers in Kona and not the local community. Since the DEIS statement says that the decrease in blue marlin is dramatic, "as of 2005, the catch rate has dropped to about 1 blue marlin in every 10 trips (pg. 52)", the proposed development is not in line with environmental "red flags" that are happening at this time. As fisheries around the world are declining alarmingly, it would not be appropriate to endanger the Kona coast, especially due to the proximity of this proposed development to the Kaloko-Honokohau National Park. The coral reefs, whales, turtles, and all other marine life would undoubtedly suffer, as would the Kona community.

Kona is currently suffering enough due to workers shortages, traffic congestion, water limitations, and housing shortages. There is no interest from the local community for more hotels, which would greatly increase the total number of units in Kona at the expense of the city itself. The resorts and hotels in North Kona are placed far enough away from Kailua Kona's stores, houses, and activity center. This development would be right in the middle of the busiest place in Kona. That doesn't make sense and it would burden all aspects of Kona's infrastructure. People want to see Kona grow in a well thought out way. They want to see it grow while taking care of its natural resources. This proposed development obviously does not prioritize the natural resources of the Kona coast.

The overwhelming negative impacts on all of the biota in the environment, the fact that the site is designated as a National Historic Landmark, and it's proximity to the Kaloko-Honokohau National Park make this proposed development unacceptable, thus no action is the only viable solution.

Sincerely,

Una Burns

Una Burns

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innovation through engineering & scientific excellence

July 23, 2007

Una Burns
P.O. Box 752
Na'alehu, HI 96772

Dear Ms. Burns:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are based on paragraph designations.

Paragraph 1

We do not agree with your comment that the proposal is inappropriate for the site and for Kona for many reasons. Studies conducted in the preparation of this Environmental Impact Statement (EIS) shows that there will be economic, infrastructure, and recreational benefits to the community from this project.

Paragraph 2

An extensive archaeological investigation was conducted during the preparation of the Draft Environmental Impact Statement (DEIS). Numerous sites both in the Department of Land and Natural Resources (DLNR) and Department of Hawaiian Home Lands (DHHL) land were identified and inventoried. The complete report is included in the EIS, Appendices M-1 and M-2. The archeological study identified eleven sites as culturally significant based on the presence of burials or ritual architecture. Fifty four sites were mapped, photographed and documented. Forty seven sites were recommended through data recovery. Detailed data recovery plans will be prepared for the State Historic Preservation Division (SHPD) of DLNR for review and approval.

The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 parts per thousand (ppt) and that the anchialine biology would then perish.

In response to DEIS comments and to further study the pools south of the entrance channel of Honokohau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design, in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2 of the EIS and is summarized in EIS Sections 3.9.2.1 and 3.9.2.2. In addition, further comment on the groundwater hydrology effects on anchialine pools was prepared by Waimea Water Services and is contained in Appendix G-3 of the EIS.

These additional studies indicated that with the construction of the new harbor basin, the anchialine pools makai of the proposed basin may not necessarily be negatively impacted by the construction of the proposed project.

In addition, these studies determined that there are mechanisms to mitigate potential impacts. Mitigation measures to facilitate the long term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. As a mitigation measure, bioretention, which is a Best Management Practice (BMP), is a highly appropriate application for the proposed development to prevent any non-point source pollution of groundwater. Another mitigation measure that may be included in the management plan is salinity adjustment of the anchialine pools to maintain healthy habitat for the anchialine ecosystem by surcharging man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water.

Paragraph 3

Several studies were conducted to assess the impact of blasting and pollution from runoff. Fauna surveys, terrestrial noise studies, and marine acoustics were conducted to assess impacts for various noise sources. These studies are included as Appendices in the EIS.

The Fauna Impact Study, as summarized in EIS Section 7, found that it is not expected that the development of the proposed Kona Kai Ola property will have significant impacts on native avian or mammalian resources present within the North Kona District. Further, Kona Kai Ola will provide additional habitat for shorebirds and some visiting seabirds through the establishment of a brackish water pond area suitable for avian fauna, including stilts, coots, and ducks. This is a positive impact and water features will constitute a managed ecosystem that will protect these species.

A complete marine acoustics study was completed in response to comments received on the DEIS. The report is included in Appendix T-2. The model results showed that the noise levels in the developed scenario did not exceed the Level A impacts to marine mammals. Level B impacts to marine mammals and sea turtles generally occur within a range of ten meters. Although noise impacts may occur during blasting the new marina, these impacts could be greatly minimized by using good blasting practices. These are addressed in detail in the EIS.

Pollution from contaminants from boats and potential possibility of oil spills is a concern in all of Hawaii, not just for Honokohau Harbor. This issue has been addressed in the EIS in Section 3.9.1.3, including a list of mitigation actions. These include boater education, enforcement of good housekeeping practices on boats and docks, and environmentally sensitive hull cleaning practices.

Regarding runoff, as discussed in EIS Section 4.10.5, Drainage and Storm Water Facilities, the proposed project will increase the proportion of impervious surfaces on the subject property through paving and reconfigure the topography, thereby adding to total runoff. Roadways in the new developed configuration will be dedicated to the County of Hawai'i, so the storm drainage system will be required to conform to the Department of Public Works Storm Drainage Standards. Mitigation measures to address runoff impacts include the use of drywells, which will require an Underground Injection Well Permit from the Department of Health, Safe Drinking Water Branch, and recommendations from a hydrogeologist will be sought to assist with the design of the drywell system.

Further, bioretention, which is a Best Management Practice (BMP), will be utilized in series to incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, the level and reliability of pollutant removal is raised. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Paragraph 4

Vessel collisions and potential noise impacts are a concern with regard to turtles. In a study of 3,861 turtle strandings in the main Hawaiian Islands from 1982 - 2003 (Chaloupka, et al. 2006), boat strikes accounted for only about 2.7 percent. Entanglement of gill nets accounted for 6 percent and hook and line entanglement for 7 percent. At least 20 green sea turtles have stranded in Honokohau harbor along the boundaries of Kaloko-Honokohau National Historic Park.

An increased level of impacts to sea turtles from boating and fishing activities may occur. Human caused impacts from fishing and boat strikes are anticipated to increase as sea turtle populations continue to increase and boating/fishing activities increase with the expanding harbor.

Paragraph 5

Numerous studies have shown that human activity can affect humpback whale behavior, including vessel activity. Most humpbacks off Hawaii are found north of Honokohau in the waters of the Hawaiian Islands Humpback Whale National Marine Sanctuary. Nevertheless, they are commonly seen off Honokohau in winter months.

Vessel collisions are also a major concern. The majority of whale strikes occur where whales and boats are mostly common, such as in shallow waters between Lanai and Maui. Implementation of additional regulations on private and commercial whale encountering activities and mariner education programs already in place as part of Sanctuary operations will help mitigate possible impacts due to increased boaters.

A comparison between impacts related to the proposed project concept and impacts related to Alternative 1 indicates that a reduction in the acreage and number of slips in the marina, as well as the reduction in hotel and timeshare units, would generate less environmental, social and economic impacts. Although positive economic impacts would be reduced, Alternative 1 can be considered as a preferable alternative because of reduced environmental impacts. However, while it can be concluded that the 25-acre (400 slips) marina in Alternative 1 would be the preferred size, the DLNR agreement establishes the size of the marina at 45 acres and 800 slips. An amendment to the DLNR agreement is required in order to allow Alternative 1 to proceed. Hence, selection of Alternative 1 is an unresolved issue at this time.

Both tuna and marlin fisheries have been shown to be in general decline according to private, State, and national fisheries statistics. There are several hypothesized causes for these declines relating primarily to international fisheries. The ability of the State to manage these pelargic fisheries is limited by the national and international fishing policies. Limiting the number of slips available within itself would not provide effective control over fisheries pressure because the need is market driven. Fisheries managers need to take a serious look at management strategies for the future. Attempting to preserve fisheries resources only by limiting harbor facilities is not likely to have any long term positive effects on the fisheries resources.

The EIS finds that an increase in the harbor size offers the opportunity to consolidate, focus, and fund management and enforcement activities at one centralized location. The pressure on fish and invertebrate stocks, as well as on populations of marine mammals and turtles, can be expected to increase as Kona population increases, regardless of harbor improvement. The following changes can be made by the DLNR, paid for at least in part by the additional revenues to DLNR from the Kona Kai Ola project. These changes are in the management authority of the DLNR Division of Aquatic Resources and the DLNR Division of Boating and Recreation.

Increasing the enforcement and management staff, providing slip and office space for personnel and equipment, increasing the number of mooring buoys at dive sites, increasing educational materials for divers and fishermen, restricting size and catch restrictions are some of the steps that will mitigate impacts on fisheries.

In addition, the increased knowledge of fisheries knowledge has spawned an atmosphere of stewardship in the general charter-boat fishing community. With catch and release programs reaching upward of 40 percent of the Kona catch back to the ocean there is an awareness that the value of catching the fish is greater the value than selling it. The EIS recommends that facilities and programs foster continued stewardship, fisheries science, tracking of all fish catch, and educational programs be implemented in the design of the new marina facilities.

Paragraph 6

A study of workforce housing requirements was prepared to evaluate secondary impacts. As agreements between the State and JDI prohibit residential development at Kona Kai Ola, workforce housing would need to be located off-site. The most suitable location for workforce housing units is the Villages at La‘i‘Opua community, a DHHL project, or within the Hawai‘i Housing Finance and Development Corporation affordable housing development planned for Keahuolu. These are two State-owned undertakings directly across the highway in the same or adjacent ahupua‘a. Locating workforce affordable housing units in these communities would substantially lessen the traffic impacts associated with a community subject workforce. Alternatively, the State lands adjacent to Waikoloa Village would be appropriate for workforce housing.

JDI will comply with all affordable housing requirements applicable to Hawaii County ordinances.

The development of Kona Kai Ola is broader than providing accommodations for tourists. The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, JDI will protect natural resources through the various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities such as parks, other recreational facilities, and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community. Land ownership will remain with the State.

The EIS has been revised to include information from these additional studies. Attachment 1 contains Section 3.9.2, Anchialine Pools, Attachment 2 contains Section 3.9.13, Zone of Mixing, Attachment 3 contains Section 4.10.5, Drainage and Storm Water Facilities, and Attachment 4 contains Section 2, Alternatives Analysis.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process. Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

The conditions with the project constructed were found to be phosphorous limited. Several simulations were performed including and excluding the inflow from the marine exhibits which provides an additional nitrogen load and also varying the location of this inflow. It was found that the inflow from the marine exhibits can have a beneficial effect on flushing, especially when positioned within the existing harbor basin. However, its effect is significantly less than the effect due to the brackish groundwater inflow. When the exhibit inflow is excluded or positioned at the east end of the new marina, its effect is small in terms of flushing due to its high salinity. From a water quality perspective, since the loads from the exhibit inflow consist primarily of nitrogen, it does not cause increased algae growth. However, this exhibit inflow does raise the concentrations of ammonia and nitrate in the system.

Simulation results indicate that under the conditions when the post-expansion system receives an additional brackish inflow into the new 25-acre marina on the order of 30 mgd or more, water quality within the harbor system and in the surrounding waters remained similar to existing conditions. These conditions are expected to occur based on the findings reported by Waimea Water Services (2007), which states that the proposed marina would exhibit the same or similar flushing action as the existing marina.

An additional mitigation measure proposed by Waimea Water Services (2007), if sufficient inflow is not intercepted, consists of drilling holes in the bottom of the new marina to enhance this inflow and facilitate flushing within the proposed system.

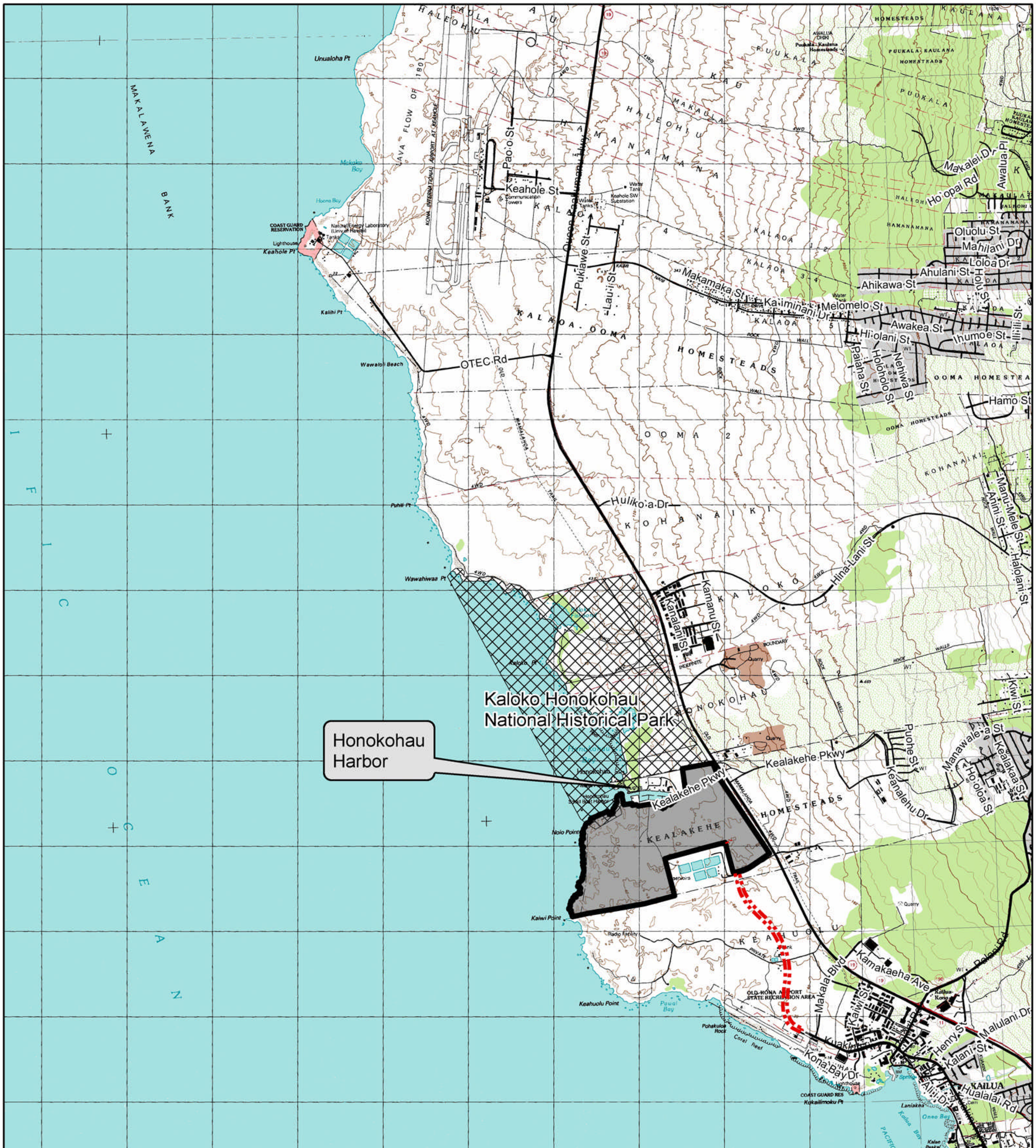
~~3.9.3~~3.9.2 Anchialine ~~Ponds~~ Pools

Two studies on anchialine pools were conducted in this EIS process. The anchialine ~~ponds~~ pools water quality studies and ~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute and is~~biota surveys were conducted by David A. Ziemann, Ph.D. of the Oceanic Institute in October 2006 and are included as Appendix ~~G~~H-1. That survey included pools located both north and south of Honokōhau Harbor. In response to DEIS comments and to further study the pools south of entrance channel of Honokōhau Harbor, a second study was conducted by David Chai of Aquatic Research Management and Design in June 2007. The second survey focused on intensive diurnal and nocturnal biological surveys and limited water quality analysis of the southern group of anchialine pools exclusively. The report is contained in Appendix H-2.

~~3.9.3.1~~3.9.2.1 Existing Conditions

Anchialine ~~ponds~~ pools exist in inland lava depressions near the ocean. Two anchialine ~~pond~~ pool complexes are located immediately to the north and south of the Honokōhau Harbor entrance channel. The complex to the north is located wholly within the designated boundaries of the Kaloko-Honokōhau National Historical Park as shown in Figure Q~~O~~. Many of the ~~ponds~~ pools in the southern complex are within the park administrative boundary as well. ~~Ponds~~ Pools in the northern complex show little evidence of anthropogenic impacts. Many contain typical vegetation and crustacean species in high abundance.

Figure R locates anchialine pools near the harbor entrance and pools~~Ponds~~ in the southern complex are depicted in Figure S.



Source: http://nrdata.nps.gov/kaho/kahodata/kaho_parkbndry_ply.zip

Figure Q: National Historical Park Service Legislative Boundary Map

Legend

- Project Site
- Proposed Parkway
- National Park Boundary

N W E S

0 2,500 5,000 Feet

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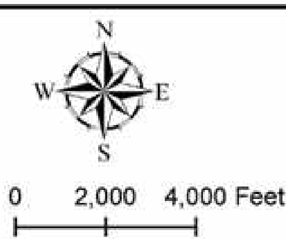
Source: Oceanic Institute

Figure R: Anchialine Pool Locations



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Source: Aquatic Resources Management And Design

Figure S: Anchialine Pool Locations in Southern Complex

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The 2006 study identified 22 pools in the southern complex. The 2007 study found that three of the 22 pools are part of an estuary complex with direct connection to the ocean. While there were several signs of direct human use and disturbance, such as trash receptacles and toilet facilities, the greatest degradation to the majority of the anchialine and estuarine resources was due to the presence of alien fish, including topminnows and tilapia, and introduced plants, predominantly pickleweed and mangrove. ~~are moderately to heavily impacted, with many containing exotic fish that exclude the anchialine crustaceans. The ponds also show evidence of human impact, including discarded bottles, cans, wrappers, diapers, toilet paper, etc. Water quality conditions within the ponds generally reflect the conditions of the underlying groundwater.~~

~~Figure P locates anchialine ponds near the harbor entrance. The study conducted as a part of this EIS show that the anchialine ponds south of the harbor entrance are moderately to heavily impacted by human activities and introduced fish populations. The study found that the nitrogen phosphorus concentrations in these ponds are significantly higher compared to the ponds north of the harbor entrance. The sources of these additional nutrients are not known. Continuous influx of nutrients will eventually degrade the water quality to levels that could alter the pond ecology.~~

Biota surveys in the two pond systems clearly indicate that counts of typical pond denizens show a remarkable difference between the northern and southern ~~ponds~~ pools. In the northern ~~ponds~~ pools the number of *Halocaridina rubra* ranged from a low of 20–25 to too numerous to count. The biota rich pond bottoms appeared red due to the *Halocaridina rubra* numbers. The only other species visible was the predatory shrimp *Metabetaeus lohena*. In contrast, only four out of the 22 ~~ponds~~ pools examined in the southern pond complex showed a decreased presence of *Halocaridina rubra* (6 to 200) individuals in the pond, and three ~~ponds~~ pools contained *Metabetaeus lohena*. Eight of the ~~ponds~~ pools contained numbers of introduced minnows which is an apparent predator of *Halocaridina rubra* and *Metabetaeus lohena*.

The 2007 study found three of the pools identified in the 2006 study were part of an estuary complex with direct connection to the ocean, and that the southern complex contained 19 anchialine pools. The study further found that a majority of the southern pools are degraded biologically and physically, primarily due to the effects of introduced fish and plant species. Six pools are currently devoid of alien fish, but they face a high level of threat due to the proximity of pools that have these species. Of the 19 anchialine pools, six were considered high tide pools (exposed only at medium or high tide), seven were considered pool complexes (individual pools at low tide and interconnected at high tide), and six were single isolated pools. Of the 19 anchialine pools, three pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction.

The DEIS presented information stating that harbor construction would cause an increase in salinity in the anchialine pools makai of the proposed marina basin to become equivalent to the ocean at 35 ppt. and that the anchialine biology would then perish. There is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and final determination of anchialine salinity following the harbor construction. The assessment that all anchialine pools will be barren with the construction of the harbor may be premature. *Halocaridina rubra* (opae ula) are routinely drawn from high salinity wells at 30-32 ppt.

Within the 19 pools, native and non-native fauna included 14 species comprised of 5 fish, 2 mollusca, and 6 crustacea. Algae within the pools primarily consisted of a mixed assemblage of diatoms and cyanobacteria, with several pools dominated by matted filamentous *Cladophora*, sp. The darker cave/overhang pools and high tide pools had epilithic *Hildenbrandia* sp. covering the rock substrate. Riparian vegetation was dominated by introduced species consisting of Pickleweed (*Batis maritima*), Mangrove (*Rhyzophora mangle*), and Christmasberry (*Shinus terebenthifolius*). Only two species of native plants Akulikuli (*Sesuvium portulacastrum*) and Makaloa (*Cyperus laevigatus*) existed near the pools and comprised only few small patches and a single tuft (respectively).

