HAWAIʻI ISLAND COMMERCIAL HARBORS 2035 MASTER PLAN UPDATE







State of Hawaiʻi
Department of Transportation
Harbors Division
August 2011

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LIST OF ACRONYMS

ARRA	America Recovery and Reinvestment Act
ATDC	Aloha Tower Development Corporation
bbls	Barrels
BEA	U.S. Bureau of Economic Analysis
CDP	Community Development Plan
cm	Centimeter
COH	County of Hawai'i
COT	Commission on Transportation
DBEDT	State Dept. of Business, Economic Development and Tourism
DHHL	State Department of Hawaiian Home Lands
DLNR	State Dept. of Land and Natural Resources
DOH	State Department of Health
EA	Environmental Assessment
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
FSO	Facility Security Officer
FSP	Facility Security Plan
GDP	Gross Domestic Product
GSP	Gross State Product
GIS	Geographic Information System
HDOT	State Department of Transportation
HHUG	Hawai'i Harbors User Group
HMP	Harbors Modernization Plan
LCL	Less-than-Container Loads
LUPAG	Land Use Pattern Allocation Guide
m	Meter
mbm	Thousand Feet Board Measure (Measurement for Lumber)
MGD	Millions of Gallons per Day
MTSA	Maritime Transportation Security Act
NCL	Norwegian Cruise Line
NPS	National Parks Service
NEPA	National Environmental Policy Act
pax	Passengers
PUC	Public Utilities Commission
PCA	Puakō Community Association
QEF	Queen Emma Foundation
RO/RO	Roll-on/Roll-off
SLUD	State Land Use District
TEU	Twenty Foot Equivalent
TMK	Tax Map Key
TWIC	Transportation Worker Identification Credentials
TSA	Transportation Security Administration
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey

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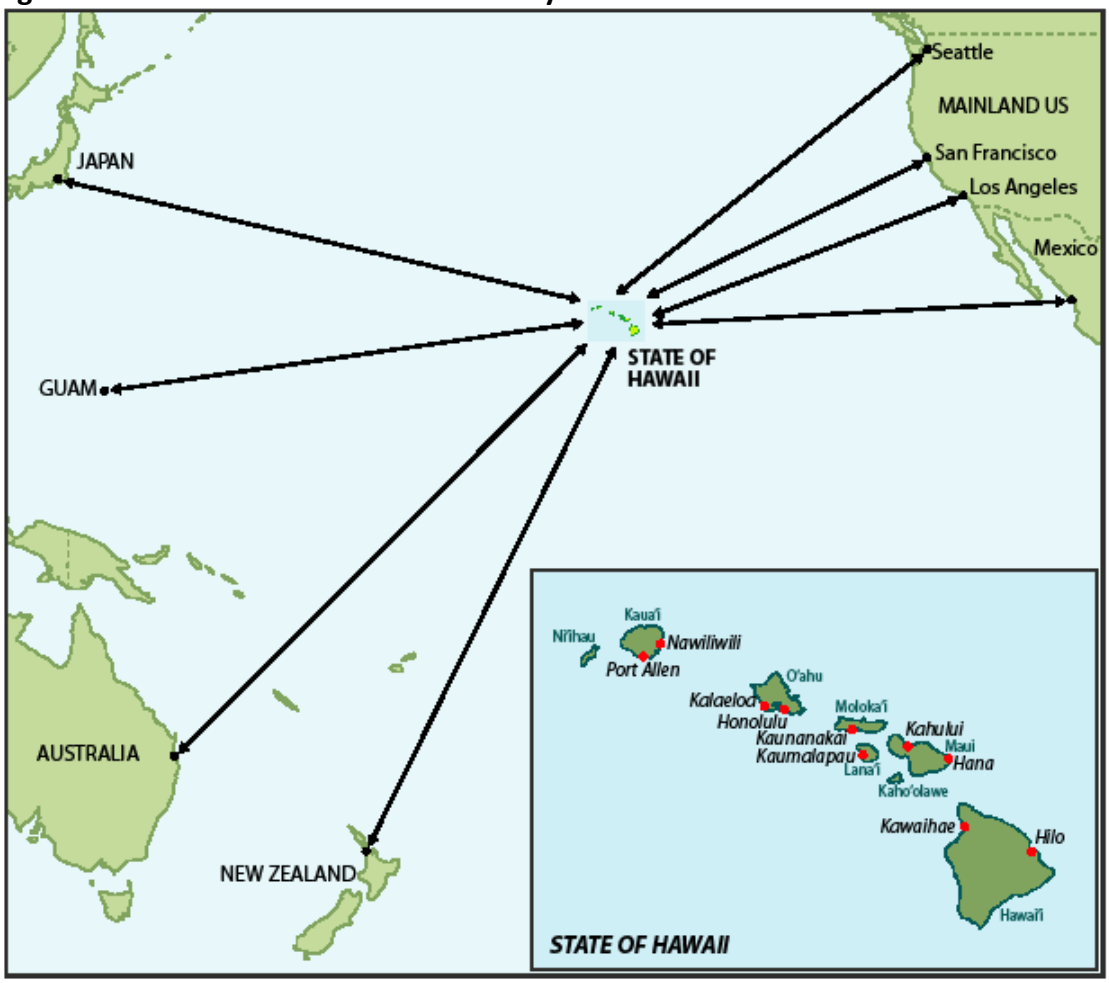
CHAPTER 1
BACKGROUND

1.1 INTRODUCTION

Located in the central Pacific Ocean, Hawai'i is an island archipelago situated over 2,000 miles from the nearest significant land mass and is the only state made up entirely of islands. Its residents pay for this geographic isolation with a near absolute dependence on ocean surface transportation for their sustenance. Eighty percent of all consumer goods are imported into Hawai'i. Its ports receive and process 98.6 percent of those imports.[1] As such, ocean transportation is Hawai'i's lifeline to the world. It supports every facet of the local economy: tourism, construction, national defense, agriculture, and all other industries. No other state in the union depends on shipping to the degree that Hawai'i does.

Figure 1.1: Hawai'i Commercial Harbors System



[1] Lee, D. and C. Olive. *Size and Growth Potential of Hawai'i's Maritime Industry*. Department of Agriculture and Resource Economics, and Sea Grant College Program, University of Hawai'i. Prepared for DBEDT, Ocean Resources Branch. 1994.

1.2 HAWAI'I DEPARTMENT OF TRANSPORTATION, HARBORS DIVISION

The Hawai'i Department of Transportation (HDOT) was established in 1959 to provide air, land, and water transportation facilities supporting commerce and the state's economy by providing efficient and cost effective transportation systems. It is comprised of three modal divisions: Airports, Harbors, and Highways. Together, these three transportation divisions constitute an inter-modal system that contributes to the convenience and welfare of Hawai'i's community.

The Harbors Division is responsible for administering the State-owned harbor facilities used by commercial cargo, passenger and fishing operations. Hawai'i Revised Statutes Chapter 266 delineates this responsibility as the control, management, use, and regulation of commercial harbors and their improvements. Its program objectives support Hawai'i's economic prosperity and quality of life. Harbors Division promotes the well being of cargo, passenger, fishing industries, and other maritime related services and support activities. In addition, the Harbors Division also promotes the enjoyment of certain waterfront facilities by the general public.

The Harbors Division manages 10 commercial harbors located in each of the four counties' political subdivisions (see Figure 1.1 inset on previous page).

1.3 PURPOSE OF MASTER PLANS

The master plans are long-range strategic guides that provide a framework for the orderly development of the commercial harbors to accommodate the future needs of its facilities. These needs are translated into specific harbor improvements to existing facilities. Master plans are developed based on the knowledge and experience of facility users. In addition, government agencies, adjacent property owners and the public provide input into the planning process. The Harbors Division routinely updates its master plans to ensure they are kept current with recent trends and operations as changes in these may affect harbor efficiencies. For example, growth in population and economy would increase the demand for harbor facilities.

Master plans must also consider emerging issues that will impact harbor operations as well as new laws and regulations. Recent examples include: security requirements, invasive species, climate change and sea level rise, new vessel types, and adjustments in the actual shippers or the way they conduct business in Hawai'i.

1.4 2035 MASTER PLAN PLANNING PARAMETERS

The 2035 Master Plan was developed using several planning parameters that helped to provide framework to the plan. First, the Harbors Division's mission statement provided the agency's role, that is:

- To ensure the continuous and effective management and operation of a statewide commercial harbors system that facilitates the efficient movement of people and goods cost effectively to, from, and between the Hawaiian Islands.

Second, the objectives of the 2035 Master Plan were developed based on input received from the Harbors Division:

- Develop terminal facilities and storage areas that can accommodate multiple uses, but give priority to cargo operations.
- Meet current and anticipated demand for cargo moving in and out of the Hawai'i Island harbors terminals.
- Decrease congestion and reduce conflicts due to multiple users.
- Ensure safe operations.
- Avoid or minimize negative impacts on the environment and cultural sites.
- Meet current and anticipated demand for passenger travel, including cruise ships and inter-island ferry service.
- Protect and secure facilities from natural or man-made threats and ensure preparedness and rapid response following disasters.
- Provide access to port landside areas that incorporates modern security techniques and which has least impact on surrounding land uses.
- Integrate harbor growth into the context of County land use and the uses of adjacent parcels.

Finally, the future vision for the 2035 Master Plan was based on input received from the stakeholders:

- Continued operation and evolution of Hilo and Kawaihae Harbors are seen as an integrated modern commercial harbors system. Together, these two harbors will continue to serve the needs of the island population for import and export, and dynamically provide for changing needs in the State and the island economic sectors including but not limited to agriculture, tourism, retail, and military.
- The Harbors system will play a critical role in an expanded and re-invigorated Hawai'i Island economy as the island maintains a key role in the State's quest towards greater energy and food independence and sustainability. The system needs to be made secure from natural and man-made threats, and to provide redundancy in the event of disruptions. The system will be flexible in order to serve changing needs and intermittent uses, as needs and opportunities present themselves. Priority should be given to maritime dependent uses.

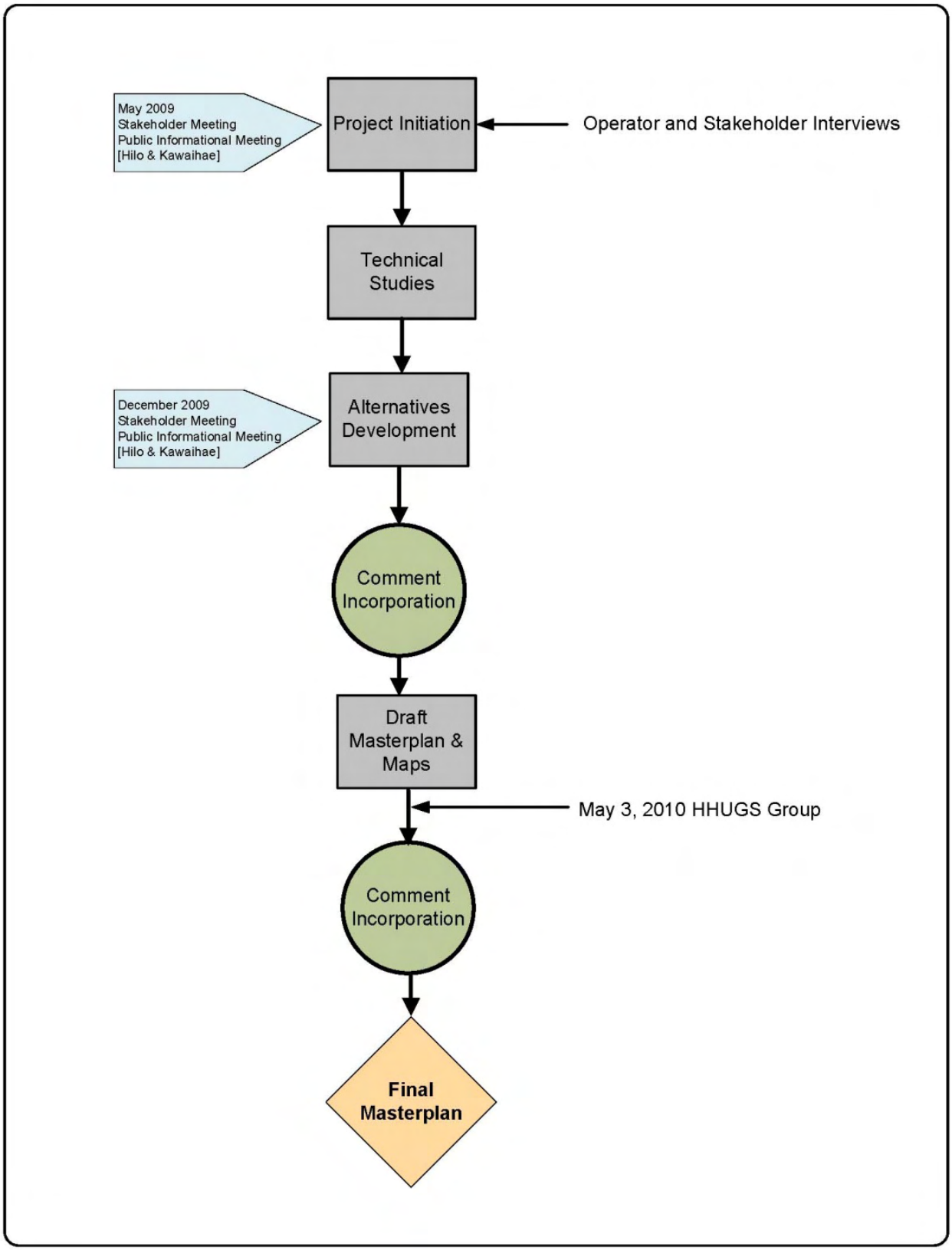
1.5 MASTER PLAN METHODOLOGY

The 2035 Master Plan was developed through a collaborative process using input from harbor users, government agencies, adjacent property owners, and the public. In addition, the 2035 Master Plan considered the relevant planning efforts of the surrounding area. Finally, technical studies, forecasts, and analyses were used to further inform and define the future needs. Figure 1.2 outlines the basic steps involved in preparing the 2035 Master Plan.