Most of the hypogeal anchialine shrimp have adapted to the presence of minnows by foraging in the pools at night. During daylight hours, only the adult shrimp appear to coexist at low population levels with the smaller *P. reticulata*, but the larger *G. affinis* and *Oreochromis* prevent the daytime appearance of hypogeal shrimp due to predation.

The average salinity in Kealakehe pools is relatively high at 13.5 ppt compared to most other pools along the West Hawaiʻi coastline, having an average of approximately 7 ppt. This high salinity appears to be characteristic of this region, and is similar to the average of most pools within the adjacent ahupua'a of Honokōhau and Kaloko. The levels of nitrate-nitrogen levels are relatively high compared to other undeveloped areas, but fall in the range of some developed landscapes. Other water quality parameters, including pH and temperature, fall into normal ranges for anchialine pools.

This relatively high salinity is the likely reason aquatic insects were not found in any pools at Kealakehe. Though the rare damselfly *Megalagrion xanthomelas* has been observed and collected from Kaloko, a statewide assessment of its range has not found it to occur in water with salinity greater than 3ppt. However, there has been an unsubstantiated occurrence of the nymph in a pool of up to 8ppt (Polhemus, 1995).

Another species of concern is the hypogeal decapod shrimp *Metabetaeus lohena.* These shrimp are sometimes predatory on *H. rubra* but are more often opportunistic omnivores similar to *H. rubra.* Predusk and nocturnal sampling at high tide is clearly the optimal method to determine habitat range and population densities for this species. These shrimp were found in 13 of the 19 pools, 7 of which had *M. lohena* only at night. The occurrences of *H. rubra* were found in 16 of 19 sampled pools, 8 of which had ʻŌpaeʻula observed only at night. Consequently, despite having numerous degraded anchialine resources at Kealakehe, there are opportunities for many of the pools to be restored and enhanced to a level where large populations of anchialine shrimp and other native species may return to inhabit the pools as they likely have in the past.

~~As mentioned earlier, the southern ponds also had elevated concentrations of nutrients indicating water quality degradation. These factors indicate that if no restoration or maintenance activities are instituted to reserve these ponds, these ecosystems will degrade beyond recovery.~~

~~3.9.3.2~~3.9.2.2 Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

The anchialine ~~ponds~~ pools that are located north of the existing harbor are not likely to be impacted because no development activities are proposed north of the existing harbor. It is highly unlikely that existing groundwater flows to the Kaloko-Honokōhau pond system to the north of the existing harbor will be impacted by the proposed marina to the south.

Of the 19 pools in the southern complex, three would be eliminated due to harbor construction. Regarding the remaining pools, the DEIS noted that t~~T~~he change in the local groundwater flow pattern in the vicinity of the proposed marina ~~will~~ would impact the anchialine ~~ponds~~ pools that are located between the proposed marina and the shoreline south of the harbor entrance. The 2006 study (Appendix H-1) noted that t~~T~~he salinity of the anchialine ~~ponds~~ pools ~~will~~ would increase due to reduction of brackish groundwater, and that ~~. Some ponds will be excavated to make the new harbor basin. T~~those ~~ponds~~ pools that are not excavated will revert to full salinity, causing the loss of their habitat. ~~and associated aquatic flora and fauna. However, current investigations indicate that these ponds are already enriched by nutrients and the density of associated aquatic fauna is very low. In addition, trash from visitors, and introduction of minnows has already degraded the pond ecology.~~ Even without the potential impacts from the proposed marina construction, the pond ecology might change irreversibly from the nutrient input, human indifference and expansion of non native fauna species.

Further studies conducted in response to DEIS comments (Appendix H-2, and Appendix G-3) indicate that the remaining pools may not increase in salinity to levels unhealthy for *H. rubra* and *M. lohena* and other anchialine pool fauna. In addition, these studies determined that there are realistic mechanisms employed elsewhere that would mitigate changes due to groundwater changes. Waimea Water Services found that harbor construction would cut off some of the fresher ground-water flow. However, predicting the extent of change in flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore.

Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented. The mitigation plan will be based on the following objectives:

Objective 1 To preserve, maintain, and foster the long-term health and native ecological integrity of anchialine pools at Kealakehe.

Objective 2 To protect and promote cultural practices and traditions surrounding anchialine resources at Kealakehe.

Objective 3 To provide education, interpretation, and interactive opportunities for the community to learn about and appreciate the anchialine resources.

Objective 4 To acquire a pond manager to implement the program, conduct monitoring, research, and reporting, and provide education to the community about anchialine and estuarine resources.

Mitigation measures to facilitate the long-term health of the remaining anchialine pools will be based on environmental monitoring, which is vital as an early warning system to detect potential environmental degradation. A series of quantitative baseline analysis of the physio-chemical and biological components within the project site will provide a standard by which the effects of the development, anthropogenic activities, and natural phenomena on the environment can be measured. The framework for the mitigation plan will include three measures intended to meet these objectives, including bioretention, salinity adjustment and possible new pools.

As a mitigation measure, bioretention, which is a Best Management Practice (BMP) is a feasible application for the proposed development. There is a probability that nutrients and other potential pollutants will runoff landscaping and impermeable surfaces such as roadways and parking lots during medium or high rainfall events. Some of these pollutants could enter the groundwater table and into anchialine pools and ultimately the ocean. As an alternative to directing runoff into the ground through drywells, storm water should be directed into bioretention areas such as constructed surface or subsurface wetlands, vegetated filter strips, grass swales, and planted buffer areas. Storm water held and moved through these living filter systems are essentially stripped of most potential pollutants, and allowed to slowly infiltrate back to the groundwater table.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Another mitigation measure that may be included in the management plan is salinity adjustment. In the 2006 assessment regarding the impact to the southern pools from the proposed construction of the harbor, it was stated that this construction would cause the salinity in the anchialine pools to become equivalent to the ocean at 35ppt. It was then concluded that the anchialine biology would perish.

However, there is currently a level of uncertainty by professional hydrologists as to the exact movement of surface groundwater and a final determination of anchialine salinity following the harbor construction. The dynamics of groundwater movement through a porous lava medium both seaward and laterally along the coastline is an inexact science. This is compounded by the variations in water density, including stratification of salinity within the proposed harbor and capillary movement of low-density surface water through the substrata.

The assessment that all anchialine pools will be barren with the construction of the harbor may therefore be premature. *H. rubra* are routinely drawn from high salinity wells at 30 – 32 ppt and survive in this salinity for years. Further, high populations *H. rubra* and *M. lohena* have thrived and reproduced in pool salinities of 27ppt. If the pools do become full strength seawater at 35ppt, there exists uncertainty on the long-term effects to anchialine organisms, since there are no long-term studies or examples of native anchialine ecosystems at 35ppt. Native anchialine pool vegetation also has relatively high salinity tolerance.

If the salinity were expected to rise to 35 ppt, possible mitigation in the management plan will include methods to surcharge man-made anchialine pools created adjacent to or in the vicinity of natural pools with low salinity well water. If sufficient volume is used, it is theoretically possible to lower salinity in adjacent natural anchialine pools. This surcharge method has been successfully used to raise salinity in anchialine pools and cause the salinity rise in adjacent pools of at least up to 10 meters away. Surcharging with low salinity should work as well or better since the lower density water will essentially float atop the higher salinity water at the surface layer, and move throughout the complex of natural pools. Surcharging may also be a viable mitigation to dilute and more rapidly disperse any pollutants that may be detected in the pools.

Another mitigation measure includes the creation of new anchialine pools. There is significant opportunity to create new anchialine pools and greatly expand the native habitat and resource. It has been demonstrated at several projects in West Hawaiʻi that anchialine pools can be created and will be colonized with a full compliment of anchialine species endemic to the area. Anchialine pools are considered focal points of higher productivity relative to the subterranean groundwater habitat around them. Their productivity promotes an increase in population levels of anchialine species within the pools themselves and throughout the subterranean habitat surrounding them.

~~No realistic mechanisms are envisioned for re-injecting fresh water into these systems to maintain their ecological balance as an anchialine system. These ponds will be changed from a brackish water system to a marine system. But, those ponds in the area of the shoreline park and cultural park will be cleaned of vegetation and protected from other physical alteration. A buffer zone around these newly established marine ponds will be protected as well.~~

~~The anchialine pond shrimp (*Metabetaeus lohena)* and the orangeback damsel fly (*Megalagrion xanthomelas)* are listed as candidate endangered species in the Federal Register and were both recorded in surveys of these anchialine ponds done in 2004 by US Geological Survey Biological Resources Division and the NPS Inventory and Monitoring Program. Low numbers of *Metabetaeus lohena* were encountered in three of the 22 ponds surveyed in the southern pond complex. *Megalagrion xanthomelas* was not encountered in any of the southern pond complex ponds during the recent study. The low density of *Metabetaeus lohena* and the observed absence of *Megalagrion xanthomelas* may be due to the impacts from high nutrient input and general degradation of the ponds.~~

~~An attempt should be made to move as much of the existing population of *Metabetaeus lohena* from these anchialine ponds before they become too saline, to possible newly excavated ponds that may be developed off-site. These shrimp should not be introduced into existing populated ponds to avoid any potential pathogenic impacts to the healthy ponds.~~

~~Public education on the unique ecology of the anchialine ponds and the need for preserving their ecology will reduce future human impacts in other healthy ponds.~~

~~Further recommended mitigation includes restoration to degraded anchialine ponds off the project site, preferably those located at the adjacent Kaloko-Honokōhau National Historical Park.~~

Attachment 2

A detailed analysis of the change in flow velocities through the harbor entrance is described within the 3D model shown in Appendix U. It was found that tidally averaged velocities through the harbor entrance may increase by 3-4 cm/s post-expansion. This is due to the increased tidal prism, the addition of the exhibit water, and the increased flow of brackish groundwater into the system.

3.9.1.2 Methodologies and Studies

Three studies were conducted to evaluate project impacts on nearshore and coastal waters. Oceanit completed a Zone of Mixing study that was presented in the DEIS and is contained in Appendix ~~H~~I. This study was tasked with determining the mixing and dispersion of flows emerging from the harbor into the adjacent shallow nearshore waters. To accomplish this, data from previous studies were reviewed and field research was conducted to measure stratification and currents adjacent to the harbor entrance and out into the ocean. A "Zone of Mixing" area was determined outside of which there is no discernable influence to water quality from the existing harbor effluent. This information was used to assess impact from modifications to groundwater inflow from marina expansion, and the seawater effluent flow from the marine water features.

~~The model analysis for mixing and water flow through the existing harbor and the proposed marina included existing water exchange between harbor and ocean and the future water exchange resulting from the expanded marina area and the discharge from the marine water features. The model results include three dimensional water flow patterns as well as water quality distribution details.~~

A Wave Penetration Study was prepared by Moffat and Nichol to determine wave characteristics within the existing harbor and the proposed expansion basin. This study was presented in the DEIS and is contained in Appendix J.

In response to DEIS comments, a Harbor Water Quality Modeling Study was prepared by Moffat and Nichol and is presented in Appendix U of this FEIS.

3.9.1.3 Zone of Mixing ~~Anticipated Impacts and Recommended Mitigation~~

~~Oceanit completed a Zone of Mixing study that is contained in Appendix H. This study was tasked with determining the mixing and dispersion of flows emerging from the harbor into the adjacent shallow nearshore waters. To accomplish this, data from previous studies were reviewed and field research was conducted to measure stratification and currents adjacent to the harbor entrance and out into the ocean. A "Zone of Mixing" area was determined outside of which there is no discernable influence to water quality from the existing harbor effluent. This information was used to assess impact from modifications to groundwater inflow from marina expansion, and the seawater effluent flow from the marine water features.~~

The model analysis for mixing and water flow through the existing harbor and the proposed marina included existing water exchange between harbor and ocean and the future water exchange resulting from the expanded marina area and the discharge from the marine water features. The model results include three-dimensional water flow patterns as well as water quality distribution details.

The three-dimensional model was extended outside of the harbor entrance in order to examine relative changes from baseline conditions. Due to the lack of available data regarding specific brackish discharge events along the coastline, the model is not calibrated outside of the harbor entrance, and any changes predicted in this region are only referred to in terms of relative changes (in relation to model predicted existing conditions). This analysis is shown in Appendix I. It was found that the significance of the additional brackish groundwater inflow into Kona Kai Ola Marina also has an effect on the surrounding surface waters of Honokōhau Bay. The concentrations of nutrients in low flow scenarios are less than existing conditions due to the lack of additional nutrients to the system. However, with higher brackish inflow, the relative growth of algae is more contained while nutrient concentrations relatively increase. Relative nitrogen concentrations in the bottom layers can be maintained in scenarios without additional exhibit flow included, however with the additional saline flow, there is more of a nitrogen load in the bottom layers.

Anticipated Impacts and Mitigation Measures

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water for the water features will be pumped from 100 to 300 foot depth. The total amount of water supplied to the water features will be 75 million gallons per day. The rate of pumping is designed to achieve an approximate 4 hour residence time within the ponds (pers. comm. Cloward H2O, 2007) and to prevent build up of pollutants from users and marine animals. ~~The water for the water features will be pumped from 100 to 300 foot depth. The total amount of water supplied to the water features will be 75 million gallons per day. The rate of pumping is designed to achieve rapid turnover of water within the ponds and to prevent build up of pollutants from marine animals and users. Currently, the nutrient concentrations at the existing marina entrance are very high (1,200ug/l of total dissolved nitrogen (TDN) and 83 ug/l of total dissolved phosphorus (TDP)). The intake water for the features has low levels of nutrients (185 ug/l TDN and 5.6 ug of TDP).~~

The anticipated impacts and mitigation measures discussed below assume construction of an 800-slip harbor. One possible mitigation measure would be to reduce the size of the harbor expansion. Any modification of the final design size of the marina would require modification of contract language with the DLNR. In that Alternative 1 would include a smaller marina and smaller seawater lagoons, the latter of which would represent a 74 percent decrease from 19 acres in the proposed project to five acres in Alternative 1, there would be a proportionate reduction in seawater discharging into the new harbor.

The intake water for the features has low levels of nutrients (185 µg/l TDN and 5.6 µg of TDP). This amount will be modified by the generation of nutrients by marine animals. This quantity was modeled via calculations performed by ClowardH2O (pers. comm., 2007). Through modeling, this level of nutrient input was found to have an effect on both ammonia and nitrate concentrations outside of the harbor. However, the modeled input did not contribute significantly to eutrophication potential due to the limiting nature of phosphorous within the system. These processes and sensitivity tests are described at length in Appendix U.

Although the total amount of nutrients that will be generated per day will increase from the nutrient output of marine animals and users, the concentration of the nutrients will be lower due to the large amount of water available for mixing within the basin. The overall impact will be a reduction of nutrient concentration in the outflowing water.

The boats used in the marina will be small, and spills could occur from boats or while fuelling. These amounts in a majority of cases will be relatively small. The entrance to the marina is relatively narrow and in case of a fuel spill, the traffic will be stopped and a containment boom will be installed to contain the spill within the basin.

Adequate numbers of containment booms, absorption units and oil removal facilities will be at the fueling station and also provided to an identified emergency response station. Personnel will be trained to respond in case of a spill. In addition, the local fire station, police and civil defense and other agencies will be informed in case of a larger spill.

The proposed new marina would significantly increase the size of the water body, but would utilize the existing marina entrance for access to the ocean. This will increase the tidal prism in addition to the extra anticipated inflows to the new marina. It would be expected to intercept additional groundwater, adding these flows to the existing harbor outflow in addition to being the outfall location for the exhibit flows. Model results presented in Appendix U show that the increase in depth-averaged velocities through the harbor entrance can be as great as 4 cm/s under typical conditions,

The proposed marina basin will therefore not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance. There will be an expanded zone of mixing between the brackish effluent and the surrounding ocean waters due to the concentration of flows at the harbor mouth. The addition of effluent water from the marine water features will result in an additional increase outflow across the marina entrance from 30 mgd to an expected value of greater than 135 mgd after development of the marine water features. ~~to the south will intercept additional groundwater, adding these flows to the existing harbor outflow. The proposed marina will therefore not result in any significant increase in groundwater flow to the coastline, but rather a concentration of the existing flows to the harbor entrance. There will be an expanded zone of mixing between the brackish effluent and the surrounding ocean waters due to the concentration of flows at the harbor mouth. The addition of effluent water from the marine water features will result in an additional increase outflow across the marina entrance from 4 mgd at present to 79 mgd after development of the marine water features. The effluent from the marine water features will contain low amounts of nutrients because of the high flow through. The large amount of water will dilute any pollutants that enter the harbor basin from groundwater or surface water. This will improve the water quality and will be a positive impact on the nearshore environment.~~

Despite its proximity to the WWTP, sewers do not service the existing adjacent State harbor or surrounding private structures. All sewage from existing facilities is treated in on-site septic systems with resulting effluent flowing to groundwater that almost certainly flows directly to the existing harbor. Under post-development conditions all of these flows would be connected to the Kona Kai Ola sewage system resulting in a positive impact by eliminating this existing pollutant load into the harbor. Sewage from facilities at the existing marina will be connected to the Kona Kai Ola sewage system. Sumps, connection lines and pumping facilities will be constructed to move the sewage from the present septic tank systems directly to the larger collection system. The work needed for this conversion will be included in the sewage infrastructure design and construction.

~~Hydrogeological studies have concluded that the expansion of the marina does not increase the groundwater flux through the harbor mouth into the ocean significantly. The groundwater from the brackish aquifer already converges to the existing harbor and does not show flow across the planned marina basin area into the ocean.~~

~~It is estimated that the average groundwater discharge is 3 to 4 million gallons per day (mgd). The salinity of the water that discharges from the brackish aquifer is about 12 percent of seawater or about 4.3 parts per thousand (ppt). In addition, 52,000 gallons per minute of surface seawater (36 ppt) will be pumped from the nearshore area for use in the marine lagoon features. This amounts to approximately 75 mgd. This water eventually is discharged into the harbor basin and into the ocean. This water is not expected to reach the existing marina basin because the proposed basin connects to the existing one very close to the common entrance. Therefore the impacts to the existing marina environment from the additional discharge are expected to be negligible.~~

At present, the salinity of the water column remains entirely saline in the bottom layers with more brackish influences near the surface (about 30 ppt). Model results displayed in detail within Appendix U show that salinity differences near the harbor entrance are completely confined to the surface layers and are at maximum about 0.5 ppt less than the current conditions of about 30 ppt (surface). Salinity at the marina entrance, at 10 foot depth is not affected by the brackish water discharge. The benthic flora and fauna close to the marina entrance and at less than 10 feet water depth face variations of salinity from 34.5 ppt to 36.0 ppt.

~~At present the depth averaged salinity of the water exiting the existing basin is about 33.5 ppt close to the marina entrance. The brackish water stays at the surface and shows its influence for distance of about 2,000 feet. Salinity at the marina entrance, at 10 foot depth is not affected by the brackish water discharge. The benthic flora and fauna close to the marina entrance and at less than 10 feet water depth face variations of salinity from 34.5 ppt to 36.0 ppt.~~

~~A straight forward mass balance calculation shows the following changes to the existing flow and salinity. The average outflow from the harbor will increase from 4 mgd to 79 mgd. The salinity of the water will change from an average of 33.5 ppt to about 34.4 ppt. The water will still be less dense, and the depth of impact will be limited to the surface 3 to 4 feet. The benthic flora and fauna will face a smaller variation in salinity that will discourage opportunistic biota dominance and lead to a healthier and more diverse benthic community. This is a positive impact on the benthic environment. The increase in the outflow will cause a very slight increase in water velocities, but this is well below the existing velocity variations in the entrance channel vicinity.~~

Construction of a new marina basin will have ~~short~~ short-term negative impacts on coastal marine resources. Direct construction impacts are likely to be small. Marina construction will be accomplished with a berm separating the construction area from adjacent marine waters, minimizing the discharge of sediment from excavation and dredging. Excess sediment remaining in excavated marina will be removed before the land bridge is removed in order to minimize any temporary sediment plume. When the final land bridge is removed, a temporary sediment plume is anticipated. Silt curtains will be used to ~~minimize the~~prevent suspended sediment entering ocean waters.

Although the runoff at the site is small due to the dry climate and the high porosity of the land, during high rainfall, some runoff might reach the harbor basin as overland sheet flow. The new marina will serve as a collection point for materials utilized or generated at the development site, either through direct runoff or by interception of groundwater flow. There is the potential that fertilizers, pesticides, petroleum products, road wastes, etc, could be discharged from the mouth of Honokōhau Harbor into the coastal marine environment. Structural Best Management Practices (BMPs) will be designed and installed to remove as much of pollutants as possible from the run off during such unusual conditions.

Small boat harbors have been found to be consistent sources of certain types of pollutants to the surrounding environment. These pollutants in general include:

- Heavy metals (zinc, copper, tin, lead) associated with bottom paint or sanding of painted surfaces during maintenance activities;
- Petroleum product release from fueling operations, and bilge discharges exacerbated by the large number of boats and range of operator skills;
- Trash and debris from boat operations and surrounding harbor activities;
- Sewage from intentional or accidental releases from on-board waste systems;
- Biological waste from fish cleaning;
- Waste streams from land-side boat washing and maintenance activities;

Most of the impacts can be minimized through the use of Best Management Practices (BMPs), which are a combination of activities, education and devices that help prevent or reduce water pollution. A "Clean Marina Program" similar to the International Blue Flag Marina Program or the Clean Marinas California Program will be implemented at the new marina and include key elements such as promoting and enforcing:

- Boater education signage, literature and programs
- Emergency and spill response plans
- Safe fuel, hazardous material, sewage and bilge water handling practices
- Use of sewage marina pump out, waste and oil recycling facilities
- Environmentally sensitive boat maintenance and cleaning practices
- Environmentally sensitive hull cleaning practices
- Good housekeeping practices on boats and docks
- Use of fish cleaning stations / receptacles and fish waste composting

- Enforcement of harbor rules and regulations

3.9.1.4 Wave Impacts to the Existing Honokōhau Harbor

The wave climate within the existing Honokōhau Harbor and the proposed marina was analyzed using a numerical model that is further discussed in Appendix J~~I~~. A wave measurement study was conducted to determine the wave response of the existing harbor to outside wave climate. A directional wave gage at a depth of sixty feet directly in front of the existing harbor entrance and a non directional wave gage inside the existing harbor basin were installed to measure wave climates simultaneously. The results of the wave measurements were provided for wave transformation model calibration.

Results of the wave climate analysis with and without the expansion were used to predict wave agitation impacts to the existing harbor. The model was operated for waves with a 9-second period and swells of 13-second period as the dominating waves for the offshore area.

Anticipated Impacts and Proposed Mitigation

Wave climate in the existing harbor from the proposed marina construction depended on the period of the incoming waves. There was a slight decrease in the wave height in the existing basin for outside waves of a 9-second period. For longer period swells, there was no significant change in the wave height in the basin.

For waves with a 9-second period, the wave height at the inner end of the outer basin attenuated to 40 percent of the incident wave. There was no additional wave attenuation due to the presence of the proposed marina. Within the existing harbor inner basin, the wave height attenuated to about 20 percent of the incident wave. The wave height in the inner harbor decreased by about 10 percent with the construction of the proposed marina.

For longer period swells, the wave height in the outer basin remained at 50 percent attenuation. In the inner basin, the wave height reduced to about 20 to 30 percent of the incident wave. There was no significant change in the wave height in the inner basin from marina construction.

The analysis shows that under short storm wave conditions, the proposed marina construction causes a positive impact by reducing the wave height by 10 percent in the existing marina. However, under swell conditions there is no change in wave agitation in the mooring area of the existing harbor with the proposed marina. Overall, the impact of construction of the proposed marina basin is positive since the existing harbor will experience less wave agitation. This may be due to the fact that the amount of wave energy entering through the harbor entrance remains the same, while additional water area and frictional surfaces (both sides and bottom) provide for greater wave dissipation after the expansion. No mitigation is ~~recommended~~ proposed due to the project's positive effect.

3.9.1.5 Harbor Water Quality

A three dimensional hydrodynamic and water quality model of Honokōhau Harbor and its surrounding waters was developed using the Delft3D modeling suite and is described in detail in Appendix U. The model was driven at its offshore boundaries by tidal predictions, and calibrated to reproduce available measurements of water levels, currents, salinity and temperature.

Attachment 3

State officials recently announced that land was being set aside in Kealakehe mauka of the project site for a Kona Medical Center.

Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

Kona Kai Ola may impact medical facilities because of the increase in de facto population due to additional visitors, and a likely increase of resident population due to employment-related in-migration. Although residential use is not a permitted use on the leased lands, JDI is planning to construct worker housing on a nearby site that will be leased at below market rents. The extent of in-migration due to employment is undetermined at this time.

The anticipated population growth for the region has stimulated plans for the development of future medical facilities. Potential impacts on existing medical facilities will be mitigated by the addition of new facilities. In the Villages of La‘i ‘Ōpua located immediately mauka of Kona Kai Ola, a site is designated for Hospital use, and allocations have been made utility needs.

4.10.4 Public Educational Facilities

The Kealakehe Intermediate School located in Kailua-Kona educates students in grades six through eight and had a fall enrollment of 1,052 during the 2004-2005 school year. Kealakehe High School is located near to the intermediate school, and serves grades 9 through 12. The high school's fall enrollment during the 2004-2005 school year was 1,450.

Anticipated Impacts and ~~Recommended~~ Proposed Mitigations

Since there are no permanent residences permitted at the site, there will be no direct impact on area schools. Although residential use is not a permitted use on the leased lands, JDI is planning to construct worker housing on a nearby site that will be leased at below market rents. A separate analysis of impacts on public education facilities will need to be done for the workforce housing that is to be part of this project, and built off-site and potentially mauka of the project site. No mitigations are ~~recommended~~ proposed at this time.

4.10.5 Drainage and Storm Water Facilities

The development of Kona Kai Ola may increase drainage flows, quantities, velocities, erosion and sediment run-off. This ~~DEIS~~ FEIS takes into consideration storm runoff generated from the proposed streets. Each individual development parcel will address its own storm runoff as required. The storm drainage facilities designed for the site will take advantage of the porosity of the existing rocky landscape and the minimal slope, through the use of grading and dry wells, per County requirements. Storm run-off that discharges into the drywell system will tend to migrate towards the manmade lagoons. The lagoons will therefore be lined to prevent influence of such storm runoff. The Hawai‘i County Public Works Department generally requires that on-site storm drainage facilities be sized to exceed pre-development drainage quantities, and be designed to result in quantities of storm water leaving the site, not exceeding those quantities entering the site.

Unlike the DLNR property, roadways within the DHHL property cannot be dedicated to the County of Hawaiʻi in fee. To obtain a license agreement for maintenance with the County, the entire storm water system will be designed to conform to the Hawaiʻi County Public Works Storm Drainage Standards.

Anticipated Impacts and ~~Recommended~~ Proposed Mitigation

The proposed project will increase the proportion of impervious surfaces on the subject property through paving and reconfigure the topography, thereby adding to total runoff. This will necessitate the development of an appropriate drainage system to handle the increased and altered drainage patterns. Roadways in the new developed configuration will be dedicated to the County of Hawaiʻi, so the storm drainage system will be required to conform to the Department of Public Works Storm Drainage Standards.

Due to the rocky and porous nature of the soils, the County allows the use of drywells. Drywells typically vary in depth from 10 to 30 feet depending upon the permeability of the underlying soil or rock. Drywells will typically consist of a catch basin type design, with an opening at the curb and gutter. The depth of the catch basin structure will vary depending upon the depth of the rock. During the design of the drywell system, the percolation rates at proposed drywell locations will be determined.

~~Recommended~~ Proposed mitigation measures are as follows:

- The proposed development is located makai of the Underground Injection Well (UIC) line. Since drywells are considered injection wells, the developer is required to secure a UIC Well Permit, from the Department of Health (DOH), Safe Drinking Water Branch.
- Groundwater migration in the area is a concern especially with the construction of natural lagoons within the proposed development. Therefore, the recommendations from a hydrogeologist should be sought to assist with the design of the drywell system.
- All construction activities will comply with the County's grading permit requirements and the State's fugitive dust regulations.
- A National Pollutant Discharge Elimination System (NPDES) permit will be obtained before construction begins and the project will comply with all NPDES permit requirements including implementation and monitoring of all DOH-approved Best Management Practices.

Bioretention is a Best Management Practice (BMP) that would be a highly appropriate application for the proposed development. Further, BMPs utilized in series may incorporate several storm water treatment mechanisms in a sequence to enhance the treatment of runoff. By combining structural and/or nonstructural treatment methods in series rather than singularly, raises the level and reliability of pollutant removal. Another means to reduce the potential for groundwater contamination is to increase soil depth above the standard in landscaped areas. This will allow chemicals to be held in the soils longer for more complete plant uptake and breakdown of these chemicals by soil microbes. A specific guide for chemical application by landscape maintenance personnel will be a beneficial tool to help avoid contamination of groundwater resources.

Specific design plans will be determined during the permitting process when final designs are developed. It is the intent of JDI to stipulate low impact development techniques as part of the general design guidelines. The Best Management Practices (BMPs) will be very site specific and must be incorporated with the building and landscape design. BMPs will be incorporated to minimize runoff volume and peak flow, minimize the quantity of pollutants in runoff or flows to groundwater, and maximize re-use of storm water for natural irrigation. Specific BMPs will be reviewed as part of the application for the National Pollutant Discharge Elimination System (NPDES) permit which will be required prior to the County's issuance of a grading permit.

Alternative 1 would result in the lowering of the density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces and the creation of more open space. However, roadway areas have increased by about 30 percent. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings.

4.10.6 Waste~~ W~~water Facilities

A *North Kona Sewer Master Plan* is being developed for the County of Hawai‘i Department of Environmental Management (DEM) to address future sewer improvements necessary to serve projected development in the North Kona region of the Island of Hawai‘i. This sewer master plan would then be used to develop an Implementation Study to support the establishment of an “Improvement District” for North Kona by the County Council (NKSMP 2006). Kona Kai Ola is being designed to be consistent with the North Kona Sewer Master Plan and will participate in any subsequent improvement district.

The proposed development is located within the service area of the Kealakehe WWTP. The Kealakehe WWTP is a County owned and operated wastewater treatment plant which has been in operation since March 1993. The WWTP currently receives about 1.8 million gallons of wastewater per day and treats it to R-2 reuse level. The Kealakehe WWTP has a design capacity of 5.3 million gallons per day (mgd) when operating all five of its lagoons. This capacity is considered the 20-year design which was initiated in year 2000. A sixth lagoon was included in the original design but was never constructed. The space for the sixth lagoon remains vacant and undeveloped. Activating the sixth lagoon increases plant capacity to 7.8 mgd. (CP&E 2006)

Wastewater is delivered to the WWTP through an existing 30-inch gravity sewer and 24-inch force main. The 30-inch sewer delivers wastewater from the mauka properties across Queen Ka‘ahumanu Highway, while the 24-inch force main transports wastewater from the Kailua-Kona area. Wastewater is discharged into aerated lagoons. The effluent pump station receives the treated wastewater from the lagoons, treats it with chlorine, and pumps it into a temporary sump located across Queen Ka‘ahumanu Highway for overland disposal.

Attachment 4

2 Alternatives Analysis

~~In typical land development projects, the initial planning process includes the exploration of alternatives to development objectives. In the EIS process, these alternatives are presented with a disclosure of reasons for the dismissal of non-preferred alternatives.~~

~~Kona Kai Ola does not follow this same pattern of alternatives evaluation.~~ As discussed in Section 1.4, the proposed Kona Kai Ola project is the result of agreements between JDI and the State DLNR and DHHL. The agreements and leases between the State and JDI stipulate the parameters of development for this site in terms of uses, quantities and size of many features, resulting in a limited range of land uses. Unlike a private property project, JDI is required to meet the criteria outlined in the agreements, thereby affording less flexibility in options and uses. From the developer's perspective, the agreements must also provide sufficient flexibility to allow for a development product that responds to market needs and provides a reasonable rate of return on the private investment.

The agreements between JDI and DLNR specify that the proposed harbor basin is to be 45 acres and accommodate 800 slips. This development proposal is the subject of this EIS. In response to DEIS comments, additional water quality studies and modeling were conducted. These studies determined that the water circulation in a 45-acre 800-slip marina would be insufficient to maintain the required standard of water quality. The models of water circulation suggest that a new 25-acre harbor basin could successfully maintain required water quality in the new harbor. Comments on the DEIS from DLNR, from other government agencies, the neighbors and the general community also called for the consideration of alternatives in the EIS, including a project with a smaller harbor basin and less density of hotel and time-share units.

In response to these comments on the DEIS, three alternatives are evaluated in this Final EIS and include Alternative 1, which is a plan with a 25-acre 400-slip harbor basin including a decrease in hotel and time-share units; Alternative 2, which is an alternative that had been previously discussed but not included in the proposed project, that includes an 800-slip harbor and a golf course; and Alternative 3, the no-project alternative. Each alternative is included in the EIS with an evaluation of their potential impacts. These project alternatives are presented to compare the levels of impacts and mitigation measures of the proposed project and alternative development schemes pursuant to requirements set forth in Chapter 343, HRS.

~~JDI is required to provide a new marina basin not less than 45 acres and a minimum of 800 new boat slips. Further, the agreements provide the following options for land uses at the project site:~~

- ~~Golf Course~~
- ~~Retail Commercial Facilities~~
- ~~Hotel Development Parcels~~
- ~~Marina Development Parcels~~
- ~~Community Benefit Development Parcels~~

~~JDI is not pursuing the golf course option and is proposing instead to create various water features throughout the project site. All other optional uses have been incorporated in Kona Kai Ola.~~

2.1 Project Alternatives

2.1.1 Alternative 1: 400-Slip Marina

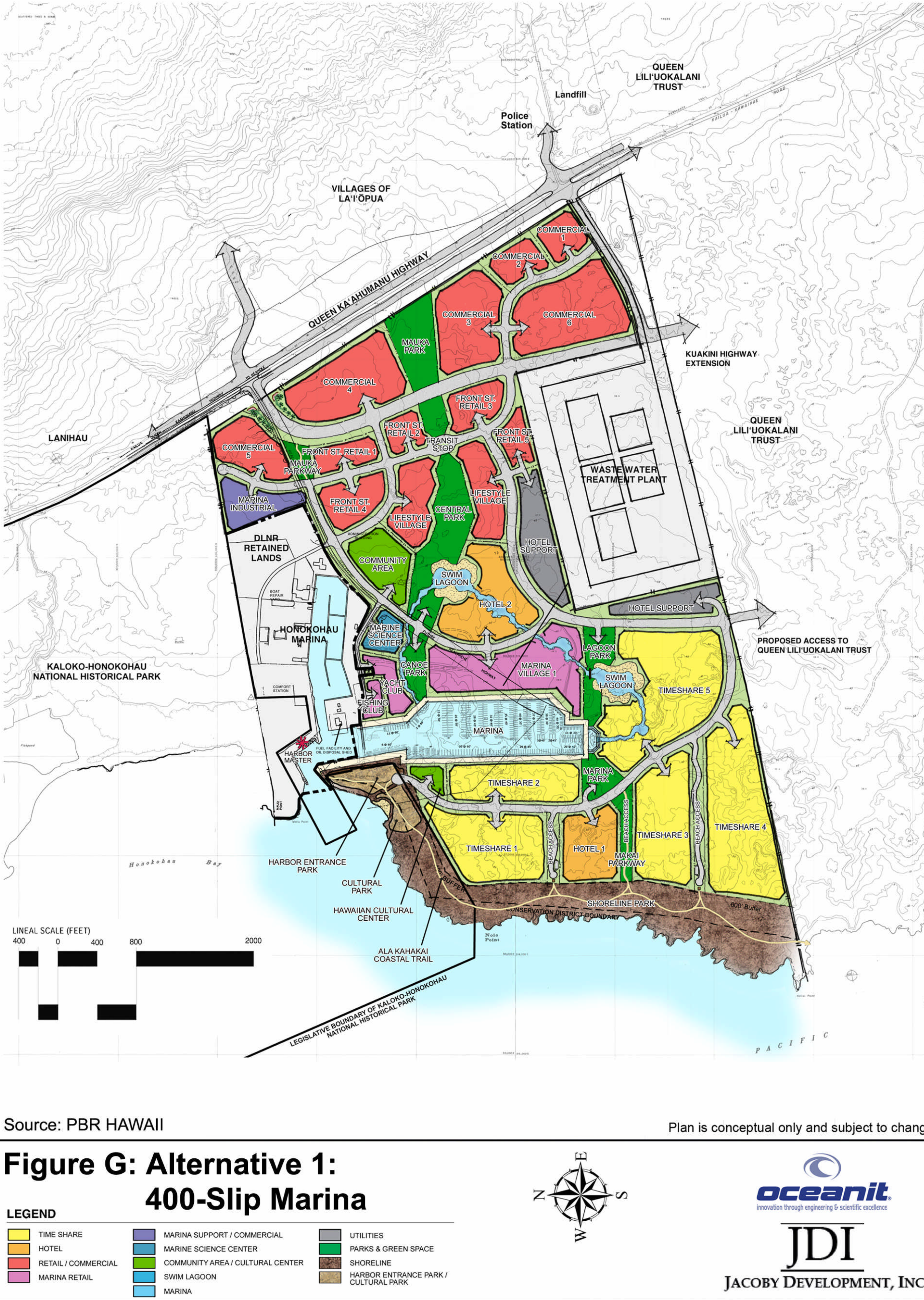
Studies conducted in response to DEIS comments found the construction and operation of an 800-slip marina may significantly impact the water quality within the marina and along the shoreline. Specifically, the Harbor Water Quality Modeling Study, as contained in Appendix U, found that the water circulation in a 45-acre 800-slip harbor was insufficient to maintain an acceptable level of water quality. Further, the existing harbor channel, which would serve both the existing and new harbors, could not adequately serve the increased boat traffic generated by an 800-slip marina during peak traffic. Mitigation measures to accommodate peak boat traffic included the widening of the existing channel, an action that would entail a complex process of Federal and State approvals and encounter significant environmental concern.

Concerns related to the proposed density of hotel and time-share units were also expressed in comments to the DEIS from members of the public, neighbors to the project site, especially the Kaniohale Community Association, and government agencies. Common themes in DEIS comments were related to impacts regarding traffic, project requirements of potable water and infrastructure systems, including sewer, drainage, utility and solid waste systems, and socioeconomic impacts.

In response to the water quality study results, and to the DEIS comments, an alternative plan was developed with a smaller marina with less boat slips, and a related decrease in hotel and time share units. Illustrated in Figure G, Alternative 1 reflects this lesser density project, and features a 400-slip marina encompassing 25 acres. For the purposes of the Alternative 1 analysis, JDI assumed 1,100 time-share units and 400 hotel rooms. Project components include:

- 400 hotel units on 34 acres
- 1,100 time-share units on 106 acres
- 143 acres of commercial uses
- 11 acres of marina support facilities
- 214 acres of parks, roads, open spaces, swim lagoons and community use areas

In addition, Alternative 1 would include the construction of a new intersection of Kealakehe Parkway with Queen Ka‘ahumanu Highway, and the extension of Kealakehe Parkway to join Kuakini Highway to cross the lands of Queen Lili‘uokalani Trust, and connecting with Kuakini Highway in Kailua-Kona. This is a significant off-site infrastructure improvement and is included in the agreements between the State and JDI.



Source: PBR HAWAII

Plan is conceptual only and subject to change

Figure G: Alternative 1: 400-Slip Marina

oceanit
innovation through engineering & scientific excellence

JDI
Jacoby Development, Inc.

Like the proposed project, Alternative 1 would have a strong ocean orientation, and project components that support this theme would include various water features including seawater lagoons and a marine science center. The new Alternative 1 harbor would include a yacht club, fishing club, a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. The coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use. Additional Alternative 1 community areas would include facilities and space for community use, including programs of the Kona Kai Ola Community Foundation, which supports community programs in health care, culture, education, and employment training for the local community, especially to native Hawaiians. Like the original proposed plan, Alternative 1 includes 40 percent of the land in parks, roads, open spaces, swim lagoons and community use areas.

2.1.2 Alternative 2: Golf Course Feature

Alternative 2 was among the alternatives discussed at a community charrette in September 2003. It includes a golf course, which is a permitted use in the DLNR agreement and DHHL lease. As Figure H illustrates, an 18-hole championship golf course would occupy 222 acres on the southern portion of the project site. As with the proposed project, Alternative 2 includes an 800-slip marina on a minimum of 45 acres.

To support the economic viability of the project, other Alternative 2 uses include:

- Golf course clubhouse on three acres
- 1,570 visitor units on 88 acres fronting the marina
- 118 acres of commercial uses
- 23 acres of community uses

Community uses in Alternative 2 include an amphitheater, a canoe facilities park, a community health center, a Hawaiian cultural center and fishing village, a marine science center and employment training center. The sea water lagoon features contained in the proposed project and Alternative 1 are not included in this alternative.

2.1.3 Alternative 3: No Action

In Alternative 3, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.