A stakeholder advisory group with representatives from harbor users, government agencies, and adjacent property owners assisted throughout the plan process. Over 21 meetings with individual stakeholder members in Hilo and Kawaihae were conducted between February 2009 and April 2010. Stakeholder group meetings served as an opportunity for stakeholders to share input with each other and with the State on the plan throughout the process.

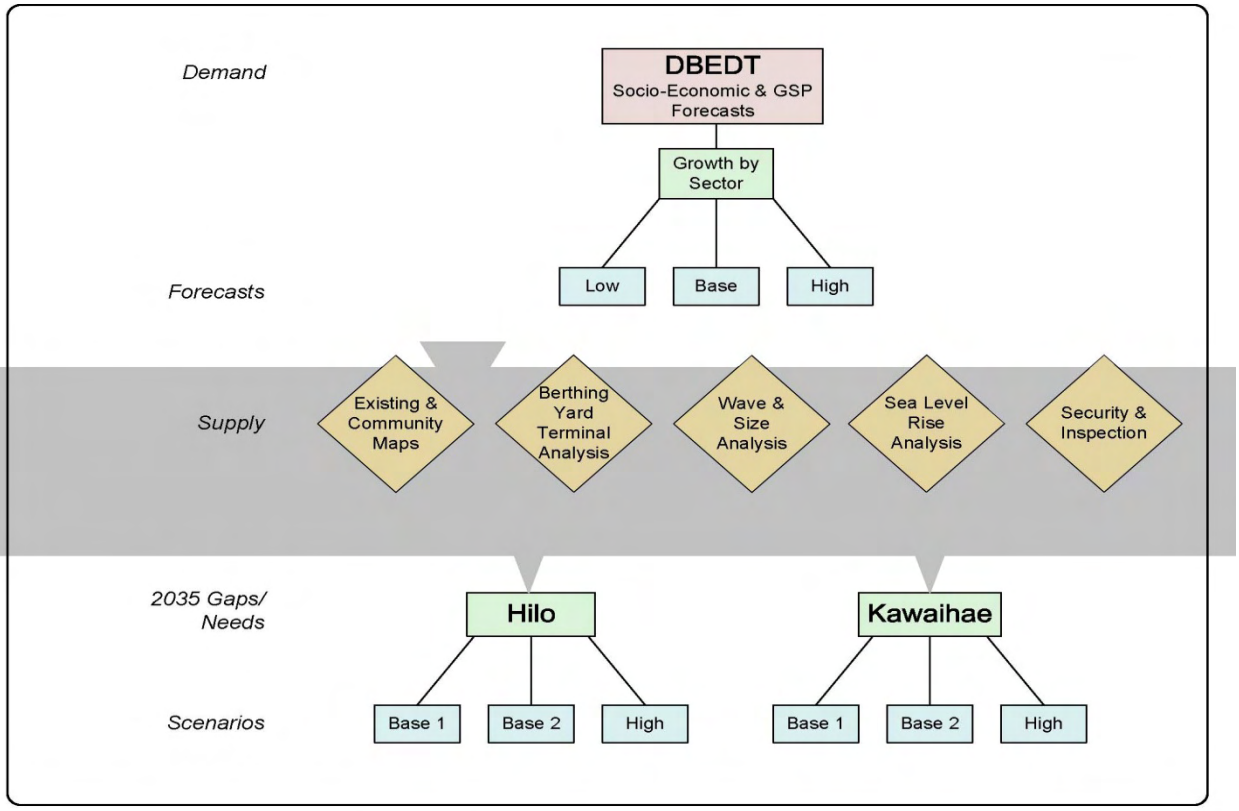
In addition, public information meetings were held to ensure the public an opportunity to see the alternatives and to provide input. Meeting schedules were advertised in the local newspaper and open to all. The meeting format included open house poster displays followed by a presentation and question and answer period. The public meetings often included general questions about harbor operations and therefore senior managers from HDOT hosted the meetings. A summary of meeting dates, locations, attendance, and topics is contained in Appendix 1.

Figure 1.2: Steps in the Master Plan Development



Finally, the technical approach is depicted in Figure 1.3. This was used to quantify asset needs in the future. Demand studies included forecasts of socio-economic and Gross State Product, analyzed by sector. Supply studies looked at berthing, yard, and terminals needs. In addition, there was a wave and surge analysis, a sea level rise analysis and a review of security protocols. Demand and supply studies identified gaps and needs for the 2035 Master Plan, resulting in alternatives scenarios for each harbor. A summary of Forecasts and Technical Analyses for the 2035 Master Plan is contained in Appendix 3. The complete studies are available in a separate volume.

Figure 1.3: Development of Future Asset Needs & Scenarios



The 2035 Master Plan matches the needs of each harbor by using input on the alternative scenarios. The most advantageous features are incorporated in the 2035 Master Plan.

Implementation of the 2035 Master Plan will proceed over several years. It is expected that it will be done in phases. Illustrative phasing is provided in Section 3.3.3 for Hilo and Section 3.4.4 for Kawaihae. Change, renovation, and expansion all need to occur while the harbors remain in operation. Therefore, careful advanced planning is essential to successfully implement the 2035 Master Plan.

1.6 PREVIOUS HAWAI'I ISLAND COMMERCIAL HARBOR MASTER PLANS

There have been two previous Hawai'i Island commercial harbors master plans. The 2010 Master Plan was prepared in 1989 and the 2020 Master Plan was prepared in 1998. Each master plan seeks out the knowledge and experience of a range of users and involves them in the planning process. Users assist with the identification of needs, the forecasting of future conditions and thus, the master plans can serve as a long range strategic guide towards fulfilling future needs. Each master plan attempts to be sufficiently flexible to account for changing economic, social, land use, development and other forces that shape the harbor role. Master plans are important planning documents because they are long-range guides that form the basis for the Harbors Division's capital improvements program (CIP).

The planning effort for the *Hawai'i Island Commercial Harbors 2035 Master Plan Update* (2035 Master Plan) was started in 2008. The 2035 Master Plan supersedes the *Hawai'i Commercial Harbors 2020 Master Plan* (2020 Master Plan) that was completed in 1998.

The 2020 Master Plan anticipated 110,300 TEU's of overseas containers, 793,278 short tons of general cargo, and a "boom" in cruise passenger service, leading to recommendations for additional cargo yards, terminal space, and berths at both harbors as well as associated navigational improvements.

1.7 VALUE OF THE HARBOR SYSTEM

Hawai'i's economy has grown rapidly since statehood, largely due to tourism. To support growth, Hawai'i must import food, fuel, raw materials, and most consumer goods. Current prosperity and quality of life are highly reliant on the commercial harbors system. Ocean transportation provides the lowest means cost and the most energy efficient way of transporting cargo in and out of the state from the US mainland and foreign countries to residents and businesses. The other alternative is air transportation; however, it is not an economical or practical substitute for transporting goods except for time sensitive cargo where cost is not a consideration. Maintaining an efficient commercial harbors system is vital to the well being of Hawai'i's economy.

Understanding the value of the commercial harbors system can be appreciated from the following perspectives: economic assessment, economic activity, employment, and energy.

Economic Assessment

A report documenting the impact of Hawai'i's harbors on the local economy indicated that if commercial harbor services were curtailed, the first sector impacted would be local businesses. Construction costs would rise due to a shortage of building materials. Retailers and wholesalers would have insufficient supplies and dramatically higher costs for any travel by air. There would be higher costs, lower productivity, and these costs would be passed on to consumers. If

one were to arbitrarily assume a constrained growth rate of one percent, the annual loss over normal projected growth would rise from $33 million in 2015 to close to $132 million in 2035.[2]

Economic Activity

Another method of valuing the harbor system is the economic model that measures the dollar value of goods and services purchased from harbor related activities. According to the SMS Input-Output Model, total value of products purchased either by consumers or by other industries (also called "intermediate demand") in Hawai'i Island came to $384 million dollars in 2005. This amounts to 3.2 percent of the total economic activity in the county. This is the direct value added by the harbor industry. In the year 2005, this contribution matched that of the construction industry, and was about one-fourth that of the hotel industry.

Table 1.1 below demonstrates that the harbor industry value grows faster than either its payroll or its imports. This suggests a relatively efficient operation with a high capital to labor ratio. The values for 1992 come from the 2020 Master Plan. The values for 2002 and 2005 are created by SMS from the Inter-County Input-Output Model. The 2009 estimate was developed using multipliers and applying them to the Gross County Product (GCP) for 2009.

Table 1.1: Economic Value of Hawai'i County Harbors, 1992-2009

Characteristic*	1992	2002	2005	2009
Value of services purchased by other industries	29.2	33.7	107.3	130.8
Value of services purchased by consumer	27.6	67.9	178.5	207.1
Value of all harbor industries output	56.8	101.6	285.7	337.9
Value added: contribution to Gross County Product	19.3	64.1	114.5	134
Labor income: total annual payrolls	13.3	40.9	65.7	80.2
Value of imports	18.5	14.8	39	50.4
Est. number of jobs supported by the industry	1,500	1,929	1,986	2,423

Source: SMS Research, *Economic Impact of Harbors on the Island of Hawai'i*, 2010
**In millions of dollars; except jobs which is in actual numbers*

Failure to keep up with demand, in the form on congestion at the harbors, would have similar negative impacts. Applying the forecasts developed for this master plan update to a constraints analysis, Table 1.2 on the following page shows that by constraining growth, there would be an annual loss of $42 million by 2035, the forecast year for this study. Total economic value of harbors activity foregone would be $207 million.

[2] Leroy O Laney, Ph.D. *The Impact of Hawai'i's Harbors on the Local Economy*. Prepared for HHUG. 2007.

Table 1.2: Results if Improvements are Not Made to the Harbors

Year	Unconstrained growth due to improvements being made*	Constrained growth if improvements are not made*	Difference (Annual Loss*)
2005	$285.7	$285.7	
2021	$357.8	$357.2	$0.6
2027	$392.8	$387.0	$5.8
2035	$440.3	$398.0	$42.3

Source: SMS Research, *Economic Impact of Harbors on the Island of Hawai'i*, 2010.
**In millions of dollars*

Employment

Still another value of the harbors is to the number of jobs it supports. In 2005, the Hawai'i Island harbors supported nearly 2,000 jobs and an annual payroll of $66 million, according to SMS Research analyses for this master plan. This is equivalent to 2.1 percent of island jobs and 2.5 percent of island payroll. According to analysis by SMS Research, the harbors industry contributed more than $114 million to the GCP[3].

Energy

Meeting the energy needs of residents and businesses is another important value. As an island state, fuel is imported and stored at the harbors or private property near the harbors. In 2009, 4.4 million barrels of petro chemicals were imported into Hilo Harbor, an increase of 2.8 percent over Year 2000. More than one-third is gasoline; the rest is diesel or liquid petro. The 2035 Master Plan forecast expects 7.0 million barrels will be required for the Island by year 2035.

Fuel presents one of the more interesting and challenging commodities to consider. The State of Hawai'i Clean Energy Initiative has a goal to reduce dependency on imported fossil fuel by 70 percent by the year 2030. Tests are ongoing whether alternative fuels can be stored in existing petroleum tanks. In the event that separate storage facilities are needed, the storage tanks and appurtenances should be located near harbor property for the cost efficient delivery of the fuels. Hawai'i Island has the greatest potential for either becoming self-sufficient or to be an exporter of alternate fuels. Should export become a reality, the ports would be a valuable part of the equation, both for storage and for transport.

[3] SMS Research work is based on data provided by the Department of Business, Economic Development, and Tourism, READ, 2005 in the County Input-Output Model.

CHAPTER 2
CONTEXT AND SETTING

2.1 STUDY AREA DESCRIPTION

Hawai'i Island has the largest land area and the second largest population in the state. In 2008, the population was estimated at 175,784 residents living on a land mass of 4,028 square miles. There are two main population areas on two sides of island: Hilo on the east side and Kailua-Kona on the west side, which is also referred to as Kona. In 2008, the immediate area around Hilo had a population of 48,104 as estimated by the American Community Service (ACS) of the US Census Bureau for periods between the decennial censuses. The Kona general area population is below the level where it is broken down in mid-census estimates, but its year 2000 population was 37,000. The visitor population in 2009 added an average of 4,583 persons per day in Hilo. In Kona, where there are more visitors and stays are typically longer than on the east side, visitors add an additional 18,622 persons per day, according to data provided by the State Department of Business, Economic Development, and Tourism (DBEDT).

Even though Hilo is the center of government, business, and commerce, over the last two years there has been substantial growth associated with tourism and resort living in Kailua-Kona and north of that along the coastline to North Kohala. Despite this activity, currently Hawai'i County is designated as an economically distressed area based on its high unemployment rate.

Hawai'i Island is served by two deep-draft commercial harbors: Hilo Harbor located on the northeast coast of the island and Kawaihae Harbor located to the northwest coast. Together these harbors work as an integrated system bringing to the island all consumable goods, durables, building materials and fuel. Cargo transported to Hawai'i Island is integrally linked to Honolulu Harbor, where the majority of cargo first arrives into the state. Cargo is then transferred to other vessels in Honolulu Harbor before it is transshipped to Hilo or Kawaihae. In 2008, cargo volume to Hawai'i Island reached 2.782 million tons and there were 1,674 vessel arrivals.

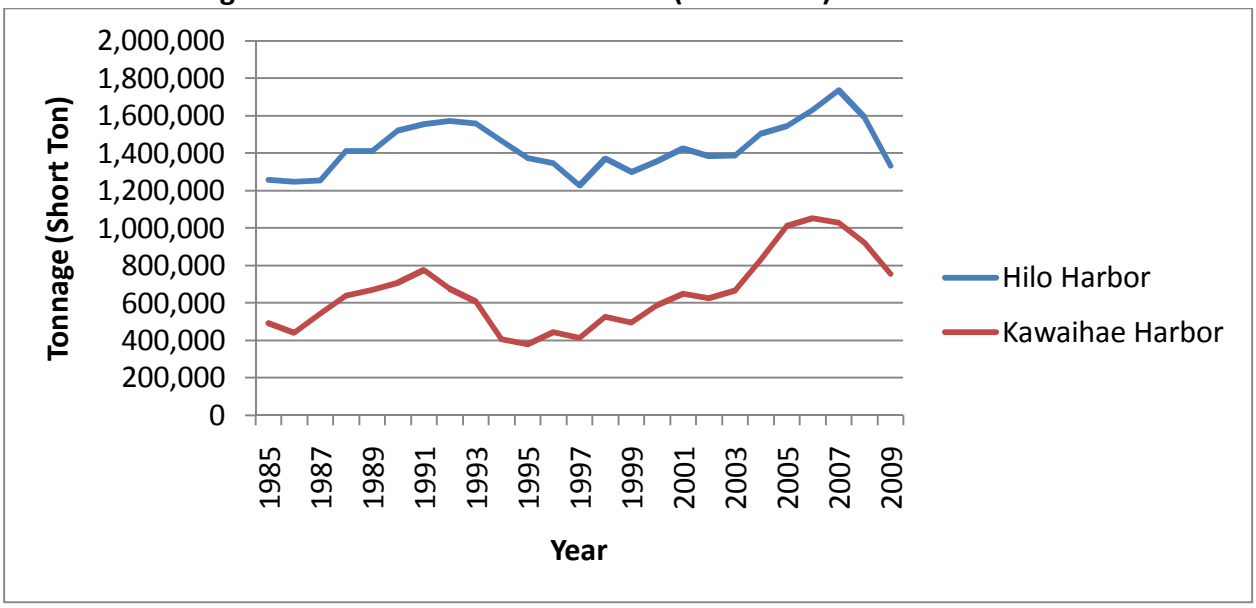
Exports, while fewer in volume are equally critical, especially for agriculture business. Sugar cane and cattle used to dominate exports. More recently, island agriculture has seen diversification adding coffee, exotic flowers, papaya, and macadamia nuts to the list of exported goods. Exports are shipped to other islands in the island chain, the United States (US) Mainland, as well as to global markets through a well developed harbor system. Bottled water and aquaculture products are exported from Kawaihae to Japan. The harbors also handle unique items such as scientific equipment for Mauna Kea Observatory and military equipment destined for Pohakuloa Training Area (PTA) in the Hamakua District north of Hilo, the US Army's largest training area in Hawai'i. Although the character of cargo has changed, the island has seen steady growth for the past thirty years as shown in Table 2.1.

Passenger cruises in Hilo are a relatively new addition to port activity (there are none at

Kawaihae). It is estimated that cruise activity has increased the visitor population by twenty percent with an average daily visitor census of 23,251. Combined with the resident population of 177,835, total daily census exceeds 200,000 according to the American Community Survey (ACS).

Hawai'i Island's commercial harbors are interdependent. Plans for either harbor will impact the other. Therefore, the 2035 Master Plan combines planning for both Hilo and Kawaihae harbors into a single master plan and treat planning considerations for both as an interrelated commercial harbors system.

Table 2.1: Tonnage for Hilo and Kawaihae Harbors (1985-2009)



Source: SSFM based on HDOT Harbors Cargo Statistics (Short Tons)

2.2 HILO HARBOR

Hilo Harbor, the island's busiest port, is located on the northeast coast of Hawai'i Island. Hilo Harbor's basin measures 1,400 by 2,300 feet long and it is protected by a 10,000 foot breakwater. Depth of the harbor basin and the entrance channel is 35 feet. It is located a mile south of Hilo International Airport and is served by Kalanianaole Avenue. Hilo Harbor's main entrance to the harbor is located at Kūhiō Street, while the secondary entrance is located at Kahanu Street.

Figure 2.1: Aerial View of Hilo Harbor

Source: University of Hawai'i, School of Ocean and Earth Science and Technology, Coastal Geology Group

2.2.1 History of Hilo Harbor

Both Hilo and Kūhiō Bays have a long history of being utilized for marine purposes such as boat launching and fishing. The first structure, a stone pier, was built in 1861 by Thomas Spencer. The two mile long rubble mound breakwater was built by the US Government between 1908 and 1929 to protect the harbor from winter storms. The breakwater is made of large stones weighing several tons each that were transported from Puna on the Hilo Railroad.

The breakwater is built on a submerged reef known as Blond Reef. The reef was named after the HMS Blond, an English vessel that carried the young bodies of Liholiho (King Kamehameha II) and his wife, Queen Kamamalu, who had died of measles while visiting London. The harbor was hit by tsunami twice in recorded history, once in 1946 generated by an earthquake in the Aleutian Islands and again in 1960 generated by an earthquake in Chile. The harbor was used extensively during the sugar plantation period at the turn of the century and later by the visitor industry.

Local Hawaiian historians have reported the presence of a heiau nearby Pier 3 and in the vicinity of the Baker Beach lots (T.M.K.: 2-1-07:11). The local group wishes to document and preserve this heiau, which is ipo lono type, typically used for fishing and agriculture ceremonies in Hawaiian culture. This property is under the jurisdiction of DLNR. Tenant leases expire in 2015.

2.2.2 Existing Harbor Facilities at Hilo Harbor

Hilo Harbor has three existing piers and a new pier and yard (Pier 4) to be constructed by 2015. Pier 1 is 1,265 feet long, has a yard area of 13.4 acres, and shed area of 81,635 square feet.

Pier 2 is 703 feet long, has only 2 acres of yard space, and shed area of 37,884 square feet. Pier 3 is 763 feet long, has 7.3 acres of yard space and no shed. Combined cargo handling and storage area at Hilo Harbor is 13.65 acres. When completed, Pier 4 will be 602 feet in length and will have 10 acres of yard space.

2.2.3 Use and Operations at Hilo Harbor

Pier 1 is used by interisland container barges, cargo ships, and large cruise ships. Pier 2 is used by cement barges and has a roll-on/roll-off (RO/RO) interisland barge facility. Pier 3 is primarily used by fuel barges. The future Pier 4 will have 602 feet of additional berth space and will have an expanded and upgraded yard for interisland cargo operations.

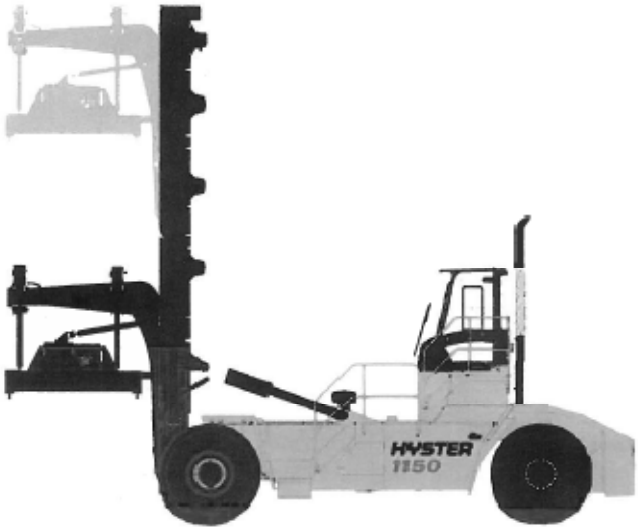
Pier 1 is shared by cargo and cruise operators. Matson Navigation Company (Matson) services container barges at Pier 1 using top-pick and forklifts to move containers on and off of barges as needed. They also have a crane barge, the Mauna Loa, that typically arrives weekly. Pasha Hawai'i Transport Lines (Pasha) operates RO/RO movements at Pier 1. Pier 1 can accommodate cruise ships measuring up to 965 feet long. The back side of Pier 1 where Radio Bay is located contains a number of berths for transient and other smaller vessels.