~~The economic viability and sustainability of the project is determined by the density and uses proposed. Because JDI is obligated to develop an 800-slip marina for the State, complete road improvements, and provide various public enhancement features at its own expense, the density proposed for the income generating features of the development must be sufficient to provide an acceptable level of economic return for JDI. The market study, which is discussed in Section 4.6, reviewed various development schemes and determined that the currently proposed density and mix is the optimum to meet the anticipated financing and development cost obligations for the public features associated with the development.~~

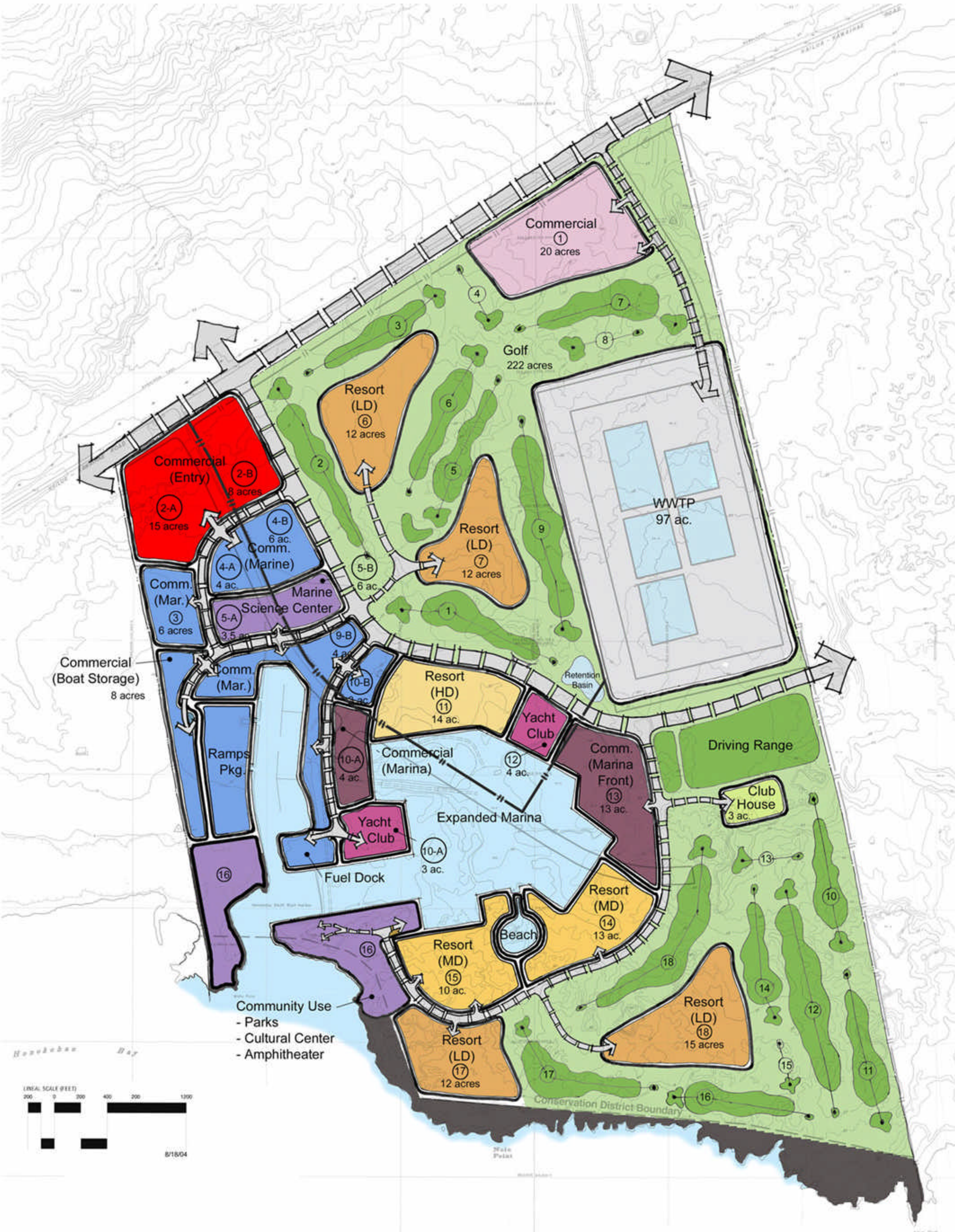


Figure H. Alternative 2: Golf Course Alternative

Legend

N E S W

JACOBY DEVELOPMENT, INC.

2.2 Alternatives Analysis

As discussed in Section 2.1, the proposed Kona Kai Ola project (also referred to as "proposed project") is defined by development requirements related for a marina and the related uses that would be needed to generate a reasonable rate of return that covers development costs.

Beginning with Section 2.2.1, the alternative development concepts are comparatively assessed for potential impacts that may reasonably be expected to result from each alternative. Following is an overview of the primary observations of such assessment.

Alternative 1 includes half of the State-required boat slips and 60 percent of the proposed hotel and time-share units and, due to the decreased density, this alternative would generate significantly less environmental and socio-economic impacts. A harbor water quality model found the reduction of the volume of the new marina basin by about half (approximately 25 acres) significantly improved the water circulation and quality. Further, the reduced number of boat slips would generate less boat traffic, thereby reducing congestion and the need to mitigate impacts further by the widening of the existing harbor channel.

A project with fewer hotel and time-share units and increased commercial space with a longer (14 years) absorption period would change the mix of employment offered by the project, and slightly increase the overall employment count. The public costs/benefits associated with Alternative 1 would change, compared to the proposed project, with a general increase in tax collections, and a general decrease in per capita costs. Detailed discussion of Alternative 1 potential economic impacts are provided in Section 4.6.6. Comparisons of levels of impact are presented throughout this FEIS.

While this analysis might indicate that the 25-acre marina in Alternative 1 would be the more prudent choice, the DLNR agreement establishes the minimum size and slip capacity of the marina at 45 acres and 800 slips, respectively. Amendments to the DLNR agreement would be required in order to allow Alternative 1 to proceed as the preferred alternative. Hence, selection of the preferred alternative is an unresolved issue at the writing of this FEIS.

Alternative 2, the golf course alternative, was not previously considered to be the preferred alternative primarily because market conditions at the time of project development might not likely support another golf course. Further, DHHL has a strategy goal to have more revenue-generating activities on the commercial lease lands within the project area. In addition, concerns have been expressed as to environmental impacts of coastal golf courses, including the potential adverse impact on Kona's water supply if potable water is used for golf course irrigation.

While Alternative 3, the no-project alternative, would not generate adverse impacts related to development of these lands associated with the construction and long-term operations, it would also not allow for an expanded public marina that would meet public need and generate income for the public sector. Further, the no-project alternative would foreclose the opportunity to create a master-planned State-initiated development that would result in increased tax revenue, recreation options and community facilities. Crucial privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities, and public access would not be contributed.

~~Hence, the only valid alternative to the proposed project is the no-action alternative. In this alternative, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.~~

~~The no-project alternative would therefore not generate adverse impacts associated with the construction and long-term operations would not occur.~~

~~Likewise, the creation of a master-planned state-initiated development, resulting in increased employment, tax revenue, recreation options and community facilities, would not be created. Privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities and public access would not be contributed.~~

Further, the creation of revenue-producing businesses on the DHHL property to fund homestead programs would not occur, resulting in fewer potential benefits for Hawaiians.

Hence, the agreements and leases between the State and JDI indicate that the no-action alternative is not in the public interest~~has been rejected at this time~~.

2.2.1 Impact Comparison

Grading and Excavation

The proposed project requires grading and excavation. Both actions may impact groundwater due to rainfall runoff during construction. Alternative 1 would require a significantly smaller excavation for the marina basin and would therefore carry a lesser risk of potential adverse effects on water quality. Alternative 2 would require the same basin excavation as the proposed project, and would also include extensive grading and filling to build the golf course, the latter of which would generate additional impacts. Alternative 3 would result in no change to the geography, topography and geology.

Further discussion on grading and excavation is contained in Section 3.3.

Natural Drainage

Most precipitation infiltrates into the porous ground at the site, and no significant sheet flow is likely. Alternative 1 would generate similar levels of impacts on natural drainage as those of the proposed project and thus require similar mitigation measures. The golf course in Alternative 2 would not be as porous since the site would be graded, soil would be placed, and grass and other landscaping would be grown. Sheet flow and runoff can occur on a golf course, and drainage patterns might change. Alternative 3 would result in no change to the existing natural drainage pattern. Further discussion on natural drainage is contained in Section 3.4.

Air Quality

Air quality will be affected by construction activities, as well as pollutants from vehicular, industrial, natural, and agricultural sources. Alternative 1 would generate less construction air quality impacts than the proposed project due to the reduced amount of intensive groundwork associated with the smaller marina basin and fewer long-term impacts by reducing traffic 35 and 40 percent during, respectively, AM and PM peak traffic times. Construction of Alternative 2 would result in fugitive dust and exhaust from equipment and is expected to generate the same level of air quality impact as the proposed project. Alternative 3 would result in no change to existing air quality. Further discussion on air quality is contained in Section 3.5.

Terrestrial Environment

To provide additional habitat for shorebirds and some visiting seabirds, the project proposes to construct a brackishwater pond area suitable for avian fauna, including stilts, coots and ducks. While habitat expansion is beneficial, there is also a possibility that these species may be exposed to activity that may harm them. Alternative 1 would not include a brackish water pond, but will include 5 acres of seawater features, which is 74 percent less than the 19 acres of seawater features in the proposed project. While this would reduce beneficial impacts, it would also decrease exposure to potentially harmful activity. Alternative 2 does not include the brackish water pond features, but would include drainage retention basins that would attract avian fauna and expose them to chemicals used to maintain golf course landscaping. While Alternative 3 would result in no increase in potentially harmful activity, it would also not provide additional habitat for avian fauna. Further discussion on the terrestrial environment is contained in Section 3.7.

Groundwater

Groundwater at the project site occurs as a thin basal brackish water lens. It is influenced by tides and varies in flow direction and salt content. The existing Honokōhau Harbor acts as a drainage point for local groundwater. Any impact to groundwater flow from the proposed harbor is likely to be localized. The proposed marina basin will not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance.

There will be differences in the flow to the marina entrance between the proposed project and Alternative 1. Alternative 1, being smaller in size, will have less impact on groundwater flow than the proposed marina. Alternative 2 will have a similar impact to groundwater quality as the proposed project. Alternative 2 may also impact water quality by contributing nutrients and biocides to the groundwater from the golf course. Alternative 3 would result in no change in existing groundwater conditions. Further discussion on groundwater is contained in Section 3.8.1.

Surface Water

There are no significant natural freshwater streams or ponds at the site, but there are brackish anchialine pools. Surface water at the project site will be influenced by rainfall. Runoff typically percolates rapidly through the permeable ground. The proposed project will include some impermeable surfaces, which together with building roofs, will change runoff and seepage patterns.

Alternative 1 is a lower density project that is expected to have proportionally less impact on surface water and runoff patterns and less potential impact on water quality than the proposed project. Alternative 2 would have more impact on surface water quality than the proposed project due to fertilizers and biocides carried by runoff from the golf course. Alternative 3 would result in no change to surface water conditions. Further discussion on surface water is contained in Section 3.8.2.

Nearshore Environment and Coastal Waters

The potential adverse impacts to the marine environment from the proposed project are due to the construction of an 800-slip marina and the resulting inflow of higher salinity seawater and inadequate water circulation, both of which are anticipated to impair water quality to the extent of falling below applicable standards. One possible mitigation measure is to significantly reduce the size of the marina expansion.

The reduced marina size (from 45 to 25 acres) and reduced lagoon acreage in Alternative 1 are expected to result in a proportionate reduction in seawater discharging into the new harbor and increased water circulation. Alternative 2 includes the same marina basin size and is therefore subject to the same factors that are expected to adversely affect water quality.

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water quality in the proposed harbor depends on several components. These include salinity, nutrients, and sediments that come from the ocean, rainfall runoff, water features with marine animals, and dust. The smaller project offered as Alternative 1 is expected to produce a reduced amount of pollutants and reduce the risk of adverse impact upon water quality.

It is notable that the 45-acre marina basin planned in the proposed project and Alternative 2 only becomes viable from a water quality impact standpoint if the additional brackish groundwater inflow into the new marina exceeds 60 mgd. The resulting flushing from such inflow would be expected to better maintain water quality. However, it is unclear whether 60 mgd of brackish groundwater would be available. As proposed in Alternative 1, reduction of the volume of the new marina basin by 45 percent will significantly improve the flushing and water quality because the lower volume can be flushed by the available groundwater flow.

In addition, there could be higher rainfall runoff from the Alternative 2 golf course into the harbor, because the grassed golf course will be less porous than the natural surface. The golf course will also require relatively high levels of fertilizer, biocides, and irrigation, all of which could contribute to adverse water quality impacts.

Further discussion on nearshore environment and coastal waters is contained in Section 3.9.1.

Anchialine Pools

Anchialine pools are located north of Honokōhau Harbor, and south of the harbor on the project site. The marine life in these pools is sensitive to groundwater quality, and changes due to construction and operation of the project could degrade the viability of the pool ecosystem. In the southern complex, 3 anchialine pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction in the proposed project and Alternatives 1 and 2.

Predicting the extent of change in groundwater flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is therefore extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Due to the uncertainty of changes in groundwater flow and quality due to marina construction, the variability in impacts between the proposed project and Alternatives 1 and 2 is unknown at this time. Alternative 3 would result in no change in groundwater flow. While this would eliminate the potential for adverse impacts, Alternative 3 would also continue the pattern of existing degradation related to human activity and the introduction of alien species. Further discussion on anchialine pools is contained in Section 3.9.2.

Marine Fishing Impacts

The proposed marina will increase the number of boats in the area and it is reasonable to assume that a portion of these new boats will engage in fishing activities. The increase in boats in the area would be primarily related to the marlin and tuna / pelagic fishery, coral reefs due to extractive fisheries, and SCUBA activities. The pressure on fish and invertebrate stocks is expected to increase with or without the marina. Harbor expansion provides the opportunity to address existing conditions to consolidate, focus, and fund management and enforcement activities at one location.

Compared to the proposed project, Alternative 1 would result in a 21 percent decrease in boat traffic, thereby lessening the potential for marine fishing impacts. The level of impacts in Alternative 2 would be similar to that of the proposed project. Alternative 3 would result in no change in existing marine fishing conditions, and no opportunity to address already existing pressure on fish and invertebrate stocks. Further discussion on marine fishing impacts is contained in Section 3.9.3.

Cultural and Archaeological Resources

The proposed project will integrate cultural and archaeological resources in the overall development. Archaeological sites recommended for preservation will be preserved, and cultural practices will be encouraged. Kona Kai Ola includes a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. Proposed is a 400-foot shoreline setback that would serve as a buffer between the ocean and developed areas. This coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use.

Alternative 1 would contain all of the cultural archaeological features and the shoreline setback area would be 400 feet in the northern portion of the site and increase to 600 feet in the southern portion. Alternative 2 would preserve cultural and archaeological resources, but does not include a 400-foot shoreline setback. Alternative 3 would result in no change to existing cultural and archaeological resources and no addition of cultural and community facilities and activities. Further discussion on cultural and archaeological resources is contained in, respectively, Sections 4.1 and 4.2.

Noise

Project-generated noise is due to construction equipment and blasting, boats, marina activities, vehicle traffic, and the Kealakehe Wastewater Treatment Plant operations. Alternative 1 would generate less noise impacts due to reduced construction activities, fewer boats, less traffic and less on-site activity. Alternative 2 would also generate less noise due to reduced traffic and less on-site activity, but noise related to the excavation of the marina basin and an increase in the number of boats would be similar to that of the proposed project. Further discussion on noise impacts is presented in Section 4.4.

Socioeconomic Impacts

The proposed project will generate an increase in de facto population of an estimated 5,321 persons due to the increase in hotel and time-share units. The estimated de facto population increase in Alternative 1 is 37 percent less, at 3,363 persons, than the proposed project. The de facto population increase in Alternative 2 is similar to Alternative 1.

Employment in the commercial components will nearly double in Alternative 1, from a stabilized level of 1,429 full-time equivalent (FTE) positions in the proposed project to 2,740 in the Alternative 1.

Under Alternative 1, the total operating economic activity at Kona Kai Ola will increase due to the added commercial space more than off-setting the fewer visitor units, moving upward from $557.6 million per year to circa $814.3 million annually. The total base economic impact resulting from development and operation of Alternative 1 will similarly be higher by between 35 and 45 percent than that of the proposed project.

Alternative 1, which has a reduced marina size of 25 acres, and fewer hotel and time-share units, would have a meaningful market standing, create significant economic opportunities, and provide a net benefit to State and County revenues. From a market perspective, a smaller Kona Kai Ola would still be the only mixed use community in the Keahole to Kailua-Kona Corridor offering competitive hotel and time-share product.

The estimated absorption periods for marketable components of Alternative 1 are generally shorter than those for the same components in the proposed project. Marina slips under Alternative 1 are estimated to be absorbed within 2 years after groundbreaking, as compared with 9 years for absorption of slips in the proposed project. Hotel rooms under Alternative 1 are estimated to be absorbed within 4 years after groundbreaking, as compared with 7 years under the proposed project. Time-share units would be absorbed within 10 years under Alternative 1, while 15 years are projected under the proposed project. Due to the planned increase in commercial facilities under Alternative 1, the absorption period of commercial space is estimated at 14 years, as compared with 8 years for absorption of such facilities under the proposed project.

The State and County will still both receive a net benefit (tax receipts relative to public expenditures) annually on a stabilized basis under the Alternative 1. The County net benefits will be some $12.2 million per year under the Alternative 1 versus $14.9 million under the proposed project. The State net benefits will increase under the Alternative 1 to about $37.5 million annually, up substantially from the $11.4 million in the proposed project.

Due to the lower de facto population at build-out, the effective stabilized public costs for both the State and County will decline meaningfully under the Alternative 1, dropping from $7.7 million annually for the County and $36.5 million for the State, to $4.9 million and $23 million per year, respectively.

Alternative 3 would result in no increase in de facto population and improvement to economic conditions. Further discussion on social and economic impacts are contained in, respectively, Sections 4.5 and 4.6.

Vehicular Traffic

The proposed project will impact the nearby road network that currently is congested during peak traffic times. The proposed project includes roadway improvements that would reduce the impact and improve roadway conditions for the regional community.

Alternative 1 includes the same roadway system improvements as the proposed project, yet would reduce vehicular traffic by 35 percent when compared to the proposed project. Alternative 2 would have similar traffic conditions and roadway improvements as Alternative 1. Alternative 3 would result in no increase in traffic and no roadway improvements.

Marina Traffic Study

The increase in boat traffic due to the proposed 800-slip marina would cause entrance channel congestion during varying combinations of existing and new marina peak traffic flow. Worst case conditions of active sport fishing weekend and summer holiday recreational traffic result in traffic volumes exceeding capacity over a short afternoon period. Mitigation to address boat traffic in the proposed project include widening the entrance channel, traffic control, implementation of a permanent traffic control tower, or limiting vessel size.

Alternative 1 would result in a 21 percent reduction in boat traffic congestion under average existing conditions and ten percent reduction during peak existing conditions. The reduction to 400 slips also reduces the impacts of congestion at the entrance channel, thereby reducing the need for any modifications to the entrance channel.

Alternative 2 would have the same level of boat traffic as the proposed project. Alternative 3 would not meet the demand for additional boat slips and would not generate additional boat traffic. Further discussion on marina traffic is contained in Section 4.8.

Police, Fire and Medical Services

The proposed project will impact police, fire and medical services due to an increase in de facto population and increased on-site activity. Alternatives 1 and 2 would have similar levels of impact as the proposed project due to increased on-site activity. Further discussion on police, fire and medical services are contained, respectively, in Sections 4.10.1, 4.10.2 and 4.10.3.

Drainage and Storm Water Facilities

The proposed project will increase drainage flows, quantities, velocities, erosion, and sediment runoff.

Alternative 1 involves a reduction of the project density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces associated with hotel and time-share development and to the creation of more open space. However, roadway areas will increase by about 30 percent in Alternative 1. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings. The golf course in Alternative 2 may also change drainage characteristics from those of the proposed project and may not reduce impacts. Alternative 3 would result in no change in existing conditions and no improvements to drainage infrastructure. Further discussion on drainage and storm water facilities is contained in Section 4.10.5

Wastewater Facilities

The proposed development is located within the service area of the Kealakehe WWTP and a sewer system will be installed that connects to the WWTP. The sewer system will be comprised of a network of gravity sewers, force mains, and pumping stations which collect and convey wastewater to the existing Kealakehe WWTP. Project improvements will incorporate the usage of recycled / R1 water. Improvements implemented by the proposed project will also accommodate the needs of the regional service population.

Alternative 1 would generate approximately 10 percent less wastewater flow than the proposed project. Wastewater flow in Alternative 2 is undetermined. Alternative 3 would result in no additional flow, as well as no improvements that will benefit the regional community. Further discussion on wastewater facilities is contained in Section 4.10.6.