Figure 2.2: Cruise Ship Docked at Pier 1

Source: Hawai'i Tribune Herald

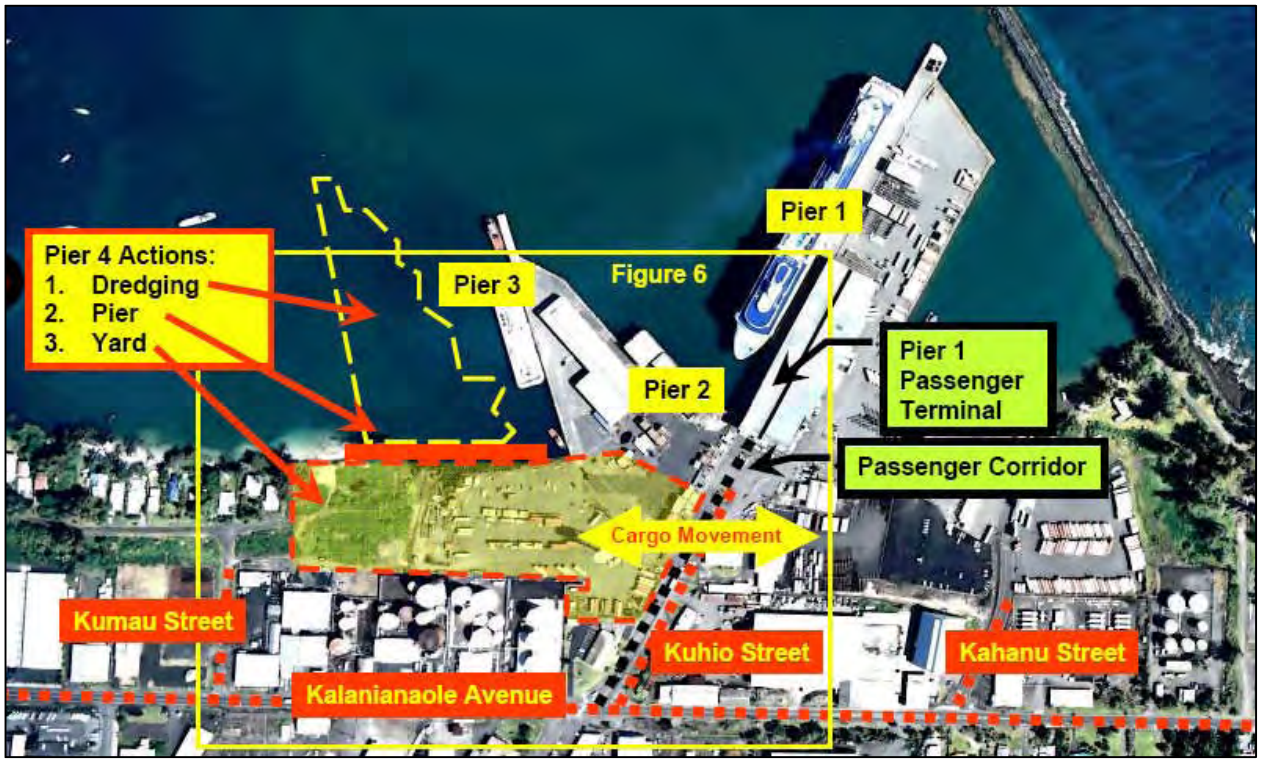
Pier 2 is used by Young Brothers, Limited (YB) to handle interisland cargo. Specifically, YB utilizes a combination of top-picks and forklifts to load and unload containers via stern and side ramps when the barge is berthed at Pier 2 RO/RO facility. Figure 2.3 illustrates typical top-pick equipment that is used to grab and lift containers for handling operations. The Pier 2 shed is used for less-than-container loads (LCL) handled by YB, including packaged agricultural products and produce. Also, Pier 2 has a manifold where cement barges arrive every two weeks to discharge cargo through pneumatic pipelines to a landside storage facility.

Figure 2.3: Hyster Top-Pick



Pier 3 is primarily used for fuel barges operated by Sause Brothers serving The Gas Company and Chevron Corporation. K-Sea Transportation serves Aloha Petroleum, Limited and Tesoro Corporation. During interviews with Hilo Harbor operators, it was described that Pier 3 is infrequently used by smaller vessels while fuel barges are not docked. The Harbor tug boat resides on the inland corner of this Pier. Small or medium-sized cruise ships up to 700 feet long can be accommodated at Pier 3 if the berth is unoccupied.

Figure 2.4: Hilo Harbor and Surrounding Areas



2.2.4 Committed Improvement Projects at Hilo Harbor

Figure 2.5 provides a map of the existing site plan and committed projects for Hilo Harbor.

There are plans to replace the aging Pier 1 Shed's asbestos roof and to split the interior for dual usage with half of the terminal to be used by cruise operators for facility security and passenger screening, and the remaining portion to be used for storage and refrigerated cargo. Also, there are minor traffic circulation improvements at the Kuhio Street entrance to enhance pedestrian safety and to improve vehicular flow in the area.

In the intermediate term, the Harbors Division is committed to building a new Pier 4 to better separate cargo operations from passenger activities at Pier 1. There are three major components to this project:

- Dredging 165,000 cubic yards to allow barge access to create a ten acre contiguous yard.
- Reconstruct and expand the existing yard. Pier 4 will have ten acres of yard area. Upgrade utilities and lighting, new comfort station, perimeter security fencing, and new terminal gate.
- Construct new 602-foot long by 50-foot wide pier and improvements, drainage, fender system, pier-side utility hatches for water and electricity, and possibly fuel.

Upon completion of Pier 4, berth capacity will increase 26 percent, and storage space will increase 16 percent. A new improved gate at Kumau Street will provide access to Pier 4, separating cargo and passenger activities.

Other committed projects include additional fencing at Pier 1 and Radio Bay Access Road.

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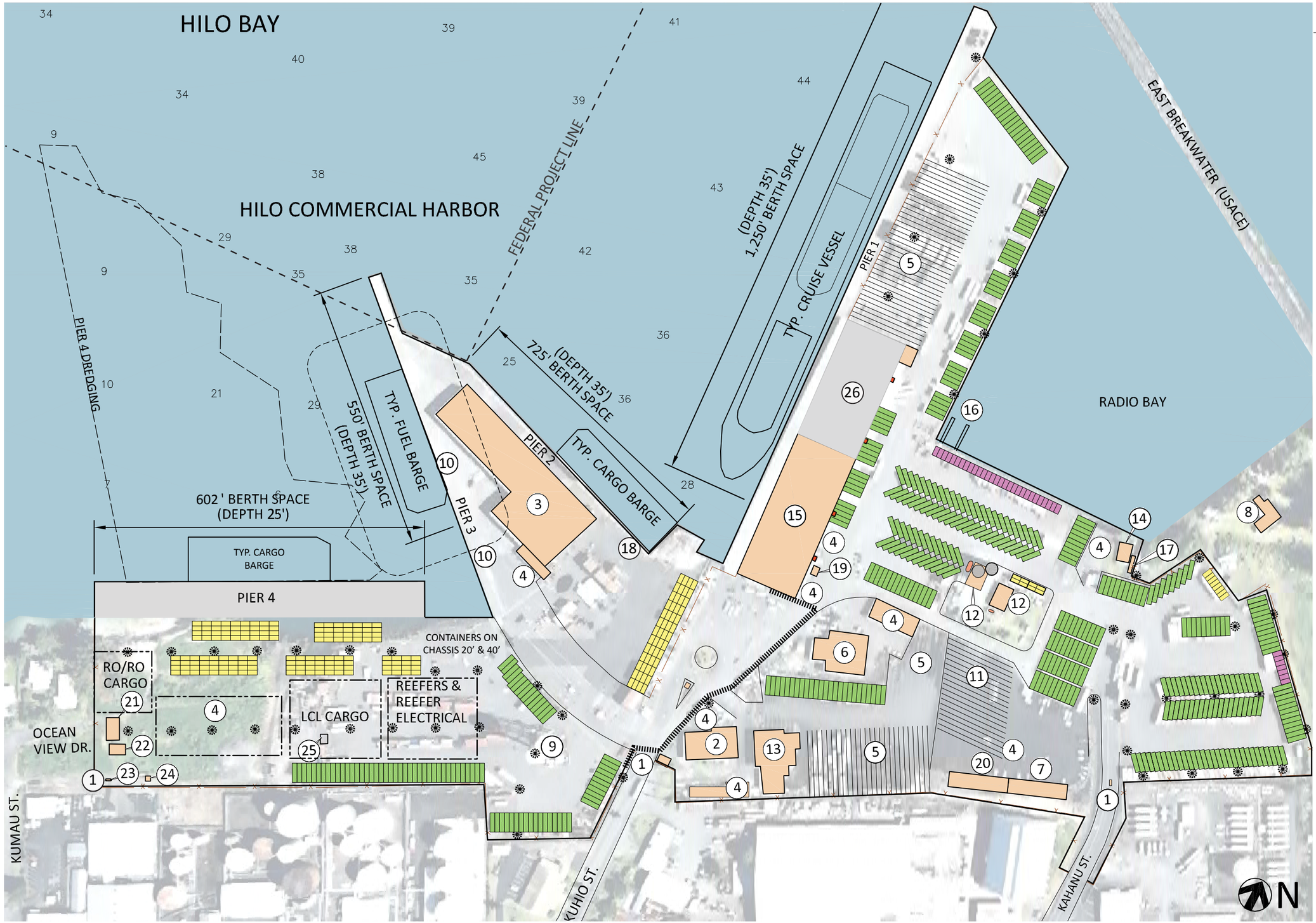

KEYNOTES

1. ENTRY GATE
2. HDOT HARBOR OFFICE
3. YB LCL SHED
4. STAFF/VISITOR PARKING
5. CHASSIS STORAGE
6. MATSON MAINT. FACILITY
7. MATSON OFFICE
8. KEAUKAHA CANOE CLUB
9. WATER TOWER
10. LIQUID PRODUCTS BERTH MANIFOLD
11. IMP./EXP. AUTO PARKING
12. HAWAIIAN CEMENT
13. HDOT MAINTENANCE SHED
14. INTRANSIT COMFORT STATION
15. TRANSIT/CRUISE SHED
16. COAST GUARD STATION
17. U.H. FACILITY
18. CEMENT MANIFOLD
19. SUBSTATION
20. BIG ISLAND STEVEDORES
21. YB OFFICE
22. COMFORT STATION
23. ENTRY BOOTH
24. CONTAINER CHECK-IN
25. FREIGHT CLERK STATION
26. PORTION OF SHED TO BE DEMOLISHED (SUBJECT TO FUNDING)

LEGEND

- HILO HARBOR BOUNDARY
- TOP PICK GROUNDED CONTAINERS (176 TGS)
- CHASSIS CONTAINERS (525-40')
- CHASSIS CONTAINERS (36-20')
- BUILDINGS
- HIGH MAST LIGHT POLE
- FENCE
- CEMENT SILO
- PETROCHEMICAL TANK
- REEFER PLUGS
- PEDESTRIAN WALKWAY

100' 0' 100' 200'

Note: Pier 4 improvements are under design and expected to be completed by 2012.

Note: YB Containers are both 20' and 40' on chassis and stacked.

PREPARED FOR:
STATE DEPT. OF TRANSPORTATION
HARBORS DIVISION

PREPARED BY:
SSFM INTERNATIONAL

HAWAII COMMERCIAL HARBORS
2035 MASTER PLAN UPDATE

HILO HARBOR BASE MAP + COMMITTED PROJECTS

FIGURE 2.5

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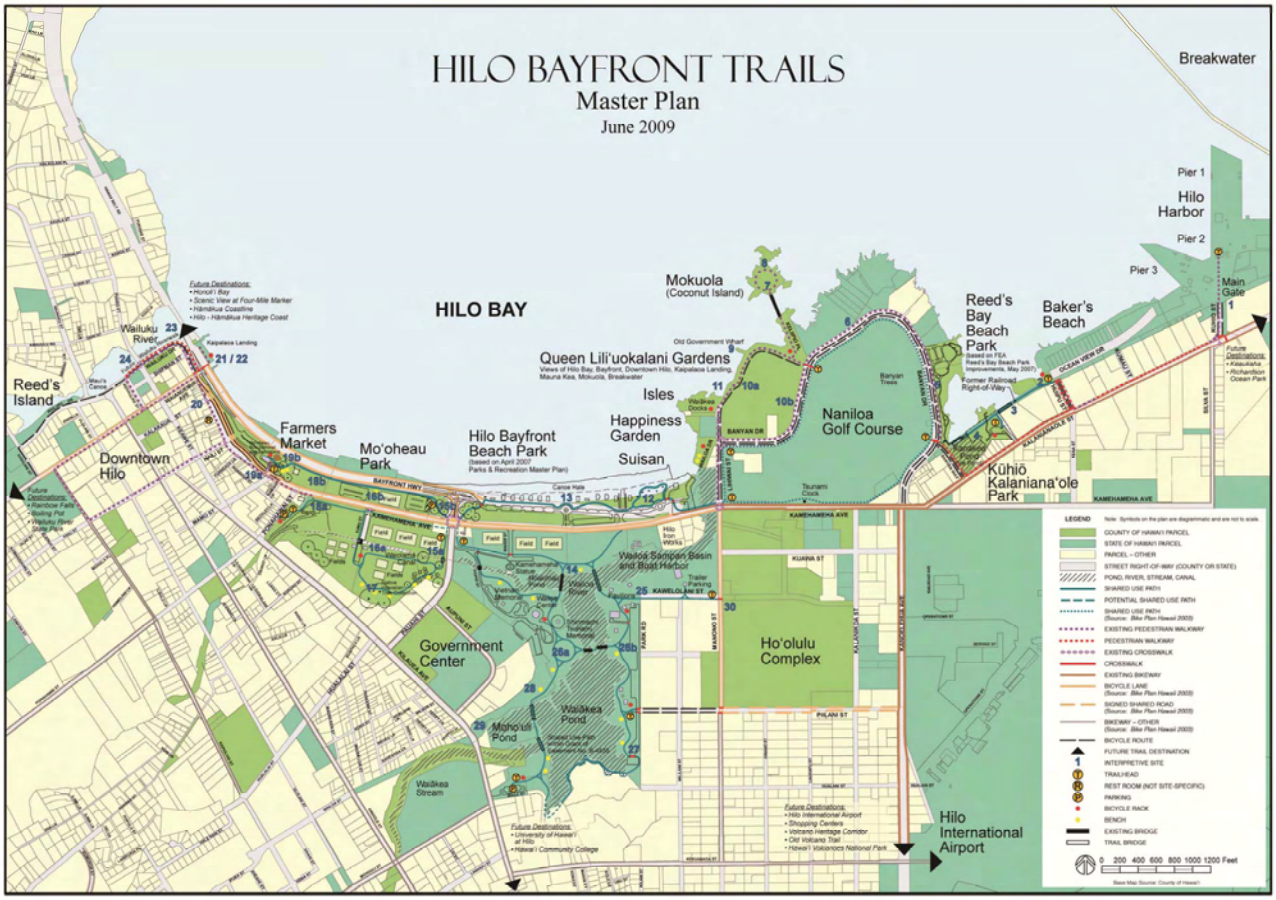
2.2.5 Neighboring Projects by Others

Coordination and compatibility with nearby users and their plans are important. The Hilo Bayfront Trail Plan (Hawai'i County, 2009) has planned a coastal path system between Wailuku River at Reed's Island and the Hilo Harbor cruise terminal for the benefit of residents and visitors. The 3-mile system of paths would connect to recreational sites along the Hilo Bayfront, which would be an amenity for cruise passengers and others. Increased foot traffic would further underscore the need for safe passage on harbor property, preferably by relocating the cruise slips to a new area.

Figure 2.6: Hilo Bayfront Trail Plan



Source: County of Hawai'i, Department of Recreation

2.2.6 Water Circulation Studies by USACE

In 2009, the U.S. Army Corps of Engineers (USACE), Honolulu District, completed the *Hilo Bay Water Circulation and Water Quality Study.* This study evaluated the water circulation and water quality within Hilo Harbor and identified potential solutions. This study evaluated five alternatives modifying the Hilo Harbor breakwater to increase water circulation. The effects of different breakwater modifications on wave energy within the harbor were quantified and assessed relative to navigational issues.

The objective of each conceptual alternative in this study was to promote greater water circulation in Hilo Harbor in order to improve its water quality. The study methodology included quantifying the effects of each alternative on wave action, assessing the resulting flushing actions and water quality, determining the estimated construction costs, and providing recommendations for future work.

The study discovered small variability between the results of each alternative and recommended future work consisting of detailed three-dimensional water quality modeling. It was determined that the two-dimensional hydrodynamic model used in this study was adequate for comparing flushing characteristics for the five alternatives, but the model was insufficient in predicting the circulation patterns of the entire bay. A three-dimensional study would allow researchers to assess impacts to the water column and locate any depositional zones contributing to the poorer circulation in the harbor.

2.3 KAWAIHAE HARBOR

Kawaihae Harbor is located on the northwest coast of Hawai'i Island. Its basin measures 1,450 by 1,500 feet and has a depth of 35 feet. The entrance channel is 3,270 feet long and 500 feet wide. A 2,650 foot breakwater protects the harbor.

The harbor is served by Queen Ka'ahumanu Highway and is located 28 miles north of Kona International Airport at Keāhole.

Figure 2.7: Aerial View of Kawaihae Harbor

Source: University of Hawai'i, School of Ocean and Earth Science and Technology, Coastal Geology Group

2.3.1 History of Kawaihae Harbor

The first settlers of South Kohala came around 750-1000 AD. These early Polynesian explorers established fishing villages and cultivated *kalo* along the streams at the base of the Kohala Mountains. Kawaihae (and Waimea) were important political regions visited by high ranking *ali‘i*. Kawaihae and Kohala are considered the birthplace of Kamehameha the Great. By the mid-19th century, the area was heavily influenced by ranching, cattle, and the *paniolo* way of life in contrast to many other districts which were dominated by the influence of the sugar industry. By the latter half of the 20th century, large high-end resorts shifted the economic base from agriculture to tourism.

The name Kawaihae means “water of wrath,” referring to battles over spring water in this arid region. The area never sustained a large population and was dominated by activity and interests of royalty. Queen Kamamalu, wife of Liholiho (Kamehameha III), and possibly Queen Emma, wife of Alexander Liholiho Keawenui (Kamehameha IV), came from the area. It was in this area that Kamehameha the Great held court. He constructed Pu‘ukoholā Heiau, a heiau where human sacrifice was performed and which is now a national historic site. He also had constructed Mailekini Heiau and Hale o Kapuni Heiau, a submerged shark heiau in Pelekane Bay. Kawaihae was a major port throughout the 1800s. Large forests of sandalwood were harvested on the slopes of Mauna Kea and brought to Kawaihae for shipment. Thousands of cattle were brought down from Parker Ranch to be shipped throughout the islands.

In 1946, the harbor experienced a 12-foot high tsunami. Construction of a deep draft harbor and main breakwater which allowed larger barges to deliver and export from the harbor began in 1957. It was completed in 1959 with the help of the USACE, the same year Hawai‘i became a state. In 1975, the Queen Ka‘ahumanu Highway was completed connecting Kona International Airport at Keāhole to Kawaihae Harbor. This generated further growth, including a number of high-end resorts which used the harbor for bringing in construction materials. Akoni Pule Highway was dedicated in 1973, providing further access to the Kawaihae district and harbor. Damage to Piers 1 and 2A caused by the October 15, 2006 earthquake rendered them temporarily unusable. This was corrected, and by 2009 repairs were financed from the proceeds from the State’s insurance policy.

2.3.2 Existing Harbor Facilities at Kawaihae Harbor

Kawaihae Harbor has two piers. Pier 1 has 412 feet of berthing space, 4.6 acres of yard space and 8,300 square feet of shed space. Pier 2 has 1,150 feet of berthing space and 30.6 acres for storage and handling.

2.3.3 Use and Operations at Kawaihae Harbor

Pier 1 is primarily used by cement barges. Pier 2 is mostly used by interisland cargo and fuel barges. Kawaihae Harbor does not handle passenger traffic.

Hawaiian Cement unloads bulk cement at Pier 1 from barges to a nearby storage facility using pneumatic pipelines. The north shed at Pier 1 is leased by Liquid Robotics for marine research. The south shed was vacant in 2010. Cattle transfer operations occur at Pier 1. The 2006 earthquake damage forced the relocation of this operation to Pier 2, but since the repairs to Pier 1 have been completed, cattle transfer operations are back at Pier 1.

Pier 2 is dedicated to cargo barges and shared by two users. YB operates interisland barge services from Pier 2A with barge calls typically twice a week. Matson operates barge services from Pier 2B with barge calls three times a week. Specifically, the cargo barge Mauna Loa is there on Mondays and Fridays while the RO/RO barge Waialeale is there on Wednesdays. Both operators typically send two barges a week to Kawaihae Harbor. Top-pick forklifts are used to load and unload containers from barges. One of the Matson barges, Mauna Loa, has its own ship-board equipment to load/unload containers.

The US Army owns and operates a landing ramp at the coral stockpile area ("Coral Flats") through Governor's Executive Order (EO) No. 1759, which allows them to conduct military operations and transfer goods including troops, vehicles, and explosives. It is used by the 45th Army Corps Support Group (Forward) to off-load Logistics Support Vehicles (LSV) to be taken to Pohakuloa Training Area (PTA). The off-loading generally occurs by dropping down a ramp from the shipping vessel. At times, they also make use of the state piers for this purpose. The use and need varies according to the status of deployment and scheduling of training exercises.

Figure 2.8: Typical LSV Ship

Source: HDOT Harbors Division

Additionally, Executive Order No. 2142 was granted to the US Army for access to the ramp area. Collectively, the two current Executive Orders grant the US Army ownership of approximately 10 acres of land at Kawaihae Harbor. Portions of Kawaihae Harbor's back areas (mauka) are used for petroleum storage, bulk cement storage, and less-than container load (LCL) staging.

2.3.4 Committed Improvement Projects for Kawaihae Harbor

Figure 2.9 provides a map of the existing site plan and committed projects for Kawaihae Harbor. Committed projects at Pier 2A terminal include paving 3.1 acres, which will increase operational acreage by 12 percent. The Hawai‘i District Office and comfort station will be demolished and rebuilt in a new location to LEED Silver standards and with ADA compliance.

Two roadway improvements will support harbor capacity. The first is new turning lanes, which will be designed for the short term connection of Kawaihae Road to Queen Ka‘ahumanu Highway. The second is connections between Kawaihae Road and the new Kawaihae Bypass Road currently in planning by the Highways Division.

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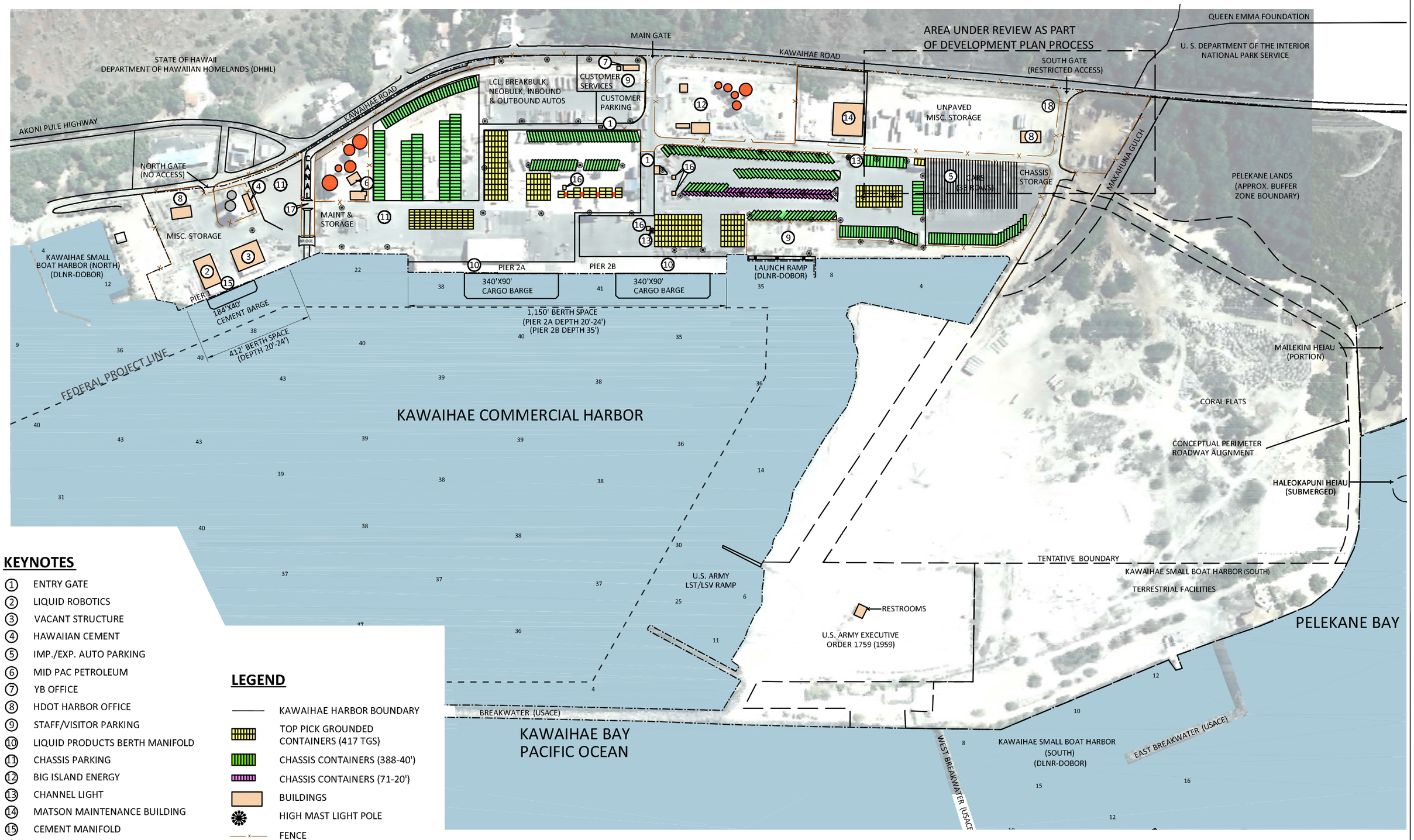