Potable Water Facilities

The proposed project average daily water demand is estimated at 1.76 million gallons per day. Existing County sources are not adequate to meet this demand and source development is required. The developer is working with DLNR and two wells have been identified that will produce a sustainable yield that will serve the project. These wells will also serve water needs beyond the project.

Alternative 1 would result in net decrease of about five percent of potable water demand. Alternative 2 may have a lower water demand than the proposed project as long as potable water is not used for irrigation. Alternative 3 would result in no additional flow, as well as no source development that will benefit the regional community. Further discussion on potable water facilities is contained in Section 4.10.8.

Energy and Communications

Regarding Alternative 1, preliminary estimates for electrical, telecommunications, and cable resulted in a net demand load that remains similar to the proposed project. Further discussion on energy and communications is contained in Section 4.10.9.1.

The proposed project will increase the demand for electrical energy and telecommunications. The demand would be reduced in Alternative 1 because the number of boat slips and units would decrease. Similarly, Alternative 2 would have fewer units than the proposed project and therefore reduce energy demands. Further reduction in energy demand for either alternative could be achieved by using seawater air conditioning (SWAC) and other energy reduction measures, as planned by the developer. Further discussion on energy and telecommunications is contained in Section 4.10.9.2.

Water Features and Lagoons

The proposed project includes a brackishwater pond, lagoons, and marine life exhibits supplied by clean seawater. The water features in Alternative 1 would significantly decrease by 74 percent from 19 acres in the proposed project to five acres in Alternative 1. This decrease in water features would result in a corresponding decrease in water source requirements and seawater discharge. Alternative 2 does not include the seawater features. Alternative 3 would result in no additional demand for water source requirements and seawater discharge.

2.2.2 Conformance with Public Plans and Policies

State of Hawai‘i

Chapter 343, Hawai‘i Revised Statutes

Compliance with this chapter is effected, as described in Section 5.1.1 in regard to the proposed project and the alternatives discussed.

- State Land Use Law, Chapter 205, Hawai‘i Revised Statutes

  The discussion in Section 5.1.2 is directly applicable to Alternative 1, the proposed project. Alternative 1 will involve a setback of 400 feet that increases to 600 feet along the southern portion of the project site’s shoreline area. Alternative 2 does not provide for such a setback, but may still require approvals from DLNR for cultural, recreational, and community uses and structures within the Conservation district.

- Coastal Zone Management Program, Chapter 205A, Hawai‘i Revised Statutes

  Recreational Resources:

  In addition to the discussion of consistency with the associated objective and policies, as described in Section 5.1.3, the reduction from the proposed project’s 800-slip marina to a 400-slip marina under Alternative 1 will still expand the region’s boating opportunities and support facilities. The existing harbor entrance will still be utilized under this alternative; however, potential risks relating to boat traffic and congestion in the marina entrance area will be reduced significantly. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities, and marine science center remain important recreational components under Alternative 1.

Alternative 2 includes a golf course component, which would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Alternative 2, like the proposed project, will expand the region's boating opportunities and support facilities through its 800-slip marina. However, the potential adverse impacts of increased boat traffic from the size of the marina are significant enough to offset the benefits of increased boating opportunities.

Coastal Ecosystems:

The discussion in Section 5.1.3 is directly applicable to Alternative 1.

Alternative 1 not only reduces the number of slips proposed by 50 percent, but it also reduces the size of the marina from 45 acres to 25 acres. The 25-acre marina will increase the body of water within the existing harbor, but to a significantly lesser extent than the proposed project's estimated increase, which is also applicable to the 45-acre size that is proposed for the marina under Alternative 2.

The findings of the Harbor Water Quality Modeling Study conclude that a reduction in the size of the harbor expansion is an alternative that will mitigate the risk of significant impacts upon water quality within the marina and existing harbor. Accordingly, the reduction in both the number of slips and the size of the marina basin under Alternative 1, in combination with proper facilities design, public education, and enforcement of harbor rules and regulations, would result in fewer long-term impacts to water quality and coastal ecosystems. Short-term (construction-related) impacts would likely remain the same although the reduction in the total acreage of excavation is expected to result in a shorter duration of such impacts.

In addition to its 800-slip marina and potential adverse impacts upon water quality and the marine environment, Alternative 2 includes a golf course component, which has the potential to impact coastal ecosystems by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Economic Uses

Although reduced in the number of slips, the smaller marina under Alternative 1 will nevertheless serve public demand for more boating facilities in West Hawai‘i and is consistent with the objective and policies and discussion set forth in Section 5.1.3. The economic impacts of Alternative 2, while comparable to those of the proposed project's marina development, are notably marginal as to the golf course component, based on the marketability analysis that indicates a condition of saturation within the region.

Coastal Hazards

The discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Tsunami risks mainly affect the large shoreline setback area that is proposed for the project and Alternative 1. Alternative 2 projects a transient accommodation site that is partially within the tsunami hazard zone and thus carries a higher hazard risk. However, the essential requirement for these alternatives, as well as the proposed project, is a well-prepared and properly implemented evacuation plan.

Beach Protection

Discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Alternative 1 and, to a lesser extent, Alternative 2, will retain the shoreline area in its natural condition.

Similar to the proposed project, Alternative 1 provides for a shoreline setback of considerable width within which no structure, except for possible culturally-related structures, would be allowed. Alternatives 1 and 2 will thus be designed to avoid erosion of structures and minimize interference with natural shoreline processes.

Marine Resources

The discussion in Section 5.1.3 is also applicable to Alternative 1 which is described to be an alternative that is specifically projected to mitigate anticipated adverse impacts on water quality and the marine environment that might otherwise result from the original harbor design and scale, which is also incorporated in Alternative 2 . The reduced marina size under Alternative 1 is projected to meet water quality standards and enable greater compliance with the objective and policies addressed in this section.

Alternative 2 includes a golf course component and thus the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Hawai'i State Plans, Chapter 226, Hawai'i Revised Statutes

Section 226-4 (State goals), 5 (Objectives and policies for population, and 6 (Objective and policies for economy in general):

The discussion in Section 5.1.4 is applicable to Alternatives 1 and 2, in addition to the proposed project. These development concepts generally conform to the goals, objectives, and policies set forth in these sections because they will provide some degree of economic viability, stability, and sustainability for future generations. Kona Kai Ola will convert essentially vacant land into a mixed-use development with a distinctive marina and boating element, providing a wide range of recreational, business, and employment opportunities to the community.

Section 226-8 Objective and policies for the economy – the visitor industry:

Alternatives 1 and 2 will be consistent with the State's economic objective and policies relating to the tourism industry for the same reasons that are discussed in regard to the proposed project in Section 5.1.4. They will incorporate JDI's commitment to sustainability principles in the planning and design of the development concepts in Alternatives 1 and 2. Although the total hotel and time-share unit count is reduced to approximately 1,500 in Alternatives 1 and 2, the transient accommodations component of these alternatives will still further the State's objective and policies for increased visitor industry employment opportunities and training, foster better visitor understanding of Hawai'i's cultural values, and contribute to the synergism of this mixed-use project concept that addresses the needs of the neighboring community, as well as the visitor industry.

Section 226-11 Objectives and policies for the physical environment: land-based, shoreline and marine resources:

Alternative 1 is expected to involve less potential adverse impacts upon these environmental resources than the proposed project. Likewise, and Alternative 2 would have less adverse impact because of its reduction in the size of the marina and in the total hotel and time-share unit count. Alternative 1 carries less potential risk to water quality and related impacts upon the marine environment and anchialine pool ecosystems. Although approximately three anchialine pools are expected to be destroyed, the great majority of pools will be preserved within and outside of the proposed 400-foot shoreline setback.

The golf course component in Alternative 2 has the potential to impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the marina basin and nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools by introducing the chemicals into the pond systems.

Section 226-12 Objective and policies for the physical environment: scenic, natural beauty, and historic resources:

The discussion in Section 5.1.4 is directly applicable to Alternative 1 and describes the compliance with the objective and policies addressed.

The golf course component of Alternative 2 would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area.

Just as with the proposed project, Alternatives 1 and 2 would also be designed to blend with the natural terrain and to honor and protect the cultural history, resources, and practices of these lands.

Section 226-13 Objectives and policies for the physical environment: land, air and water quality:

As stated above, because of the reduction in both the number of slips and the size of the marina basin, with proper facilities design, public education and enforcement of harbor rules and regulations, Alternative 1 is anticipated to cause fewer long-term impacts to water quality than either the proposed project or Alternative 2. Based on the findings of the Harbor Water Quality Modeling Study, water quality resulting from a reduced marina basin size as proposed under Alternative 1 is expected to be similar to existing conditions.

As previously noted, Alternative 2 has the potential to adversely impact water quality by increasing the nutrient loading in surface runoff and groundwater by introducing pesticides, herbicides and other chemicals common in golf course development and maintenance into the marina basin and nearshore waters surrounding the project site.

Section 226-14 Objectives and policies for facility systems - general:

Alternatives 1 and 2 will conform to the objective and policies of this section on the grounds that are discussed in regard to the proposed project in Section 5.1.4. The master-planning and phasing of the project concepts under these alternatives will be coordinated with associated public and private infrastructural planning and related private and public infrastructural financing. The cost of the marina construction and project-related infrastructure is to be borne by the developer, resulting in considerable savings for the public. In addition, the projected lease revenue from these public lands will provide additional public benefits by establishing a revenue stream for capital improvements and maintenance of a range of State facilities.

Section 226-15 Objectives and policies for facility systems - solid and liquid wastes:

In addition to the developer's commitment to sustainable development design, the project will involve upgrades to the County of Hawai'i's Kealakehe Wastewater Treatment Plant to meet current needs, as well as the project's future needs. This commitment is applicable to Alternatives 1 and 2, as well as the proposed project that is discussed in Section 5.1.4.

Section 226-16 Objectives and policies for facility systems – water:

The discussion of water conservation methods and the need to secure additional potable water sources in Section 5.1.4 is also applicable to Alternative 1 and demonstrates conformity to the objective and policies for water facilities. Alternative 2 involves greater irrigation demands in regard to its golf course component and greater potable water demands for human consumption than those for Alternative 1. Alternative 2 is expected to face more serious challenges in securing adequate and reliable sources of water.

Section 229-17 Objectives and policies for facility systems – transportation:

Alternatives 1 and 2 will conform to this objective and policies because they will present water transportation opportunities, including the possible use of transit water shuttles to Kailua-Kona, as described in regard to the proposed project in Section 5.1.4.

Section 226-18 Objectives and policies for facility systems – energy:

Alternatives 1 and 2 conform to these objective and policies through the use of energy efficient design and technology and commitment to the use and production of renewable energy to serve the project's needs. Solar energy production, solar hot water heating, and the use of deep cold seawater for cooling systems are currently identified as means of saving substantial electrical energy costs for the community and the developer.

Section 226-23 Objectives and policies for socio-cultural advancement – leisure:

Alternative 1 conforms to this objective and related policies for the reasons offered in Section 5.1.4 in regard to the proposed project. Alternative 1 will be of greater conformity with the policy regarding access to significant natural and cultural resources in light of the 400-600 foot shoreline setback that has been designed for this alternative.

Although it does not propose the considerable shoreline setback that is planned for Alternative 1, Alternative 2 is consistent with this objective and related policies in incorporating opportunities for shoreline-oriented activities, such as the walking trails. In addition, the golf course component adds a more passive recreation alternative to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Section 226-25 Objectives and policies for socio-cultural advancement-culture:

The discussion in Section 5.1.4 is relevant to Alternatives 1 and 2 and demonstrate their conformity the objective and policies of this section.

Both alternatives involve the preservation and protection of cultural features that have been identified by the Cultural Impact Assessment and archaeological studies for the project area. Both provide for public shoreline access, and both will continue the policy of close consultation with the local Hawaiian community and cultural and lineal descendants in the planning of cultural resource preservation and protection.

Section 226-103 Economic priority guidelines:

Alternatives 1 and 2 conform to these guidelines for the same reasons that are set forth in Section 5.1.4. They involve private investment in a public project that will create economic diversification through a mix of marina, industrial, commercial, visitor, and cultural facilities. This presents a wide range of entrepreneurial opportunities, long-term employment opportunities, and job training opportunities.

Section 226-104 Population growth and land resources priority guidelines:

As described in Section 5.1.4, the policy support for the proposed project also extends to the similar development concepts considered in Alternatives 1 and 2. Those alternatives conform to the guidelines of this section because they involve an urban development under parameters and within geographical bounds that are supported by the County's General Plan, a preliminary form of the Kona Community Development Plan, the County's Keahole to Kailua Regional Development Plan, and the reality of being located along the primary commercial/industrial corridor between Keahole Airport and Kailua-Kona. As with the proposed project, the development concepts of Alternatives 1 and 2 are essentially alternatives for the implementation and "in-filling" of the urban expansion area in North Kona.

DHHL Hawai'i Island Plan

This 2002 plan projects DHHL's Honokōhau makai lands for commercial use. As compared to the proposed project and Alternative 2, Alternative 1 presents an expanded commercial component that provides greater compliance with the plan, while addressing certain beneficiaries' concerns about the scale of the marina originally required in the Project. Alternative 2 also conforms to the recommended commercial uses in the makai lands but to a lesser degree than Alternative 1 because of its more limited commercial component. Like the proposed project, its marina size and number of slips raise environmental issues, as more specifically discussed in Part 3, and community concerns.

County of Hawai'i General Plan

HCGP Section 4 – Environmental Quality Goals, Policies and Courses of Action:

Alternative 1 is consistent with this section. It presents a reduction in both the number of slips and the size of the marina basin that, in combination with proper facilities design, public education and enforcement of harbor rules and regulations, would result in very few long term impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions.

Alternative 2 is the least consistent with this section. In addition to the potential significant impacts of its 800 slip marina basin, its golf course component has the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides and other chemicals common in golf course use and management into the nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools beyond their current conditions by introducing such substances into the pool systems.

HCGP Section 7 – Natural Beauty Goals and Policies:

Alternative 2 conforms to some degree with this section. Its golf course component would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area, as demonstrated in other makai golf courses within the region.

HCGP Section 8 – Natural Resources and Shoreline:

Alternative 1 is most consistent with the goals and policies of this section. It would require considerably less marina excavation than the proposed project and Alternative 2 and would reduce the potential risk of long-term adverse impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions with the degree of reduction in marina basin size that is proposed under Alternative 1. This reduction is also expected to reduce potential impacts upon anchialine pools and their ecosytems, as well as shoreline and marine resources that are affected by water quality. Alternative 1 also retains the shoreline preservation and protection concepts that are proposed in and described for the Project.

HCGP Section 10 – Public Facilities Goals and Policies:

The discussion in Section 5.2.1. in relation to the proposed project is applicable to Alternatives 1 and 2. Improvements to public facilities are are integral to the Kona Kai Ola development. The provision of additional boat slips and numerous road improvements, including a makai extension of Kuakini Highway south to Kailua-Kona are incorporated into plans for the project's development. In light of these elements, Alternatives 1 and 2 are consistent with the goals and policies of this section.

HCGP Section 11 – Public Utility Goals, Policies:

As with the proposed project, Alternatives 1 and 2 are consistent with the goals and policies of this section, based on the relevant grounds set forth in Section 5.2.1. The developer is committed to design, fund, and develop environmentally sensitive and energy efficient utility systems to the extent possible, as described previously in Part 5. Its master planning provides for the coordinated development of such systems with the objective of achieving significant savings for the public. As previously-mentioned example, the project development involves the upgrading of the Kealakehe Wastewater Treatment Plant.

HCGP Section 12 – Recreation:

Alternative 1 is consistent with the goals, policies, and courses of action for North Kona in this section.

Although the number of slips is reduced under Alternative 1, the region's boating opportunities and support facilities will still be expanded. The existing marina entrance would still be utilized under this alternative. However, concerns relating to increased activity leading to increased congestion in the marina entrance area would be mitigated to a certain extent. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities and marine science center remain important components of Alternative 1.

The golf course component of Alternative 2 would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola. Alternative 2 is also considered to be consistent with this section.

HCGP Section 13 and 13.2 – Transportation:

The reduced marina component under Alternative 1 will still provide transportation opportunities and provide for possible use of transit water shuttles to Kailua-Kona, although to a lesser degree than under the proposed project and Alternative 2 . However, in each scenario, internal people-movers are planned, and numerous roadway improvements are planned for coordination with public agencies, including but not limited to the construction of the Kuakini Highway extension between Honokōhau and Kailua-Kona. Accordingly, both Alternatives 1 and 2 are consistent with the goals, policies, and courses of action for North Kona under these sections of the General Plan.

HCGP Section 14.3 – Commercial Development:

For the reasons presented in the discussion under Section 226-104 of the State Plan, the planned commercial component under Alternatives 1 and 2 are consistent with this section.

HCGP Section 14.8 – Open Space:

Alternatives 1 and 2 are consistent with the goals and policies of this section. Alternative 1 provides a considerable (400-600 foot) shoreline setback along the entire ocean frontage of the project site as a means of protecting the area's scenic and open space resources, as well as natural and cultural resources. Although it does not incorporate the shoreline setback planned in Alternative 1, Alternative 2 provides a golf course component would contribute to the amount of open space that is currently proposed and allow additional view corridors to be created.

Community Development Plans

Community development plans are being formulated for different regions in the County in order to supplement the County's General Plan. The Kona Kai Ola project is located in the Kona Community Development Plan (CDP) area. Maps associated with the preliminary work phases

of the Kona CDP include the Kona Kai Ola project site within the “Preferred Urban Growth” boundary of the North Kona district. The Kona CDP process is guided by a Steering Committee composed of a broad cross-section of the community. The Steering Committee will eventually complete its work and recommend the CDP’s adoption.

After the DEIS was published, the Kona CDP has progressed to the development of plans for the major urban growth corridor north of Kailua-Kona. The Kona CDP has produced a draft plan showing a transit oriented development that includes a midlevel public transit corridor along the mauka residential elevation, and a makai transit corridor that runs along a proposed new frontage road just makai and parallel to Queen Kaahumanu Highway. The development plan for Alternative 1 includes the Kuakini Highway as part of this proposed frontage road and transit line from Kailua Kona to the Kealakehe area, along with a transit stop at Kona Kai Ola. The Alternative 1 plan also includes a road that could be extended to be part of the proposed frontage road should it be approved and implemented. In addition, the Kona CDP has continued to emphasize the principles of smart growth planning with mixed use urban areas where people can live, work, play and learn in the same region. Kona Kai Ola has been specifically designed to be consistent with this policy in order to provide a stable employment base close to where people live in the mauka residential areas already planned for DHHL and HHFDC lands.

It should be noted that currently and over the years, the 1990 Keāhole to Kailua Development Plan (K-to-K Plan) guides land use actions by the public and private sectors. It is intended to carry out the General Plan goals and policies related to the development of the portion of North Kona area, including the Kona Kai Ola site. The “Preferred Growth Plan” of the Keāhole to Kailua Development Plan identifies the project site as a new regional urban center to include commercial, civic, and financial business related uses, an expanded “Harbor Complex,” a shoreline road, and a shoreline park. The proposed project and the development concepts in Alternatives 1 and 2 are therefore consistent with the recommendations in the Keāhole to Kailua Development Plan.

Hawai‘i County Zoning

As shown on Figure AA, the project site is zoned “Open”. Under Section 25-5-160 of the Hawai‘i County Code, “The O (Open) district applies to areas that contribute to the general welfare, the full enjoyment, or the economic well-being of open land type use which has been established, or is proposed. The object of this district is to encourage development around it such as a golf course and park, and to protect investments which have been or shall be made in reliance upon the retention of such open type use, to buffer an otherwise incompatible land use or district, to preserve a valuable scenic vista or an area of special historical significance, or to protect and preserve submerged land, fishing ponds, and lakes (natural or artificial tide lands)”.

Some of the proposed uses at Kona Kai Ola are permitted uses in the Open zone such as:

- Heiau, historical areas, structures, and monuments;
- Natural features, phenomena, and vistas as tourist attractions;
- Private recreational uses involving no aboveground structure except dressing rooms and comfort stations;

- Public parks;
- Public uses and structures, as permitted under Section 25-4-11.

In addition to those uses permitted outright, the following uses are permitted after issuance of a use permit:

- Yacht harbors and boating facilities; provided that the use, in its entirety, is compatible with the stated purpose of the O district.
- Uses considered directly accessory to the uses permitted in this section shall also be permitted in the O district.

The proposed time-share and hotel units and commercial uses would not be consistent with the zoning designation of "Open". Project implementation therefore requires rezoning of portions of the project to the appropriate zoning category or use permits for certain uses.