KEYNOTES

1. ENTRY GATE
2. LIQUID ROBOTICS
3. VACANT STRUCTURE
4. HAWAIIAN CEMENT
5. IMP./EXP. AUTO PARKING
6. MID PAC PETROLEUM
7. YB OFFICE
8. HDOT HARBOR OFFICE
9. STAFF/VISITOR PARKING
10. LIQUID PRODUCTS BERTH MANIFOLD
11. CHASSIS PARKING
12. BIG ISLAND ENERGY
13. CHANNEL LIGHT
14. MATSON MAINTENANCE BUILDING
15. CEMENT MANIFOLD
16. SUBSTATION
17. BRIDGE - CLOSED TO TRAFFIC
18. VERIZON CELL SITE

LEGEND

- KAWAIHAE HARBOR BOUNDARY
- TOP PICK GROUNDED CONTAINERS (417 TGS)
- CHASSIS CONTAINERS (388-40')
- CHASSIS CONTAINERS (71-20')
- BUILDINGS
- HIGH MAST LIGHT POLE
- FENCE
- CEMENT SILO
- PETROCHEMICAL TANK
- REEFER PLUGS

PREPARED FOR:
STATE DEPT. OF TRANSPORTATION
HARBORS DIVISION

PREPARED BY:
SSFM INTERNATIONAL

HAWAII COMMERCIAL HARBORS
2035 MASTER PLAN UPDATE

KAWAIHAE HARBOR BASE
MAP+COMMITTED PROJECTS

FIGURE
2.9

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2.3.5 Regional Context: Plans and Projects by Others

In the case of Kawaihae Harbor, the 2035 Master Plan will be part of building the community as well as the harbor. For this reason, coordination with nearby landowners, the county, and others is especially important.

A number of planning efforts have been completed or are underway in the general area of Kawaihae Harbor. Because the harbor is such a prominent influence, it is important to consider these planning efforts and how they view the harbor in relation to other critical regional issues. The 2035 Master Plan Update has worked to be compatible with the plans of surrounding areas, landowners, the county, and others.

Land Use

One of the most important planning efforts is the *South Kohala Community Development Plan* (Hawai'i County, 2008) which was signed into law in November 2008. The district contains two major landowners, Department of Hawaiian Homelands (DHHL) and Queen Emma Foundation, owners of two adjacent ahupua'a. The *Department of Hawaiian Home Lands Regional Master Plan* and the *Queen Emma Foundation Ahupua'a Strategic Management Plan* envision land uses compatible with and taking advantage of their location near the Kawaihae Harbor. In particular, DHHL plans developing industrial lots for harbor compatible users.

The DLNR Division of Boating and Outdoor Recreation (DOBOR) completed their master plan for its Kawaihae Small Boat Harbor (South) in December 2003. The HDOT Highways Division is in the alternatives development and environmental review stage of a new road, the Kawaihae Bypass, which not only would alter access into the area, but would provide new opportunities by having spurs and connections into development areas.

Water Quality

Marine water quality (siltation) is of paramount interest. The Pelekane Bay Watershed Restoration Project has completed a Watershed Management Plan in 2005 and is currently studying erosion control practices. The USACE has also studied water quality at Pelekane Bay.

In 2009, USACE conducted an evaluation of a proposed channel on the circulation and morphology changes at Kawaihae Harbor and Pelekane Bay. The alignment for the proposed channel bisected Coral Flats near the Makahuna Gulch drainage outlet. Four (4) channel alternatives of varying width and depth were evaluated. Each alternative was evaluated for anticipated changes in water hydrodynamics, wave conditions, and ability to transport sediment.

In summary, this study indicated that construction of a circulation channel would result in consistent flow from the bay to the harbor under normal and storm conditions. This flow would produce net sediment transport into the channel and the harbor. Based on the USACE's findings, implementation of the circulation channel would not serve the purpose of harbor water renewal and Pelekane Bay water quality improvement, therefore is not recommended.

CHAPTER 3
ISSUES AND CHALLENGES

Stakeholder needs were determined through one-on-one interviews and in stakeholder group meetings at each harbor. Stakeholders include harbor users and tenants, government agencies, and landowners. Chapter 3 describes the planning considerations that call for improvements to existing facilities that surfaced from these interviews and meetings.

3.1 ISSUES & CHALLENGES COMMON TO BOTH HARBORS

Multiple Use Facilities

Maritime lands are finite, and both Hilo and Kawaihae harbors face the challenge of providing adequate space and facilities that correspond to multiple users with a variety of vessels and cargo.

The challenge is to develop master plans that take into account the unique requirements of each harbor user and their unique operational requirements, yet remain flexible to provide for multiple uses all while ensuring efficiency and safety.

Priority for Maritime Dependent Uses

Given the finite nature of maritime space and the competition for its use, the Harbors Division must prioritize maritime-dependent uses and accommodate maritime-related uses on an as available basis, subject to revocation.

The challenge is to determine what user should be classified as a maritime-dependent operation and what user should be classified as a maritime-related operation.

Agriculture Inspections

Hawai'i's Biodiversity Law is designed to protect the state from crop losses, extinction of native species, destruction of native forests, spread of diseases, and inspection of exported agricultural crops which allows them to be sold in markets outside of Hawai'i. This is an important environmental issue for Hawai'i where the agriculture industry can experience serious consequences if invasive species arrive and take hold. Examples of invasive species include Brown Tree Snakes, Red Imported Fire Ants, and Coqui Frogs.

The Department of Agriculture Plant Quarantine Branch is responsible under Hawai'i Revised Statutes Sections 141 and 150A for the biodiversity program, and they must interface with multiple entry points at harbors and airports to effectively eradicate, control, reduce, and suppress pests. Both Hilo and Kawaihae Harbors need dedicated space that supports the Hawai'i Department of Agriculture (DOA) function to conduct biosecurity inspections for the control of invasive species.

The challenge is to provide the requisite space that is in close proximity to the harbor. If the space is located too far outside from the harbor, there are additional transportation costs

involved with the double handling of the cargo as it needs to be trucked over from the staging area to the shipper after the inspection is conducted. If the space is located within the harbor, it should be in a central location close to the entry gate so that cargo does not have to be transported long distances after their inspections, yet not interfere with operations.

Food Safety and Security

As recognized in the *Hawai‘i Economic Development Strategy* prepared by the Department of Business and Economic Development, agriculture is an important sector in Hawai‘i’s economy, providing food for residents and export revenues. Increased food self-sufficiency is a goal, similar to the energy goal to decrease dependency on imports. Agriculture also helps support many rural communities.

Aquaculture research and development is also an economic strategy. In addition to technical extension services, marketing assistance and training, lease land at harbors is cited as being needed for staging, storage, and hatchery production to support offshore aquaculture development.

The State Farm Bureau and the DOA are concerned about food stored in the open areas waiting to be loaded into refrigerated containers because of the potential for spoilage. Covered storage and additional refrigerated units would improve the situation and prevent food from being exposed to the sun and other elements. The farming and agriculture communities’ desire climate controlled shed space at both harbors where perishables can be handled and stored while waiting for shipping (exports) or transfer (imports).

Fruit flies, a major problem for farmers because it renders the fruit unsuitable for export, are currently treated at a private irradiation facility. In the *Statewide Comprehensive Economic Development Strategy (CEDS),* Hawai‘i County and the Farm Bureau propose an Agricultural Products Marketing Facility which would conduct irradiation, vacuum cooling, packing, distribution, and ice facilities. Consolidation, warehousing, storage, refrigeration, packing, and high tech telecommunications marketing would be important functions for such this facility. Ideally such a facility would be located near the harbors.

The challenge is to work with the Farm Bureau and DOA to make sure that climate controlled storage is available to ensure food safety when it is on harbor property.

Fuel Storage

Most of the fuel brought into Hawai‘i Island comes to Hilo Harbor, where it is stored or trucked over to Kawaihae Harbor or other West Hawai‘i destinations for storage. Many residents in the community would prefer that fuel barges arrive in a more balanced proportion at both harbors because trucking of fuel increases fuel costs and adds to congestion on the roadways. The need for fuel storage is predicted to increase as the population increases.

There are also the expectations that a variety of fuel will need to be stored, including diesel, biofuels, and possibly propane. This is possible at Hilo Harbor, but not at Kawaihae where storage capacity is limited.

At Hilo Harbor, all of the storage facilities are located on private lands. At Kawaihae Harbor, there are two storage facilities located on Harbors property. However, the *South Kohala Community Development Plan* and stakeholders comments called for adding more fuel storage capacity outside of the commercial harbor for the following reasons:

1. To locate new storage facility outside of the tsunami inundation zone.
2. To locate new storage outside the US Army safety arc for ammunition transport.
3. To reduce the visual intrusion for the National Park Service (NPS).
4. To improve the aesthetics of the village center at Kawaihae.

The challenge is to meet fuel storage requirements in a balanced manner between the two harbors while understanding they are changing due to demand and due to state policy for greater energy self sufficiency. While fuel storage is the responsibility of the industry, fuel discharge lines, pipelines and other connections to the final storage area are within the harbor boundaries.

Roadway Capacity

Hilo Harbor is served by entrances at Kahanu Street and Kuhio Street, which are both off of Kalanianaole Avenue. Stakeholders have expressed concern about the limited roadway capacity leading to congestion. Design for a project to construct a new roadway at Kumau Street and a third entrance to Hilo Harbor is underway with construction to follow.

At Kawaihae Harbor, Kawaihae Road is a narrow roadway with limited capacity in terms of turning lanes into and out from the harbor. Truck traffic is slow moving and can create congestion issues to neighboring residents. In addition, Kawaihae Road runs past a national park and the Pu'ukohola Heiau. Traffic, especially truck traffic, causes vibration and road conflict issues for the park.

The challenge is to identify feasible roadway improvements that will address the congestion issues and coordinate with the Department of Transportation, Highways Division and the County to implement solutions.

Security

Hilo and Kawaihae Harbors are regulated under the Maritime Transportation Security Act (MSTA). MTSA requires the Port Owner/Operator to appoint a Facility Security Officer (FSO) and prepare a detailed Facility Security Plan (FSP). The FSP specifies security procedures for each site and must be approved by the U.S. Coast Guard (USCG. USCG provides additional guidance and directives as needed. MTSA requires the port to conduct frequent security drills, exercises, security equipment inspection, and a comprehensive annual security audit. USCG

enforces MTSA by inspecting each port facility and issuing citations and fines if violations are found. Every five years, each port facility must update/revise their Facility Security Plans. MTSA was recently amended adding the requirement for each facility to implement the Transportation Workers Identification Credential or TWIC program.

The Harbors Division is developing and continually refining a comprehensive Statewide Maritime Security Plan for all DOT Harbors. The plan encompasses (MTSA) Facility Security Plans as well as physical security improvements, electronic security systems, security operations and other measures based on specific harbor(s) security plans. These assessments and plans are "Sensitive Security Information" (SSI) and are restricted under federal law.

Both Hilo and Kawaihae Harbors are required to maintain compliance with their security plans. Procedures and equipment have been established to control access to secured and restricted areas and other vulnerable or sensitive key points, location, functions and operations at the ports. Access to the ports is restricted to those who have been screened by the Transportation Security Administration (TSA) for the US Coast Guard and issued a Transportation Worker Identification Credential (TWIC). A legitimate reason for access and compliance with state and federal laws is necessary. Access is restricted to prevent damage to the facility and to ships. Recent mandatory increased security measures are common to both harbors and have led to the requirement for new security fencing, gate identification, security camera systems, and upgraded security equipment consistent with TSA requirements. When a notice of a credible threat has been issued, the harbor facilities need sufficient space to ensure security while continuing to ensure the efficient and safe flow of commerce.

The challenge is to effectively manage the high volume of security information, conduct good security needs assessments and select the best security management strategies. Maximizing the use of electronic and passive security systems save personnel costs and must be coordinated with port security operations. Security planning must allow for changing laws, advancements in security technologies, and a process for updating and continually improving security programs over the long-term. The goal, as always is to have effective port security without restricting the flow of commerce.