Special Management Area

As shown in Figure AB, the entire project area up to the highway is within the coastal zone management zone known as the Special Management Area ("SMA"). At the County level, implementation of the CZM Program is through the review and administering of the SMA permit regulations. Kona Kai Ola complies with and implements the objectives and policies of the Coastal Zone Management (CZM) Program, and a full discussion is provided in Section 5.1.3. The development concepts in the proposed project and Alternatives 1 and 2 will be subject to applicable SMA rules and regulations.

Testimony of Zachary McClure

73-4207 Eluna St., Kailua Kona, HI 96740

In Support of a Compromise

I am writing this testimony in support of development, but not in support of all projects, or most, and not the Kona Kai Ola development. I like the project, but disagree with some key points. I think it would be excellent to have something akin to the Kings' Shops in Waikoloa on this side of the island. An inclusive community with lots of shops and restaurants would be excellent, even if you had no money to spend. Walking through the place would be fun in itself, if it were anything like Kings' Shops. So I say build it. Just not at Kaloko-Honokohau.

I have been to Kaloko-Honokohau National Historical Park and the surrounding areas many times. The water is clean, the fish are plentiful, and the beach is very beautiful. I like to just look out over the water at all the animals that frequent the waters close to shore. I see dolphins, seabirds, turtles; just a few weeks ago I saw a whale breaching. My point is, these fantastic animals will most likely not benefit from so large a construction project so close to their home. I recently learned that a whole pod of dolphins rest at the mouth of the harbor. Correct me if I'm wrong, but is it not illegal to change the behavior of an animal under the protection Endangered Species Act—in any way? So technically, since dolphins and whales are extremely sensitive to sound, any excavation would be violating the law. Also, I doubt that manta rays would appreciate being put in a lagoon.

The new harbor idea is flawed as well. The largest issue is that of sound. As before stated, dolphins and whales are extremely sensitive to sound, and sound is an unfortunate bi-product of boat motors. Eight hundred more boats would probably not help. The developer, Jacoby Development, Inc. (JDI) is saying that Kona Kai Ola would be an inclusive environment with more places for you to dock your boat, a public transportation system, parks, and meeting areas. But it would be very much an exclusive community, at least in the new marina. The rates for the marina would be eleven dollars per foot, a rate that many Hawaiians won't be able to afford. This is compared to the current price of four dollars per foot. Shouldn't price go down as demand decreases? This harbor is targeted at the rich people and their yachts. I can't wait to see what the costs of other utilities are.

My last objection concerns the land on the site. The site has 22 alkaline pools, home to many species of shrimp and fish; a water source for many native or endemic plants (JDI's answer is that they would plant new plants. But it would be impossible to make up for all the rare species that would die.). Also, much of the land is of cultural or historical significance. And nothing, nothing, can replace the lost relics of a proud, ancient civilization.

I like the idea, yes. However, I object to large increments of it. For instance, I think the harbor is unnecessary. The added boat slips can go somewhere else. Also, the man-made lagoons. I believe that no animal that's larger than a parrotfish should be kept in a lagoon.

Other than these flaws, I think that Kona Kai Ola is brilliant! Just not there, at Kaloko-Honokohau.

Sincerely,

July 23, 2007

Zachary McClure
73-4207 Eluna St.
Kailua-Kona, HI 96740

Dear Mr. McClure:

Subject: Kona Kai Ola Draft Environmental Impact Statement
Response to Your Comments Received on February 5, 2007

Thank you for your comments on the Kona Kai Ola Draft Environmental Impact Statement. Our responses to your comments are based on paragraph designations.

Paragraph 1

The project includes community benefits and privately funded infrastructure development. Kona Kai Ola includes crucial privately-funded infrastructure improvements, such as the marina, regional roadway and traffic circulation improvements, and improvements to the existing wastewater treatment plant. Further, with the use of private funds, Jacoby Development, Inc. (JDI) will protect natural resources through the various measures that preserve and enhance the environment. Private funds will also be used in the development of community-oriented facilities such as parks, other recreational facilities, and public access. Hence, Kona Kai Ola will bring in private investment for infrastructure improvements that would mitigate project impacts while serving the wider community.

Paragraph 2

The Fauna Impact Study, as summarized in Environmental Impact Statement (EIS) Section 7, found that it is not expected that the development of the proposed Kona Kai Ola property will have significant impacts on native avian or mammalian resources present within the North Kona District. Further, Kona Kai Ola will provide additional habitat for shorebirds and some visiting seabirds through the establishment of a brackish water pond area suitable for avian fauna, including stilts, coots, and ducks. This is a positive impact and water features will constitute a managed ecosystem that will protect these species.

Management of habitats within lagoons is a question of aquaria technology and fish husbandry. The limiting criteria in aquaria is typically water quality, with habitat design more a matter of providing the correct physical habitat (sand, coral, rock, caves, etc.) in an ecologically balanced, aesthetically pleasing, fashion. The display type of animals has not been finalized at this time. The superb water quality, and low turn overtime in the lagoons will preclude the necessity of filtration. Professional aquarists and staff will manage the lagoon features and associated educational activities from the Marine Science offices adjacent to the upper lagoon.

Paragraph 3

A complete marine acoustics study was completed in response to comments received on the Draft Environmental Impact Statement (DEIS). The report is included in Appendix T-2. The model results showed that the noise levels in the developed scenario did not exceed the Level A impacts to marine mammals. Level B impacts to marine mammals and sea turtles generally occur within a range of ten meters. Although noise impacts may occur during blasting the new marina, these impacts could be greatly minimized by using good blasting practices. These are addressed in detail in the EIS.

A comparison between impacts related to the proposed project concept and impacts related to Alternative 1 indicates that a reduction in the acreage and number of slips in the marina, as well as the reduction in hotel and timeshare units, would generate less environmental, social and economic impacts. Although positive economic impacts would be reduced, Alternative 1 can be considered as a preferable alternative because of reduced environmental impacts. However, while it can be concluded that the 25-acre (400 slips) marina in Alternative 1 would be the preferred size, the Department of Land and Natural Resources (DLNR) agreement establishes the size of the marina at 45 acres and 800 slips. An amendment to the DLNR agreement is required in order to allow Alternative 1 to proceed. Hence, selection of Alternative 1 is an unresolved issue at this time.

The proposed marina is *not* only for "an exclusive community at the expense of the local fishing and general community." The demand for additional boat slips and marina facilities originates from the local fishing and general community, and, in recognition of this community need, the State has initiated the effort to expand the harbor and marina facilities through the Kona Kai Ola project.

The EIS has been revised to include information on the additional studies, and Attachment 1 contains Section 2, Alternatives Analysis.

Your comment letter and this response are included in the Final Environmental Impact Statement. We appreciate your participation in the environmental review process.

Please submit a request to our office if you would like to receive a printed or electronic copy of the Final Environmental Impact Statement, or portions thereof.

Sincerely,

Dayan Vithanage, P.E., PhD.
Director of Engineering

cc: Office of Environmental Quality Control
State Department of Hawaiian Home Lands
Jacoby Development, Inc.

Attachment 1

2 Alternatives Analysis

~~In typical land development projects, the initial planning process includes the exploration of alternatives to development objectives. In the EIS process, these alternatives are presented with a disclosure of reasons for the dismissal of non-preferred alternatives.~~

~~Kona Kai Ola does not follow this same pattern of alternatives evaluation.~~ As discussed in Section 1.4, the proposed Kona Kai Ola project is the result of agreements between JDI and the State DLNR and DHHL. The agreements and leases between the State and JDI stipulate the parameters of development for this site in terms of uses, quantities and size of many features, resulting in a limited range of land uses. Unlike a private property project, JDI is required to meet the criteria outlined in the agreements, thereby affording less flexibility in options and uses. From the developer's perspective, the agreements must also provide sufficient flexibility to allow for a development product that responds to market needs and provides a reasonable rate of return on the private investment.

The agreements between JDI and DLNR specify that the proposed harbor basin is to be 45 acres and accommodate 800 slips. This development proposal is the subject of this EIS. In response to DEIS comments, additional water quality studies and modeling were conducted. These studies determined that the water circulation in a 45-acre 800-slip marina would be insufficient to maintain the required standard of water quality. The models of water circulation suggest that a new 25-acre harbor basin could successfully maintain required water quality in the new harbor. Comments on the DEIS from DLNR, from other government agencies, the neighbors and the general community also called for the consideration of alternatives in the EIS, including a project with a smaller harbor basin and less density of hotel and time-share units.

In response to these comments on the DEIS, three alternatives are evaluated in this Final EIS and include Alternative 1, which is a plan with a 25-acre 400-slip harbor basin including a decrease in hotel and time-share units; Alternative 2, which is an alternative that had been previously discussed but not included in the proposed project, that includes an 800-slip harbor and a golf course; and Alternative 3, the no-project alternative. Each alternative is included in the EIS with an evaluation of their potential impacts. These project alternatives are presented to compare the levels of impacts and mitigation measures of the proposed project and alternative development schemes pursuant to requirements set forth in Chapter 343, HRS.

~~JDI is required to provide a new marina basin not less than 45 acres and a minimum of 800 new boat slips. Further, the agreements provide the following options for land uses at the project site:~~

- ~~Golf Course~~
- ~~Retail Commercial Facilities~~
- ~~Hotel Development Parcels~~
- ~~Marina Development Parcels~~
- ~~Community Benefit Development Parcels~~

~~JDI is not pursuing the golf course option and is proposing instead to create various water features throughout the project site. All other optional uses have been incorporated in Kona Kai Ola.~~

2.1 Project Alternatives

2.1.1 Alternative 1: 400-Slip Marina

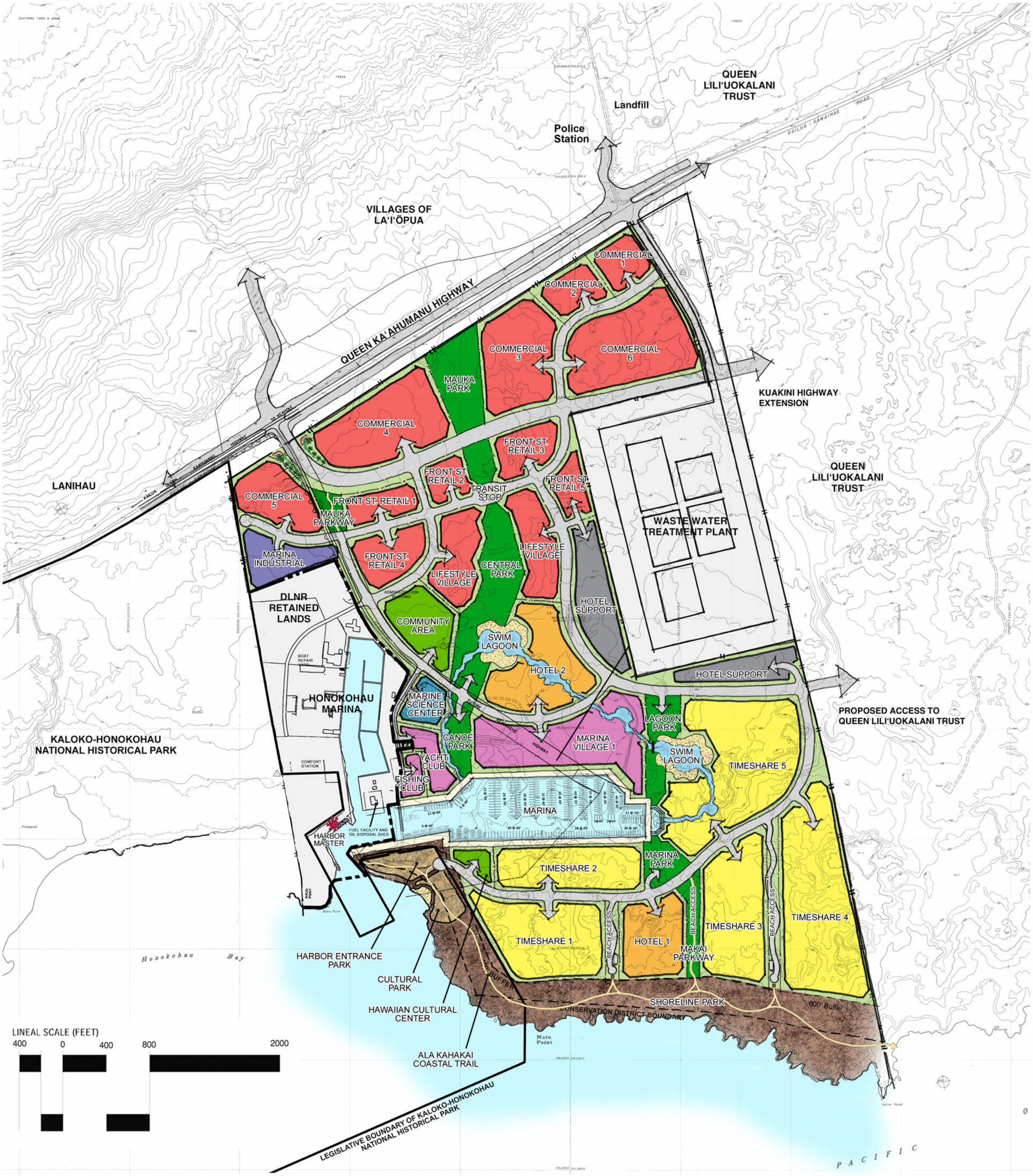
Studies conducted in response to DEIS comments found the construction and operation of an 800-slip marina may significantly impact the water quality within the marina and along the shoreline. Specifically, the Harbor Water Quality Modeling Study, as contained in Appendix U, found that the water circulation in a 45-acre 800-slip harbor was insufficient to maintain an acceptable level of water quality. Further, the existing harbor channel, which would serve both the existing and new harbors, could not adequately serve the increased boat traffic generated by an 800-slip marina during peak traffic. Mitigation measures to accommodate peak boat traffic included the widening of the existing channel, an action that would entail a complex process of Federal and State approvals and encounter significant environmental concern.

Concerns related to the proposed density of hotel and time-share units were also expressed in comments to the DEIS from members of the public, neighbors to the project site, especially the Kaniohale Community Association, and government agencies. Common themes in DEIS comments were related to impacts regarding traffic, project requirements of potable water and infrastructure systems, including sewer, drainage, utility and solid waste systems, and socioeconomic impacts.

In response to the water quality study results, and to the DEIS comments, an alternative plan was developed with a smaller marina with less boat slips, and a related decrease in hotel and time share units. Illustrated in Figure G, Alternative 1 reflects this lesser density project, and features a 400-slip marina encompassing 25 acres. For the purposes of the Alternative 1 analysis, JDI assumed 1,100 time-share units and 400 hotel rooms. Project components include:

- 400 hotel units on 34 acres
- 1,100 time-share units on 106 acres
- 143 acres of commercial uses
- 11 acres of marina support facilities
- 214 acres of parks, roads, open spaces, swim lagoons and community use areas

In addition, Alternative 1 would include the construction of a new intersection of Kealakehe Parkway with Queen Ka'ahumanu Highway, and the extension of Kealakehe Parkway to join Kuakini Highway to cross the lands of Queen Lili'uokalani Trust, and connecting with Kuakini Highway in Kailua-Kona. This is a significant off-site infrastructure improvement and is included in the agreements between the State and JDI.



Source: PBR HAWAII

Plan is conceptual only and subject to change

Figure G: Alternative 1: 400-Slip Marina

LEGEND

- TIME SHARE
- HOTEL
- RETAIL / COMMERCIAL
- MARINA RETAIL
- MARINA SUPPORT / COMMERCIAL
- MARINE SCIENCE CENTER
- COMMUNITY AREA / CULTURAL CENTER
- SWIM LAGOON
- MARINA
- UTILITIES
- PARKS & GREEN SPACE
- SHORELINE
- HARBOR ENTRANCE PARK / CULTURAL PARK

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JDI
JACOBY DEVELOPMENT, INC.

Like the proposed project, Alternative 1 would have a strong ocean orientation, and project components that support this theme would include various water features including seawater lagoons and a marine science center. The new Alternative 1 harbor would include a yacht club, fishing club, a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. The coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use. Additional Alternative 1 community areas would include facilities and space for community use, including programs of the Kona Kai Ola Community Foundation, which supports community programs in health care, culture, education, and employment training for the local community, especially to native Hawaiians. Like the original proposed plan, Alternative 1 includes 40 percent of the land in parks, roads, open spaces, swim lagoons and community use areas.

2.1.2 Alternative 2: Golf Course Feature

Alternative 2 was among the alternatives discussed at a community charrette in September 2003. It includes a golf course, which is a permitted use in the DLNR agreement and DHHL lease. As Figure H illustrates, an 18-hole championship golf course would occupy 222 acres on the southern portion of the project site. As with the proposed project, Alternative 2 includes an 800-slip marina on a minimum of 45 acres.

To support the economic viability of the project, other Alternative 2 uses include:

- Golf course clubhouse on three acres
- 1,570 visitor units on 88 acres fronting the marina
- 118 acres of commercial uses
- 23 acres of community uses

Community uses in Alternative 2 include an amphitheater, a canoe facilities park, a community health center, a Hawaiian cultural center and fishing village, a marine science center and employment training center. The sea water lagoon features contained in the proposed project and Alternative 1 are not included in this alternative.

2.1.3 Alternative 3: No Action

In Alternative 3, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.

~~The economic viability and sustainability of the project is determined by the density and uses proposed. Because JDI is obligated to develop an 800-slip marina for the State, complete road improvements, and provide various public enhancement features at its own expense, the density proposed for the income generating features of the development must be sufficient to provide an acceptable level of economic return for JDI. The market study, which is discussed in Section 4.6, reviewed various development schemes and determined that the currently proposed density and mix is the optimum to meet the anticipated financing and development cost obligations for the public features associated with the development.~~

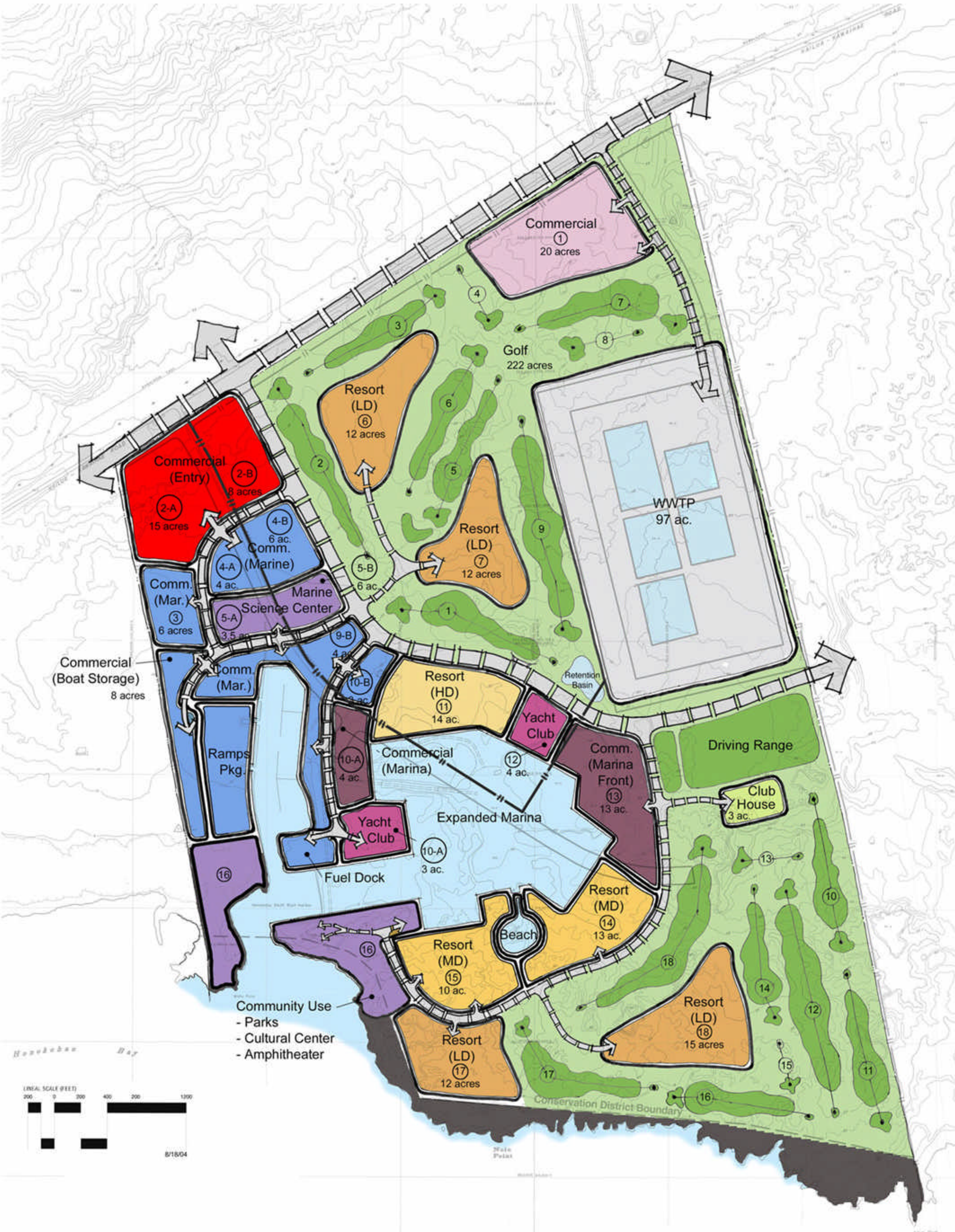

Figure H. Alternative 2: Golf Course Alternative

Legend

2.2 Alternatives Analysis

As discussed in Section 2.1, the proposed Kona Kai Ola project (also referred to as "proposed project") is defined by development requirements related for a marina and the related uses that would be needed to generate a reasonable rate of return that covers development costs.

Beginning with Section 2.2.1, the alternative development concepts are comparatively assessed for potential impacts that may reasonably be expected to result from each alternative. Following is an overview of the primary observations of such assessment.

Alternative 1 includes half of the State-required boat slips and 60 percent of the proposed hotel and time-share units and, due to the decreased density, this alternative would generate significantly less environmental and socio-economic impacts. A harbor water quality model found the reduction of the volume of the new marina basin by about half (approximately 25 acres) significantly improved the water circulation and quality. Further, the reduced number of boat slips would generate less boat traffic, thereby reducing congestion and the need to mitigate impacts further by the widening of the existing harbor channel.

A project with fewer hotel and time-share units and increased commercial space with a longer (14 years) absorption period would change the mix of employment offered by the project, and slightly increase the overall employment count. The public costs/benefits associated with Alternative 1 would change, compared to the proposed project, with a general increase in tax collections, and a general decrease in per capita costs. Detailed discussion of Alternative 1 potential economic impacts are provided in Section 4.6.6. Comparisons of levels of impact are presented throughout this FEIS.

While this analysis might indicate that the 25-acre marina in Alternative 1 would be the more prudent choice, the DLNR agreement establishes the minimum size and slip capacity of the marina at 45 acres and 800 slips, respectively. Amendments to the DLNR agreement would be required in order to allow Alternative 1 to proceed as the preferred alternative. Hence, selection of the preferred alternative is an unresolved issue at the writing of this FEIS.

Alternative 2, the golf course alternative, was not previously considered to be the preferred alternative primarily because market conditions at the time of project development might not likely support another golf course. Further, DHHL has a strategy goal to have more revenue-generating activities on the commercial lease lands within the project area. In addition, concerns have been expressed as to environmental impacts of coastal golf courses, including the potential adverse impact on Kona's water supply if potable water is used for golf course irrigation.

While Alternative 3, the no-project alternative, would not generate adverse impacts related to development of these lands associated with the construction and long-term operations, it would also not allow for an expanded public marina that would meet public need and generate income for the public sector. Further, the no-project alternative would foreclose the opportunity to create a master-planned State-initiated development that would result in increased tax revenue, recreation options and community facilities. Crucial privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities, and public access would not be contributed.

~~Hence, the only valid alternative to the proposed project is the no-action alternative. In this alternative, the project site would be left vacant, and the proposed marina, hotel and time-share facilities, commercial and marina industrial complexes, and community-oriented uses would not be realized.~~

~~The no-project alternative would therefore not generate adverse impacts associated with the construction and long-term operations would not occur.~~

~~Likewise, the creation of a master-planned state-initiated development, resulting in increased employment, tax revenue, recreation options and community facilities, would not be created. Privately-funded improvements, such as the marina, regional roadway and circulation improvements, and improvements to the existing wastewater treatment plant, would not be implemented. Private funds toward the development of community-oriented facilities such as parks, other recreational facilities and public access would not be contributed.~~

Further, the creation of revenue-producing businesses on the DHHL property to fund homestead programs would not occur, resulting in fewer potential benefits for Hawaiians.

Hence, the agreements and leases between the State and JDI indicate that the no-action alternative is not in the public interest~~has been rejected at this time~~.

2.2.1 Impact Comparison

Grading and Excavation

The proposed project requires grading and excavation. Both actions may impact groundwater due to rainfall runoff during construction. Alternative 1 would require a significantly smaller excavation for the marina basin and would therefore carry a lesser risk of potential adverse effects on water quality. Alternative 2 would require the same basin excavation as the proposed project, and would also include extensive grading and filling to build the golf course, the latter of which would generate additional impacts. Alternative 3 would result in no change to the geography, topography and geology.

Further discussion on grading and excavation is contained in Section 3.3.

Natural Drainage

Most precipitation infiltrates into the porous ground at the site, and no significant sheet flow is likely. Alternative 1 would generate similar levels of impacts on natural drainage as those of the proposed project and thus require similar mitigation measures. The golf course in Alternative 2 would not be as porous since the site would be graded, soil would be placed, and grass and other landscaping would be grown. Sheet flow and runoff can occur on a golf course, and drainage patterns might change. Alternative 3 would result in no change to the existing natural drainage pattern. Further discussion on natural drainage is contained in Section 3.4.

Air Quality

Air quality will be affected by construction activities, as well as pollutants from vehicular, industrial, natural, and agricultural sources. Alternative 1 would generate less construction air quality impacts than the proposed project due to the reduced amount of intensive groundwork associated with the smaller marina basin and fewer long-term impacts by reducing traffic 35 and 40 percent during, respectively, AM and PM peak traffic times. Construction of Alternative 2 would result in fugitive dust and exhaust from equipment and is expected to generate the same level of air quality impact as the proposed project. Alternative 3 would result in no change to existing air quality. Further discussion on air quality is contained in Section 3.5.

Terrestrial Environment

To provide additional habitat for shorebirds and some visiting seabirds, the project proposes to construct a brackishwater pond area suitable for avian fauna, including stilts, coots and ducks. While habitat expansion is beneficial, there is also a possibility that these species may be exposed to activity that may harm them. Alternative 1 would not include a brackish water pond, but will include 5 acres of seawater features, which is 74 percent less than the 19 acres of seawater features in the proposed project. While this would reduce beneficial impacts, it would also decrease exposure to potentially harmful activity. Alternative 2 does not include the brackish water pond features, but would include drainage retention basins that would attract avian fauna and expose them to chemicals used to maintain golf course landscaping. While Alternative 3 would result in no increase in potentially harmful activity, it would also not provide additional habitat for avian fauna. Further discussion on the terrestrial environment is contained in Section 3.7.

Groundwater

Groundwater at the project site occurs as a thin basal brackish water lens. It is influenced by tides and varies in flow direction and salt content. The existing Honokōhau Harbor acts as a drainage point for local groundwater. Any impact to groundwater flow from the proposed harbor is likely to be localized. The proposed marina basin will not result in any significant increase in groundwater flow to the coastline, but rather a concentration and redirection of the existing flows to the harbor entrance.

There will be differences in the flow to the marina entrance between the proposed project and Alternative 1. Alternative 1, being smaller in size, will have less impact on groundwater flow than the proposed marina. Alternative 2 will have a similar impact to groundwater quality as the proposed project. Alternative 2 may also impact water quality by contributing nutrients and biocides to the groundwater from the golf course. Alternative 3 would result in no change in existing groundwater conditions. Further discussion on groundwater is contained in Section 3.8.1.

Surface Water

There are no significant natural freshwater streams or ponds at the site, but there are brackish anchialine pools. Surface water at the project site will be influenced by rainfall. Runoff typically percolates rapidly through the permeable ground. The proposed project will include some impermeable surfaces, which together with building roofs, will change runoff and seepage patterns.

Alternative 1 is a lower density project that is expected to have proportionally less impact on surface water and runoff patterns and less potential impact on water quality than the proposed project. Alternative 2 would have more impact on surface water quality than the proposed project due to fertilizers and biocides carried by runoff from the golf course. Alternative 3 would result in no change to surface water conditions. Further discussion on surface water is contained in Section 3.8.2.

Nearshore Environment and Coastal Waters

The potential adverse impacts to the marine environment from the proposed project are due to the construction of an 800-slip marina and the resulting inflow of higher salinity seawater and inadequate water circulation, both of which are anticipated to impair water quality to the extent of falling below applicable standards. One possible mitigation measure is to significantly reduce the size of the marina expansion.

The reduced marina size (from 45 to 25 acres) and reduced lagoon acreage in Alternative 1 are expected to result in a proportionate reduction in seawater discharging into the new harbor and increased water circulation. Alternative 2 includes the same marina basin size and is therefore subject to the same factors that are expected to adversely affect water quality.

In the existing Honokōhau Harbor, water quality issues focus on the potential for pollutants, sediments, mixing and discharge into the nearshore marine waters. Before the harbor was constructed, any pollutants entrained within the groundwater were believed to have been diffused over a broad coastline.

The water quality in the proposed harbor depends on several components. These include salinity, nutrients, and sediments that come from the ocean, rainfall runoff, water features with marine animals, and dust. The smaller project offered as Alternative 1 is expected to produce a reduced amount of pollutants and reduce the risk of adverse impact upon water quality.

It is notable that the 45-acre marina basin planned in the proposed project and Alternative 2 only becomes viable from a water quality impact standpoint if the additional brackish groundwater inflow into the new marina exceeds 60 mgd. The resulting flushing from such inflow would be expected to better maintain water quality. However, it is unclear whether 60 mgd of brackish groundwater would be available. As proposed in Alternative 1, reduction of the volume of the new marina basin by 45 percent will significantly improve the flushing and water quality because the lower volume can be flushed by the available groundwater flow.

In addition, there could be higher rainfall runoff from the Alternative 2 golf course into the harbor, because the grassed golf course will be less porous than the natural surface. The golf course will also require relatively high levels of fertilizer, biocides, and irrigation, all of which could contribute to adverse water quality impacts.

Further discussion on nearshore environment and coastal waters is contained in Section 3.9.1.

Anchialine Pools

Anchialine pools are located north of Honokōhau Harbor, and south of the harbor on the project site. The marine life in these pools is sensitive to groundwater quality, and changes due to construction and operation of the project could degrade the viability of the pool ecosystem. In the southern complex, 3 anchialine pools with a combined surface area of $20m^2$ would be eliminated due to the harbor construction in the proposed project and Alternatives 1 and 2.

Predicting the extent of change in groundwater flow is difficult if not impossible even with numerous boreholes and intense sampling. The actual flow of groundwater towards the sea is minimal today, and tidal measurements show that tide fluctuations represent more than 90 percent in actual harbor tides. The fluctuations occur simultaneous with the ocean/harbor tide, which indicate a vertical and horizontal pressure regime between bore hole 6 and the ocean and harbor. Hence, the tides alone create a mixing system that increases salinity, as the flow approaches the point of discharge which will be either the channel or the shore. Another factor that could influence groundwater quality is the increased local recharge from irrigation between the channel and shore. This will add fresh water to the lens locally but is not quantified at this time.

Quantification of these impacts, including the flow of groundwater through each pond, is therefore extremely difficult. The shallow lavas are of the pahoehoe type and have a relatively high horizontal permeability. In surface depressions or undulations, the pahoehoe lavas have a tendency to lose vertical permeability from sedimentation thus restricting water exchange within the individual pools. This is normally reflected in both the salinity and temperature and this information has been adequately studied in the pools.

Changes in groundwater quality may or may not impact biological communities in the anchialine and estuarine environment. In either case, it is important to understand these relationships to effectively manage the resource. If there is significant deviation from the baseline especially in regard to nutrients, pathogens, and toxins, a mitigation plan to determine the cause and take decisive appropriate action will be implemented.

Due to the uncertainty of changes in groundwater flow and quality due to marina construction, the variability in impacts between the proposed project and Alternatives 1 and 2 is unknown at this time. Alternative 3 would result in no change in groundwater flow. While this would eliminate the potential for adverse impacts, Alternative 3 would also continue the pattern of existing degradation related to human activity and the introduction of alien species. Further discussion on anchialine pools is contained in Section 3.9.2.

Marine Fishing Impacts

The proposed marina will increase the number of boats in the area and it is reasonable to assume that a portion of these new boats will engage in fishing activities. The increase in boats in the area would be primarily related to the marlin and tuna / pelagic fishery, coral reefs due to extractive fisheries, and SCUBA activities. The pressure on fish and invertebrate stocks is expected to increase with or without the marina. Harbor expansion provides the opportunity to address existing conditions to consolidate, focus, and fund management and enforcement activities at one location.

Compared to the proposed project, Alternative 1 would result in a 21 percent decrease in boat traffic, thereby lessening the potential for marine fishing impacts. The level of impacts in Alternative 2 would be similar to that of the proposed project. Alternative 3 would result in no change in existing marine fishing conditions, and no opportunity to address already existing pressure on fish and invertebrate stocks. Further discussion on marine fishing impacts is contained in Section 3.9.3.

Cultural and Archaeological Resources

The proposed project will integrate cultural and archaeological resources in the overall development. Archaeological sites recommended for preservation will be preserved, and cultural practices will be encouraged. Kona Kai Ola includes a canoe park, and a cultural park with a focus on Hawaiian maritime cultural heritage of the voyaging canoe. Proposed is a 400-foot shoreline setback that would serve as a buffer between the ocean and developed areas. This coastal area would be protected with a shoreline park with trails and public access parking for walking and shoreline fishing, and a cultural park surrounding the heiau, the cultural sites and 'Alula for community use.

Alternative 1 would contain all of the cultural archaeological features and the shoreline setback area would be 400 feet in the northern portion of the site and increase to 600 feet in the southern portion. Alternative 2 would preserve cultural and archaeological resources, but does not include a 400-foot shoreline setback. Alternative 3 would result in no change to existing cultural and archaeological resources and no addition of cultural and community facilities and activities. Further discussion on cultural and archaeological resources is contained in, respectively, Sections 4.1 and 4.2.

Noise

Project-generated noise is due to construction equipment and blasting, boats, marina activities, vehicle traffic, and the Kealakehe Wastewater Treatment Plant operations. Alternative 1 would generate less noise impacts due to reduced construction activities, fewer boats, less traffic and less on-site activity. Alternative 2 would also generate less noise due to reduced traffic and less on-site activity, but noise related to the excavation of the marina basin and an increase in the number of boats would be similar to that of the proposed project. Further discussion on noise impacts is presented in Section 4.4.

Socioeconomic Impacts

The proposed project will generate an increase in de facto population of an estimated 5,321 persons due to the increase in hotel and time-share units. The estimated de facto population increase in Alternative 1 is 37 percent less, at 3,363 persons, than the proposed project. The de facto population increase in Alternative 2 is similar to Alternative 1.

Employment in the commercial components will nearly double in Alternative 1, from a stabilized level of 1,429 full-time equivalent (FTE) positions in the proposed project to 2,740 in the Alternative 1.

Under Alternative 1, the total operating economic activity at Kona Kai Ola will increase due to the added commercial space more than off-setting the fewer visitor units, moving upward from $557.6 million per year to circa $814.3 million annually. The total base economic impact resulting from development and operation of Alternative 1 will similarly be higher by between 35 and 45 percent than that of the proposed project.

Alternative 1, which has a reduced marina size of 25 acres, and fewer hotel and time-share units, would have a meaningful market standing, create significant economic opportunities, and provide a net benefit to State and County revenues. From a market perspective, a smaller Kona Kai Ola would still be the only mixed use community in the Keahole to Kailua-Kona Corridor offering competitive hotel and time-share product.

The estimated absorption periods for marketable components of Alternative 1 are generally shorter than those for the same components in the proposed project. Marina slips under Alternative 1 are estimated to be absorbed within 2 years after groundbreaking, as compared with 9 years for absorption of slips in the proposed project. Hotel rooms under Alternative 1 are estimated to be absorbed within 4 years after groundbreaking, as compared with 7 years under the proposed project. Time-share units would be absorbed within 10 years under Alternative 1, while 15 years are projected under the proposed project. Due to the planned increase in commercial facilities under Alternative 1, the absorption period of commercial space is estimated at 14 years, as compared with 8 years for absorption of such facilities under the proposed project.

The State and County will still both receive a net benefit (tax receipts relative to public expenditures) annually on a stabilized basis under the Alternative 1. The County net benefits will be some $12.2 million per year under the Alternative 1 versus $14.9 million under the proposed project. The State net benefits will increase under the Alternative 1 to about $37.5 million annually, up substantially from the $11.4 million in the proposed project.

Due to the lower de facto population at build-out, the effective stabilized public costs for both the State and County will decline meaningfully under the Alternative 1, dropping from $7.7 million annually for the County and $36.5 million for the State, to $4.9 million and $23 million per year, respectively.

Alternative 3 would result in no increase in de facto population and improvement to economic conditions. Further discussion on social and economic impacts are contained in, respectively, Sections 4.5 and 4.6.

Vehicular Traffic

The proposed project will impact the nearby road network that currently is congested during peak traffic times. The proposed project includes roadway improvements that would reduce the impact and improve roadway conditions for the regional community.

Alternative 1 includes the same roadway system improvements as the proposed project, yet would reduce vehicular traffic by 35 percent when compared to the proposed project. Alternative 2 would have similar traffic conditions and roadway improvements as Alternative 1. Alternative 3 would result in no increase in traffic and no roadway improvements.

Marina Traffic Study

The increase in boat traffic due to the proposed 800-slip marina would cause entrance channel congestion during varying combinations of existing and new marina peak traffic flow. Worst case conditions of active sport fishing weekend and summer holiday recreational traffic result in traffic volumes exceeding capacity over a short afternoon period. Mitigation to address boat traffic in the proposed project include widening the entrance channel, traffic control, implementation of a permanent traffic control tower, or limiting vessel size.

Alternative 1 would result in a 21 percent reduction in boat traffic congestion under average existing conditions and ten percent reduction during peak existing conditions. The reduction to 400 slips also reduces the impacts of congestion at the entrance channel, thereby reducing the need for any modifications to the entrance channel.

Alternative 2 would have the same level of boat traffic as the proposed project. Alternative 3 would not meet the demand for additional boat slips and would not generate additional boat traffic. Further discussion on marina traffic is contained in Section 4.8.

Police, Fire and Medical Services

The proposed project will impact police, fire and medical services due to an increase in de facto population and increased on-site activity. Alternatives 1 and 2 would have similar levels of impact as the proposed project due to increased on-site activity. Further discussion on police, fire and medical services are contained, respectively, in Sections 4.10.1, 4.10.2 and 4.10.3.

Drainage and Storm Water Facilities

The proposed project will increase drainage flows, quantities, velocities, erosion, and sediment runoff.

Alternative 1 involves a reduction of the project density that would reduce storm runoff from the various land uses due to a reduction in impervious surfaces associated with hotel and time-share development and to the creation of more open space. However, roadway areas will increase by about 30 percent in Alternative 1. Storm runoff from proposed streets would therefore increase; thus requiring additional drainage facilities and possibly resulting in no net savings. The golf course in Alternative 2 may also change drainage characteristics from those of the proposed project and may not reduce impacts. Alternative 3 would result in no change in existing conditions and no improvements to drainage infrastructure. Further discussion on drainage and storm water facilities is contained in Section 4.10.5

Wastewater Facilities

The proposed development is located within the service area of the Kealakehe WWTP and a sewer system will be installed that connects to the WWTP. The sewer system will be comprised of a network of gravity sewers, force mains, and pumping stations which collect and convey wastewater to the existing Kealakehe WWTP. Project improvements will incorporate the usage of recycled / R1 water. Improvements implemented by the proposed project will also accommodate the needs of the regional service population.

Alternative 1 would generate approximately 10 percent less wastewater flow than the proposed project. Wastewater flow in Alternative 2 is undetermined. Alternative 3 would result in no additional flow, as well as no improvements that will benefit the regional community. Further discussion on wastewater facilities is contained in Section 4.10.6.

Potable Water Facilities

The proposed project average daily water demand is estimated at 1.76 million gallons per day. Existing County sources are not adequate to meet this demand and source development is required. The developer is working with DLNR and two wells have been identified that will produce a sustainable yield that will serve the project. These wells will also serve water needs beyond the project.

Alternative 1 would result in net decrease of about five percent of potable water demand. Alternative 2 may have a lower water demand than the proposed project as long as potable water is not used for irrigation. Alternative 3 would result in no additional flow, as well as no source development that will benefit the regional community. Further discussion on potable water facilities is contained in Section 4.10.8.

Energy and Communications

Regarding Alternative 1, preliminary estimates for electrical, telecommunications, and cable resulted in a net demand load that remains similar to the proposed project. Further discussion on energy and communications is contained in Section 4.10.9.1.

The proposed project will increase the demand for electrical energy and telecommunications. The demand would be reduced in Alternative 1 because the number of boat slips and units would decrease. Similarly, Alternative 2 would have fewer units than the proposed project and therefore reduce energy demands. Further reduction in energy demand for either alternative could be achieved by using seawater air conditioning (SWAC) and other energy reduction measures, as planned by the developer. Further discussion on energy and telecommunications is contained in Section 4.10.9.2.