Fencing

Fencing is key to physical security protection and access control in and around regulated security areas. Harbors Division has adopted the standard fence specification used by USCG (Chain link fence - 8' high, 9 gauge wire, three strand barbed wire apron angled outward, etc.) Fence lines and gates should be located so they can be secured or opened and staffed for access control depending on security level in effect, type of vessels in port, or other harbor operations.

US Customs

In Hilo Harbor, US Customs is co-located with the US Coast Guard where it is crowded, but manageable. US Customs must inspect yachts, sailing vessels, and foreign cruise ship

passengers, in addition to cargo. Office space is at Hilo Harbor, but customs could use some working space at the harbor for inspections, possible near where the DOA would be doing its inspections.

In West Hawai'i, US Customs operates out of Kona International Airport at Keahole. They inspect container cargo as "premise" inspections of the consignee, meaning the cargo leaves the airport or harbor and is inspected at a facility owned by the consignee. This is due to the lack of personnel by the freight handlers to remove the cargo twice, once for inspection and once again for transfer to the destination. In addition, all cargo (except bulk cargo like sand and fuel) now goes to Honolulu Harbor first where it is inspected. If pests are found, the container is sent back to Honolulu. In the case of contraband, a seizure is made, and then sent to third party storage areas. Should Kawaihae Harbor ever start to receive direct foreign shipments, then US Customs would need space with docks where the containers on chassis could back up for removal, inspection, and then return.

The challenge is to ensure that required space is provided in the appropriate location so that inspections can be conducted efficiently.

Auto Storage

Shipping carriers bring in large amount of automobiles on a weekly basis. This serves both the car rental businesses and the resident population. Intraisland shipping of cars also occurs, and cars are allowed to be temporarily stored on Harbors' property, sometimes for several days. This requires storage areas for several hundred cars at a time.

The challenge is to identify and provide the requisite amount of space for auto storage in a safe and secured area to prevent damage from the elements and theft, when industry practices frequently shift according to economic changes and market demands.

Sea-Level Effects

Sea-level rise (SLR) due to global climate change presents challenges to coastal communities and ecosystems, and planners are engaged in assessing management options. Accordingly, it is desirable to have an estimate of SLR expected during this century to properly design adaptation strategies. An approximation of one meter rise SLR by the end of the 21st century will allow:

1. Estimates of coastal erosion and changes in vulnerability to coastal hazards.
2. Assessments of threats to coastal ecosystems.
3. Development of climate risk management policies.

The 2035 Master Plan has included reviews of recent studies of global warming, sea-level observations, global ice volume, ocean heating, and estimates of SLR by the end of the 21st century (Fletcher, 2009).

The challenge is to identify appropriate adaption steps and to incorporate them in maintenance and capital improvement projects.

3.2 ISSUES & CHALLENGES SPECIFIC TO HILO HARBOR

Hilo has its own unique set of issues and challenges that must be considered in the plan.

Separation of Incompatible Uses

Hilo Harbor's cruise passenger terminal is located between two cargo operations. This creates a hazardous condition for passengers as they traverse from the Pier 1 Terminal to Kūhiō Street in order to gain access to areas outside of the harbor. Separating these incompatible uses from each other would benefit both passenger service and cargo operations by removing a conflicting use and by providing a safe and dedicated area for each activity.

In the short-term, the Pier 4 Interisland Cargo Terminal project calls for a new gated paved road at Kūmau Street. This would provide a dedicated access for cargo traffic through this area. This will remove some of the incompatible cargo traffic from Kūhiō Street.

The challenge is to identify a long-term solution that provides suitable locations for each activity that will completely separate them from each other in an efficient manner.

Liquid Bulk Cargo and Fuel Hatches

The fuel hatches have been alternately proposed at Pier 4 and Pier 2. At Pier 4, they interfere with Young Brothers operations.

The challenge is to provide fuel hatches in both a preferred location and in an alternate back up location.

Fencing Near the USCG Area

Whether the gate nearest the Harbors Division maintenance shed should remain open or closed during passenger ship days has been questioned. One option is to build a double wide gate near the corner of Radio Bay which can be closed most of the time, and have security-controlled access those times when it needs to be open.

The challenge is to provide both security and access to the area during days when there are cruise passengers in the port.

Research Vessels in Radio Bay

University of Hawai'i at Hilo (UH) uses Radio Bay for education and research in oceanography. In 2010, they were using a 38-foot long catamaran and a homemade floating dock for loading to support dives and charter school programs. They also have a 40-foot container to store their equipment. While UH previously used a 53-foot long catamaran, the current vessel is adequate for the foreseeable future. Their program would be aided by a second slip and assurances of permanence for their location.

The challenge is to ensure that UH's program needs are understood and provided for in the plan.

3.3 ISSUES & CHALLENGES SPECIFIC TO KAWAIHAE HARBOR

Accommodate Growth

Kawaihae Harbor has enjoyed tremendous growth in cargo volumes over the past decade. The most basic need is to expand its facilities to accommodate future growth demand. Expansion was called for in the 2020 Master Plan and this remains a priority. In the short-term, the Pier 2A yard project will provide additional cargo handling capacity.

The challenge is to identify strategically located expansion areas that will provide safe cargo handling yards and berthing capacity as well as staging areas for new products such as wood chips and logs.

Co-existence with Pu'ukoholā Heiau

Kawaihae Harbor and the National Park Service (NPS) Pu'ukoholā Heiau serve important purposes. Both entities can co-exist with each other by communicating and working together. Visual intrusion, noise from cargo operations, and vibration impacts from construction activities are all concerns that have been expressed by NPS officials.

The challenge is to develop a plan that will respect and satisfy the needs of both facilities.

Military Operations

The military owns and operates the Landing Ship, Tank (LST) ramp in the Coral Flats that provides a landing area for specially designed military ships that transport equipment, supplies, and ammunition. Military cargo is then off-loaded and stored until it is ready for transport through the tank trail located on the Coral Flats to its final destination. The Army has been extremely active at the LVS/LVT ramp, coming in three to four times a month. The beach is closed during these times. LST ramp is critical in the support for national defense. When ammunitions are off-loaded and stored in the Coral Flats, the military imposes a safety arc as shown in Figure 3.1 enclosed by a large red circle.

In addition, the US Army is considering operating joint high speed vessels (JHSV) at various locations, including Kawaihae Harbor. Because the JHSV is purported to have their own shipboard ramp system, they would use existing pier space in the harbor.

The challenge is to blend military and civilian uses together so that maritime facilities can be developed in the Coral Flats while providing the necessary access. This includes providing access for the military's operations and considering the necessary safety arc when planning for maritime uses.

Figure 3.1: Military Safety Arc

Source: Ed Uchida, US Army

Potential Ferry Facilities

A safe location for ferry service should be provided in the event a service is proposed. The safety issue applies to both loading/embarking away from wave surge areas, and it applies to the transport of passengers on and off harbor property.

The challenge is to identify potential locations for passenger service that are separated from cargo functions and that provide safe passageway to areas outside the harbor.

Compatibility with Recreational Uses

Kawaihae Small Boat Harbor (South) is located in the southwest corner of the Coral Flats. Dedicated access to this facility has to be provided to recreational users that are outside of the maritime security area.

The challenge is to identify a separate roadway alignment that will provide dedicated access for recreational users.

Forestry Industry Potential

There is a potential of growth in the timber industry for the production of bio-fuel and for the export of wood chips and/or logs. Kawaihae Harbor is better located, drier, and has more space available than Hilo Harbor. Logs are likely to be shipped in flat racks, open modular units which can be stacked for efficiency. Wood chips would be processed and shipped in "ragtop" containers measuring 40 by 8 by 9 feet. The ragtop is open at the top for easy loading, and then covered with a canvas material. The product must remain cool to avoid spontaneous combustion, which is why the open ragtop is superior to closed containers. Top loading could be accomplished at the logging site or in the Coral Flats.

The challenge is identify a suitable location with enough space within the commercial harbor should this industry develop.

Aquaculture

Several enterprises (i.e., Kona Blue, Hawai'i Oceanic Technology, and Indigo) are either contemplating or currently raise and harvest fish for international and domestic export. These enterprises require amenities such as space to process, store, and transport their products near the harbor.

The challenge is to prioritize the need for this activity and to identify space within the harbor.

Demand for Industrial Lots

There is demand for industrial lots, both for truck staging, stand-by uses, and other purposes.

The challenge is to identify a suitable location for industrial lots development that will meet the needs of the users.

CHAPTER 4
HAWAI'I ISLAND COMMERCIAL HARBORS MASTER PLAN FOR 2035

4.1 MASTER PLAN OVERVIEW

The planning process provides a unique opportunity to collaborate with harbor users, government agencies, adjacent landowners, and the public to realize community, economic, and social benefits when developing facilities because improvements can be determined and implemented in an orderly and strategic manner. After considering relevant stakeholders' input (Chapter 3) and understanding future facility requirements from the forecasts and technical analyses (Appendix 3), three master plan alternatives were developed for each harbor. These alternatives were discussed and vetted in a series of stakeholders and public meetings, and refined over time. From these alternatives, a preferred alternative for each harbor was selected for inclusion in the 2035 Master Plan. Implementing improvements will be coordinated within the context of a financially constrained plan.

The *Hilo Commercial Harbor 2035 Master Plan* (Hilo Master Plan), at full build out, recommends the construction of a new dedicated passenger terminal referred to as Pier 5 at the west side of the harbor to separate passenger activities from cargo operations. To meet forecasted cargo demand, the Hilo Master Plan provides additional berth capacity at Pier 4 and yard capacity for cargo handling at the landside of Pier 1. Total yard capacity will be for 294 twenty-foot ground slots for stacked containers, 535 forty-foot wheeled chassis slots, and 49 twenty-foot wheeled chassis slots for a total area of roughly 18 acres for cargo handling and storage. In addition, a total of 3.8 acres of handling and storage is allocated for less-than-container (LCL) cargo, 1.6 acres for an automobile handling and storage area, and roughly 3 acres for bare chassis storage. The Hilo Master Plan also provides space for Department of Agriculture's (DOA) inspection, quarantine, and treatment facilities. Table 4.1 provides a summary.

Table 4.1: Summary of Hilo Harbor Improvements

	Current	Committed	2035 Improvements
Berth	Pier 1: 1,265 feet Pier 2: 703 feet Pier 3: 637 feet	New Pier 4: 602 feet	Pier 4 RO/RO facility and Pier 4 Extension of 250 feet. Relocate fuel hatches to accommodate Pier 4 RO/RO facility.
Yard	Pier 1: 13.4 acres Pier 2: 2 acres Pier 3: 7.3 acres	New Pier 4 Yard: 26 acres	Pier 1 landside additional 2.9 acres storage yard. Set aside 1 acre space for DOA facilities.
Shed	Pier 1: 81,635 sq. ft. Pier 2: 37,884 sq. ft.		
Gates		New Kūmau Street entrance	New Hilo Harbor entrance at east side of harbor.

The *Kawaihae Commercial Harbor 2035 Master Plan* (Kawaihae Master Plan), at full build out, recommends the construction of a new cargo terminal, including a pier for two barges, and a cargo handling and storage yard at the Coral Flats. Pier 2A will be extended, and a new Pier 2C will be constructed. Total yard capacity will be for 814 twenty-foot ground slots for stacked containers, 756 forty-foot wheeled chassis slots, and 113 twenty-foot wheeled chassis slots, for a total area of roughly 31 acres for container storage. In addition, 1.5 acres of storage is allocated for LCL cargo, 2.7 acres for an automobile handling area, and roughly 8 acres for bare chassis storage. The Kawaihae Master Plan recommends any potential ferry service to be located in the Coral Flats because of the relatively calm water conditions found there. Forecasts indicate that cargo, new industries such as timber and aquaculture, fuel, military activity, and fuel will grow significantly, and therefore additional berthing and yard space is needed to meet future demand. The Kawaihae Master Plan also provides space for DOA's inspection, quarantine, and treatment facilities. Table 4.2 provides a summary of Kawaihae improvements.

Table 4.2: Summary of Kawaihae Harbor Improvements

	Current	Committed	2035 Improvements
Berth	Pier 1: 412 feet Pier 2: 1,105 feet		Extends Pier 2A by 340 feet and relocate fuel hatches. New Pier 2C at 325 feet. New Pier 4 at 865 feet to accommodate 2 barges.
Yard	Pier 1: 4.6 acres Pier 2: 27.1 acres	Pier 2A landside 3.9 acres	Adds 22 acres of paved yard and 2.7 acres of auto handling area. Set aside 1 acre space for DOA facilities.
Shed	Pier 2A Shed	Removed	
Gates	Main Gate		Improve Main Gate ingress and egress configuration. Reconfigure South Gate.