Water Features and Lagoons

The proposed project includes a brackishwater pond, lagoons, and marine life exhibits supplied by clean seawater. The water features in Alternative 1 would significantly decrease by 74 percent from 19 acres in the proposed project to five acres in Alternative 1. This decrease in water features would result in a corresponding decrease in water source requirements and seawater discharge. Alternative 2 does not include the seawater features. Alternative 3 would result in no additional demand for water source requirements and seawater discharge.

2.2.2 Conformance with Public Plans and Policies

State of Hawai‘i

Chapter 343, Hawai‘i Revised Statutes

Compliance with this chapter is effected, as described in Section 5.1.1 in regard to the proposed project and the alternatives discussed.

- State Land Use Law, Chapter 205, Hawai‘i Revised Statutes

  The discussion in Section 5.1.2 is directly applicable to Alternative 1, the proposed project. Alternative 1 will involve a setback of 400 feet that increases to 600 feet along the southern portion of the project site’s shoreline area. Alternative 2 does not provide for such a setback, but may still require approvals from DLNR for cultural, recreational, and community uses and structures within the Conservation district.

- Coastal Zone Management Program, Chapter 205A, Hawai‘i Revised Statutes

  Recreational Resources:

  In addition to the discussion of consistency with the associated objective and policies, as described in Section 5.1.3, the reduction from the proposed project’s 800-slip marina to a 400-slip marina under Alternative 1 will still expand the region’s boating opportunities and support facilities. The existing harbor entrance will still be utilized under this alternative; however, potential risks relating to boat traffic and congestion in the marina entrance area will be reduced significantly. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities, and marine science center remain important recreational components under Alternative 1.

Alternative 2 includes a golf course component, which would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Alternative 2, like the proposed project, will expand the region's boating opportunities and support facilities through its 800-slip marina. However, the potential adverse impacts of increased boat traffic from the size of the marina are significant enough to offset the benefits of increased boating opportunities.

Coastal Ecosystems:

The discussion in Section 5.1.3 is directly applicable to Alternative 1.

Alternative 1 not only reduces the number of slips proposed by 50 percent, but it also reduces the size of the marina from 45 acres to 25 acres. The 25-acre marina will increase the body of water within the existing harbor, but to a significantly lesser extent than the proposed project's estimated increase, which is also applicable to the 45-acre size that is proposed for the marina under Alternative 2.

The findings of the Harbor Water Quality Modeling Study conclude that a reduction in the size of the harbor expansion is an alternative that will mitigate the risk of significant impacts upon water quality within the marina and existing harbor. Accordingly, the reduction in both the number of slips and the size of the marina basin under Alternative 1, in combination with proper facilities design, public education, and enforcement of harbor rules and regulations, would result in fewer long-term impacts to water quality and coastal ecosystems. Short-term (construction-related) impacts would likely remain the same although the reduction in the total acreage of excavation is expected to result in a shorter duration of such impacts.

In addition to its 800-slip marina and potential adverse impacts upon water quality and the marine environment, Alternative 2 includes a golf course component, which has the potential to impact coastal ecosystems by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Economic Uses

Although reduced in the number of slips, the smaller marina under Alternative 1 will nevertheless serve public demand for more boating facilities in West Hawai‘i and is consistent with the objective and policies and discussion set forth in Section 5.1.3. The economic impacts of Alternative 2, while comparable to those of the proposed project's marina development, are notably marginal as to the golf course component, based on the marketability analysis that indicates a condition of saturation within the region.

Coastal Hazards

The discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Tsunami risks mainly affect the large shoreline setback area that is proposed for the project and Alternative 1. Alternative 2 projects a transient accommodation site that is partially within the tsunami hazard zone and thus carries a higher hazard risk. However, the essential requirement for these alternatives, as well as the proposed project, is a well-prepared and properly implemented evacuation plan.

Beach Protection

Discussion and considerations set forth in Section 5.1.3 are also applicable to Alternatives 1 and 2 and indicate compliance with the objective and policies addressed. Alternative 1 and, to a lesser extent, Alternative 2, will retain the shoreline area in its natural condition.

Similar to the proposed project, Alternative 1 provides for a shoreline setback of considerable width within which no structure, except for possible culturally-related structures, would be allowed. Alternatives 1 and 2 will thus be designed to avoid erosion of structures and minimize interference with natural shoreline processes.

Marine Resources

The discussion in Section 5.1.3 is also applicable to Alternative 1 which is described to be an alternative that is specifically projected to mitigate anticipated adverse impacts on water quality and the marine environment that might otherwise result from the original harbor design and scale, which is also incorporated in Alternative 2 . The reduced marina size under Alternative 1 is projected to meet water quality standards and enable greater compliance with the objective and policies addressed in this section.

Alternative 2 includes a golf course component and thus the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the nearshore waters surrounding the project site.

Hawai‘i State Plans, Chapter 226, Hawai‘i Revised Statutes

Section 226-4 (State goals), 5 (Objectives and policies for population, and 6 (Objective and policies for economy in general):

The discussion in Section 5.1.4 is applicable to Alternatives 1 and 2, in addition to the proposed project. These development concepts generally conform to the goals, objectives, and policies set forth in these sections because they will provide some degree of economic viability, stability, and sustainability for future generations. Kona Kai Ola will convert essentially vacant land into a mixed-use development with a distinctive marina and boating element, providing a wide range of recreational, business, and employment opportunities to the community.

Section 226-8 Objective and policies for the economy – the visitor industry:

Alternatives 1 and 2 will be consistent with the State’s economic objective and policies relating to the tourism industry for the same reasons that are discussed in regard to the proposed project in Section 5.1.4. They will incorporate JDI’s commitment to sustainability principles in the planning and design of the development concepts in Alternatives 1 and 2. Although the total hotel and time-share unit count is reduced to approximately 1,500 in Alternatives 1 and 2, the transient accommodations component of these alternatives will still further the State’s objective and policies for increased visitor industry employment opportunities and training, foster better visitor understanding of Hawai‘i’s cultural values, and contribute to the synergism of this mixed-use project concept that addresses the needs of the neighboring community, as well as the visitor industry.

Section 226-11 Objectives and policies for the physical environment: land-based, shoreline and marine resources:

Alternative 1 is expected to involve less potential adverse impacts upon these environmental resources than the proposed project. Likewise, and Alternative 2 would have less adverse impact because of its reduction in the size of the marina and in the total hotel and time-share unit count. Alternative 1 carries less potential risk to water quality and related impacts upon the marine environment and anchialine pool ecosystems. Although approximately three anchialine pools are expected to be destroyed, the great majority of pools will be preserved within and outside of the proposed 400-foot shoreline setback.

The golf course component in Alternative 2 has the potential to impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides, and other chemicals common in golf course use and management into the marina basin and nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools by introducing the chemicals into the pond systems.

Section 226-12 Objective and policies for the physical environment: scenic, natural beauty, and historic resources:

The discussion in Section 5.1.4 is directly applicable to Alternative 1 and describes the compliance with the objective and policies addressed.

The golf course component of Alternative 2 would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area.

Just as with the proposed project, Alternatives 1 and 2 would also be designed to blend with the natural terrain and to honor and protect the cultural history, resources, and practices of these lands.

Section 226-13 Objectives and policies for the physical environment: land, air and water quality:

As stated above, because of the reduction in both the number of slips and the size of the marina basin, with proper facilities design, public education and enforcement of harbor rules and regulations, Alternative 1 is anticipated to cause fewer long-term impacts to water quality than either the proposed project or Alternative 2. Based on the findings of the Harbor Water Quality Modeling Study, water quality resulting from a reduced marina basin size as proposed under Alternative 1 is expected to be similar to existing conditions.

As previously noted, Alternative 2 has the potential to adversely impact water quality by increasing the nutrient loading in surface runoff and groundwater by introducing pesticides, herbicides and other chemicals common in golf course development and maintenance into the marina basin and nearshore waters surrounding the project site.

Section 226-14 Objectives and policies for facility systems - general:

Alternatives 1 and 2 will conform to the objective and policies of this section on the grounds that are discussed in regard to the proposed project in Section 5.1.4. The master-planning and phasing of the project concepts under these alternatives will be coordinated with associated public and private infrastructural planning and related private and public infrastructural financing. The cost of the marina construction and project-related infrastructure is to be borne by the developer, resulting in considerable savings for the public. In addition, the projected lease revenue from these public lands will provide additional public benefits by establishing a revenue stream for capital improvements and maintenance of a range of State facilities.

Section 226-15 Objectives and policies for facility systems - solid and liquid wastes:

In addition to the developer’s commitment to sustainable development design, the project will involve upgrades to the County of Hawai‘i’s Kealakehe Wastewater Treatment Plant to meet current needs, as well as the project’s future needs. This commitment is applicable to Alternatives 1 and 2, as well as the proposed project that is discussed in Section 5.1.4.

Section 226-16 Objectives and policies for facility systems – water:

The discussion of water conservation methods and the need to secure additional potable water sources in Section 5.1.4 is also applicable to Alternative 1 and demonstrates conformity to the objective and policies for water facilities. Alternative 2 involves greater irrigation demands in regard to its golf course component and greater potable water demands for human consumption than those for Alternative 1. Alternative 2 is expected to face more serious challenges in securing adequate and reliable sources of water.

Section 229-17 Objectives and policies for facility systems – transportation:

Alternatives 1 and 2 will conform to this objective and policies because they will present water transportation opportunities, including the possible use of transit water shuttles to Kailua-Kona, as described in regard to the proposed project in Section 5.1.4.

Section 226-18 Objectives and policies for facility systems – energy:

Alternatives 1 and 2 conform to these objective and policies through the use of energy efficient design and technology and commitment to the use and production of renewable energy to serve the project's needs. Solar energy production, solar hot water heating, and the use of deep cold seawater for cooling systems are currently identified as means of saving substantial electrical energy costs for the community and the developer.

Section 226-23 Objectives and policies for socio-cultural advancement – leisure:

Alternative 1 conforms to this objective and related policies for the reasons offered in Section 5.1.4 in regard to the proposed project. Alternative 1 will be of greater conformity with the policy regarding access to significant natural and cultural resources in light of the 400-600 foot shoreline setback that has been designed for this alternative.

Although it does not propose the considerable shoreline setback that is planned for Alternative 1, Alternative 2 is consistent with this objective and related policies in incorporating opportunities for shoreline-oriented activities, such as the walking trails. In addition, the golf course component adds a more passive recreation alternative to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola.

Section 226-25 Objectives and policies for socio-cultural advancement-culture:

The discussion in Section 5.1.4 is relevant to Alternatives 1 and 2 and demonstrate their conformity the objective and policies of this section.

Both alternatives involve the preservation and protection of cultural features that have been identified by the Cultural Impact Assessment and archaeological studies for the project area. Both provide for public shoreline access, and both will continue the policy of close consultation with the local Hawaiian community and cultural and lineal descendants in the planning of cultural resource preservation and protection.

Section 226-103 Economic priority guidelines:

Alternatives 1 and 2 conform to these guidelines for the same reasons that are set forth in Section 5.1.4. They involve private investment in a public project that will create economic diversification through a mix of marina, industrial, commercial, visitor, and cultural facilities. This presents a wide range of entrepreneurial opportunities, long-term employment opportunities, and job training opportunities.

Section 226-104 Population growth and land resources priority guidelines:

As described in Section 5.1.4, the policy support for the proposed project also extends to the similar development concepts considered in Alternatives 1 and 2. Those alternatives conform to the guidelines of this section because they involve an urban development under parameters and within geographical bounds that are supported by the County's General Plan, a preliminary form of the Kona Community Development Plan, the County's Keahole to Kailua Regional Development Plan, and the reality of being located along the primary commercial/industrial corridor between Keahole Airport and Kailua-Kona. As with the proposed project, the development concepts of Alternatives 1 and 2 are essentially alternatives for the implementation and "in-filling" of the urban expansion area in North Kona.

DHHL Hawai‘i Island Plan

This 2002 plan projects DHHL's Honokōhau makai lands for commercial use. As compared to the proposed project and Alternative 2, Alternative 1 presents an expanded commercial component that provides greater compliance with the plan, while addressing certain beneficiaries' concerns about the scale of the marina originally required in the Project. Alternative 2 also conforms to the recommended commercial uses in the makai lands but to a lesser degree than Alternative 1 because of its more limited commercial component. Like the proposed project, its marina size and number of slips raise environmental issues, as more specifically discussed in Part 3, and community concerns.

County of Hawai‘i General Plan

HCGP Section 4 – Environmental Quality Goals, Policies and Courses of Action:

Alternative 1 is consistent with this section. It presents a reduction in both the number of slips and the size of the marina basin that, in combination with proper facilities design, public education and enforcement of harbor rules and regulations, would result in very few long term impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions.

Alternative 2 is the least consistent with this section. In addition to the potential significant impacts of its 800 slip marina basin, its golf course component has the potential to adversely impact marine resources by increasing the nutrient loading in surface runoff and groundwater and also by introducing pesticides, herbicides and other chemicals common in golf course use and management into the nearshore waters surrounding the project site. It also has the potential to adversely affect the anchialine pools beyond their current conditions by introducing such substances into the pool systems.

HCGP Section 7 – Natural Beauty Goals and Policies:

Alternative 2 conforms to some degree with this section. Its golf course component would create a park-like view that would potentially enhance the beauty of the project site and surrounding areas when considered in combination with the existing rugged natural beauty of the area, as demonstrated in other makai golf courses within the region.

HCGP Section 8 – Natural Resources and Shoreline:

Alternative 1 is most consistent with the goals and policies of this section. It would require considerably less marina excavation than the proposed project and Alternative 2 and would reduce the potential risk of long-term adverse impacts to water quality. Based on the findings of the Harbor Water Quality Modeling Study, water quality would remain similar to existing conditions with the degree of reduction in marina basin size that is proposed under Alternative 1. This reduction is also expected to reduce potential impacts upon anchialine pools and their ecosytems, as well as shoreline and marine resources that are affected by water quality. Alternative 1 also retains the shoreline preservation and protection concepts that are proposed in and described for the Project.

HCGP Section 10 – Public Facilities Goals and Policies:

The discussion in Section 5.2.1. in relation to the proposed project is applicable to Alternatives 1 and 2. Improvements to public facilities are are integral to the Kona Kai Ola development. The provision of additional boat slips and numerous road improvements, including a makai extension of Kuakini Highway south to Kailua-Kona are incorporated into plans for the project's development. In light of these elements, Alternatives 1 and 2 are consistent with the goals and policies of this section.

HCGP Section 11 – Public Utility Goals, Policies:

As with the proposed project, Alternatives 1 and 2 are consistent with the goals and policies of this section, based on the relevant grounds set forth in Section 5.2.1. The developer is committed to design, fund, and develop environmentally sensitive and energy efficient utility systems to the extent possible, as described previously in Part 5. Its master planning provides for the coordinated development of such systems with the objective of achieving significant savings for the public. As previously-mentioned example, the project development involves the upgrading of the Kealakehe Wastewater Treatment Plant.

HCGP Section 12 – Recreation:

Alternative 1 is consistent with the goals, policies, and courses of action for North Kona in this section.

Although the number of slips is reduced under Alternative 1, the region's boating opportunities and support facilities will still be expanded. The existing marina entrance would still be utilized under this alternative. However, concerns relating to increased activity leading to increased congestion in the marina entrance area would be mitigated to a certain extent. The 400-600 foot shoreline setback, public parks, trails, cultural areas, community facilities and marine science center remain important components of Alternative 1.

The golf course component of Alternative 2 would add a more passive recreation to the active and social components, such as boating, fishing, swimming, trails, walkways, parks, marine life, educational and interactive areas that are also part of the project. The golf course would enhance the range of leisure and recreational opportunities offered at Kona Kai Ola. Alternative 2 is also considered to be consistent with this section.

HCGP Section 13 and 13.2 – Transportation:

The reduced marina component under Alternative 1 will still provide transportation opportunities and provide for possible use of transit water shuttles to Kailua-Kona, although to a lesser degree than under the proposed project and Alternative 2 . However, in each scenario, internal people-movers are planned, and numerous roadway improvements are planned for coordination with public agencies, including but not limited to the construction of the Kuakini Highway extension between Honokōhau and Kailua-Kona. Accordingly, both Alternatives 1 and 2 are consistent with the goals, policies, and courses of action for North Kona under these sections of the General Plan.

HCGP Section 14.3 – Commercial Development:

For the reasons presented in the discussion under Section 226-104 of the State Plan, the planned commercial component under Alternatives 1 and 2 are consistent with this section.

HCGP Section 14.8 – Open Space:

Alternatives 1 and 2 are consistent with the goals and policies of this section. Alternative 1 provides a considerable (400-600 foot) shoreline setback along the entire ocean frontage of the project site as a means of protecting the area's scenic and open space resources, as well as natural and cultural resources. Although it does not incorporate the shoreline setback planned in Alternative 1, Alternative 2 provides a golf course component would contribute to the amount of open space that is currently proposed and allow additional view corridors to be created.

Community Development Plans

Community development plans are being formulated for different regions in the County in order to supplement the County's General Plan. The Kona Kai Ola project is located in the Kona Community Development Plan (CDP) area. Maps associated with the preliminary work phases

of the Kona CDP include the Kona Kai Ola project site within the "Preferred Urban Growth" boundary of the North Kona district. The Kona CDP process is guided by a Steering Committee composed of a broad cross-section of the community. The Steering Committee will eventually complete its work and recommend the CDP's adoption.

After the DEIS was published, the Kona CDP has progressed to the development of plans for the major urban growth corridor north of Kailua-Kona. The Kona CDP has produced a draft plan showing a transit oriented development that includes a midlevel public transit corridor along the mauka residential elevation, and a makai transit corridor that runs along a proposed new frontage road just makai and parallel to Queen Kaahumanu Highway. The development plan for Alternative 1 includes the Kuakini Highway as part of this proposed frontage road and transit line from Kailua Kona to the Kealakehe area, along with a transit stop at Kona Kai Ola. The Alternative 1 plan also includes a road that could be extended to be part of the proposed frontage road should it be approved and implemented. In addition, the Kona CDP has continued to emphasize the principles of smart growth planning with mixed use urban areas where people can live, work, play and learn in the same region. Kona Kai Ola has been specifically designed to be consistent with this policy in order to provide a stable employment base close to where people live in the mauka residential areas already planned for DHHL and HHFDC lands.

It should be noted that currently and over the years, the 1990 Keāhole to Kailua Development Plan (K-to-K Plan) guides land use actions by the public and private sectors. It is intended to carry out the General Plan goals and policies related to the development of the portion of North Kona area, including the Kona Kai Ola site. The "Preferred Growth Plan" of the Keāhole to Kailua Development Plan identifies the project site as a new regional urban center to include commercial, civic, and financial business related uses, an expanded "Harbor Complex," a shoreline road, and a shoreline park. The proposed project and the development concepts in Alternatives 1 and 2 are therefore consistent with the recommendations in the Keāhole to Kailua Development Plan.

Hawai'i County Zoning

As shown on Figure AA, the project site is zoned "Open". Under Section 25-5-160 of the Hawai'i County Code, "The O (Open) district applies to areas that contribute to the general welfare, the full enjoyment, or the economic well-being of open land type use which has been established, or is proposed. The object of this district is to encourage development around it such as a golf course and park, and to protect investments which have been or shall be made in reliance upon the retention of such open type use, to buffer an otherwise incompatible land use or district, to preserve a valuable scenic vista or an area of special historical significance, or to protect and preserve submerged land, fishing ponds, and lakes (natural or artificial tide lands)".

Some of the proposed uses at Kona Kai Ola are permitted uses in the Open zone such as:

- Heiau, historical areas, structures, and monuments;
- Natural features, phenomena, and vistas as tourist attractions;
- Private recreational uses involving no aboveground structure except dressing rooms and comfort stations;

- Public parks;
- Public uses and structures, as permitted under Section 25-4-11.

In addition to those uses permitted outright, the following uses are permitted after issuance of a use permit:

- Yacht harbors and boating facilities; provided that the use, in its entirety, is compatible with the stated purpose of the O district.
- Uses considered directly accessory to the uses permitted in this section shall also be permitted in the O district.

The proposed time-share and hotel units and commercial uses would not be consistent with the zoning designation of “Open”. Project implementation therefore requires rezoning of portions of the project to the appropriate zoning category or use permits for certain uses.

Special Management Area

As shown in Figure AB, the entire project area up to the highway is within the coastal zone management zone known as the Special Management Area (“SMA”). At the County level, implementation of the CZM Program is through the review and administering of the SMA permit regulations. Kona Kai Ola complies with and implements the objectives and policies of the Coastal Zone Management (CZM) Program, and a full discussion is provided in Section 5.1.3. The development concepts in the proposed project and Alternatives 1 and 2 will be subject to applicable SMA rules and regulations.