4.2 HILO HARBOR

4.2.1 Hilo Harbor 2035 Master Plan Features

The Hilo Master Plan is shown in Figure 4.1. Salient features of the plan are:

Passenger Terminal

Pier 5 is a new 830 feet long pier dedicated to passenger operations at the west side of the harbor. This facility will provide separation between passenger activities and cargo operations as it will remove a significant conflict between two incompatible uses. The length of the pier will provide a berth apron for two-thirds the length of a 1,165-foot long cruise ship, which corresponds with a Royal Caribbean Lines' *Freedom Class* ship, the second largest class of cruise vessel currently in service. Currently, only one ship is larger: The Oasis of the Seas. Most cruise ship doors for passengers and stores are located in the middle third of any vessel, so a solid pier deck in this area is necessary. Breasting and mooring dolphins will provide support for the

other one-third of the ship that will overhang the pier. Pier 5 development includes dredging of the shallow area immediately adjacent to the east side of the pier. The west side of Pier 5 can be dredged, if required, either to provide for a second cruise berth or for the berthing of other vessels such as the UH research vessels. The initial alignment of Pier 5 will be the same as the existing Pier 3 so as not to encroach on the approach channel for Pier 3 and Pier 4, but the final alignment, length, and structural system for the pier will be subject to detailed navigation, mooring, foundation, and dredging studies during future planning, project development, and design stages.

Associated improvements include a 0.75 acre reception and security area and 2 acres for taxi, tour bus, parking, and staging will be located adjacent to the terminal. Approximately 2 acres would be set aside with access from Kūmau Street for University of Hawai'i at Hilo (UH) research facilities. To provide space for these uses, the acquisition of the Ocean View Lease Lots from the Department of Land and Natural resources (DLNR) will be necessary. See Figure 4.1.

Berths

In addition to the construction of the new cruise pier, a 250-foot long extension to Pier 4 will provide Young Brothers, Limited (YB) berthing for two 400-foot long barges. A roll-on/roll-off (RO/RO) facility at the corner of Piers 3 and 4 will provide YB with an option to include stern loading and unloading operations in addition to their side operations. See key 26 on Figure 4.1.

Cargo Terminal

A portion of the Pier 1 shed will be demolished to provide additional space for container operations. The remaining shed area will accommodate cruise passenger operations until the new Pier 5 Passenger Terminal is developed. Additional LCL cargo handling area is added next to the Kūhiō Street entrance and consolidated parking in the central harbor area and would use that entrance. An additional 2.85 acres of yard space for container storage would be located at the central area of the harbor to meet forecasted requirements. Reconfiguration of the Radio Bay comfort station and UH facility will allow for the expansion of the east side of the harbor for needed chassis storage. Additional chassis storage will also be provided at the west side of the harbor to support Pier 4 operations, thereby reducing the need to cross the Kūhiō Street entrance for an empty chassis. See key 5 on Figure 4.1. Finally, a new Pier 1 user maintenance building will be located along the south harbor property line.

Liquid-Bulk Cargo Terminals

Fuel hatches are located along Pier 3. With the construction of the RO/RO facility at the corners of Piers 3 and 4, the fuel hatches will be relocated seaward to provide a safe distance between the barge and fuel operations so that they can be conducted simultaneously. Additional fuel hatches can be located at either Piers 2 or 4 to provide an alternative location to conduct fuel discharge operations. Fuel storage facilities are located outside of Hilo harbor on private property.

Other Facilities

The Harbors Division's Office and parking facilities will be relocated to the east side of the harbor out of the way of cargo handling and storage operations. If there is no suitable location outside of Hilo Harbor, a one acre space located inside of the secured area and close to the main entrance would be provided to DOA to conduct biosecurity, agricultural inspection, quarantine, and treatment operations. See key 27 on Figure 4.1. In the long-range picture, landside of new Pier 5 area, an area for research facilities related to the UH will be provided.

Harbor Entrance and Roadways

There are 3 entrances to Hilo Harbor: Kūhiō, Kahanu, and the future Kūmau streets. In addition to the three, the Hilo Master Plan recommends that a fourth entrance be provided at the east side harbor entrance. The new entrance will be opened up so it can be used for access to the harbor and reconfigured Radio Bay facilities. Kalaniana'ole Avenue provides access between Hilo Harbor and Hilo Town.

Commercial Fishing

A well established local firm has expressed an interest in the development of a commercial fishing complex in Hilo Harbor. Commercial fishing facilities are currently located at Wailoa River and under the management of DLNR, Division of Boating and Ocean Recreation. However, these facilities lack adequate space and improvements to meet the growing demands of the fishing industry. Shoaling and siltation limit dredge depths and are an ongoing issue. It is foreseeable that new and improved facilities are likely to be required to support this lucrative industry as it is a significant revenue generator. In 2009, Honolulu's facilities was ranked 31st in the nation for catch volume, but 8th for value bringing in $59.4 million.[4]

The future commercial fishing complex is anticipated to consist of the following:

1. A receiving, auction and processing facility. This facility would receive the catch for distribution. It would also provide ice, provisioning and fuel to the fishing vessels.
2. Berths to accommodate three (3) commercial fishing vessels.
3. Parking for employees and customers.

This area would be separated from other commercial activities such as cargo and passenger vessels. The Ocean View Beach Lots area is a potential location for this commercial fishing complex on a space available basis and pending funding.

[4] Taken from website (www.hawaii-seafood.org).

Navigational Improvements

New dredging to minus 35 feet will be needed at the east side of the new Pier 5 to accommodate large cruise ships. Additional dredging at the west side of Pier 4 will provide berthing for either a second cruise ships or other vessels. The harbor basin is small, and it is recommended that the basin be expanded so that large ships can more easily navigate through the harbor, particularly in the Pier 1 area. The US Army Corps of Engineers (USACE) has a reconnaissance level study to look into ways of improving navigational conditions there.

In summary, the construction of Pier 5 Passenger Terminal will require a major expenditure for dedicated use of cruise traffic, but the development of it will substantially increase berth capacity that exceeds the needs for 2035. In addition, a separate cruise terminal eliminates conflicts between passenger activities and cargo operations provided cargo traffic is rerouted to the Kūhiō Street entrance. Also, the central area of the harbor is wide open, allowing for maximum flexibility of harbor operations and seamless integration of cargo operations between the east and west sides of harbor without worry for passenger traffic.

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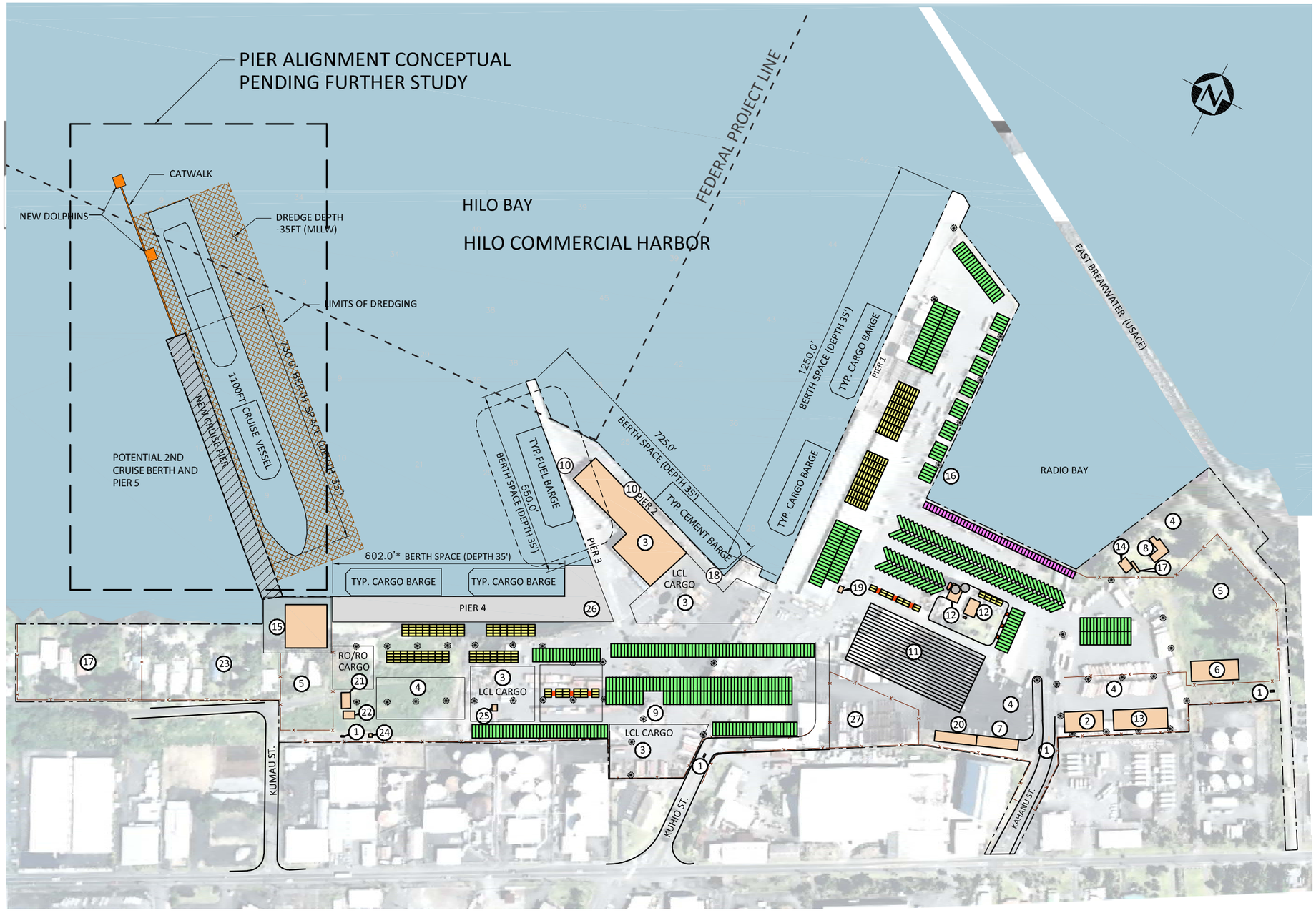

* SUBJECT TO CHANGE AS DESIGN PROCEEDS

HILO HARBOR

KEYNOTES

1. ENTRY GATE
2. HDOT HARBOR OFFICE
3. LCL CARGO (3.8 ACRES)
4. STAFF/VISITOR PARKING
5. CHASSIS STORAGE
6. MATSON MAINT. FACILITY
7. MATSON OFFICE
8. KEAUKAHA CANOE CLUB
9. WATER TOWER
10. RELOCATED LIQUID PRODUCTS BERTH MANIFOLD
11. IMP./EXP. AUTO PARKING (1.6 ACRES)
12. HAWAIIAN CEMENT
13. HDOT MAINTENANCE SHED
14. INTRANSIT COMFORT STATION
15. CRUISE RECEPTION AND TERMINAL FACILITY (0.75 ACRES)
16. COAST GUARD STATION
17. U.H. FACILITY
18. CEMENT MANIFOLD
19. SUBSTATION
20. BIG ISLAND STEVEDORES
21. YB OFFICE
22. COMFORT STATION
23. VAN, BUS, TAXI CRUISE PARKING (2 ACRES)
24. CONTAINER CHECK-IN
25. FREIGHT CLERK STATION
26. FUTURE RO/RO BERTH
27. INSPECTION AND QUARANTINE AREA (1 ACRE)

LEGEND

- HILO HARBOR BOUNDARY
- TOP PICK GROUNDED CONTAINERS (294 TGS)
- CHASSIS CONTAINERS (535-40')
- CHASSIS CONTAINERS (49-20')
- BUILDINGS
- HIGH MAST LIGHT POLE
- FENCE
- CEMENT SILO
- PETROCHEMICAL TANK
- REEFER PLUGS
- NEW PIER

160' 0' 160' 320'

SCALE: 1"=160'

CONCEPT PLAN
FOR DISCUSSION PURPOSES ONLY

Mark	Description	Date	Dr'n	Appr
E	ISSUED FOR CLIENT REVIEW	APR.23/10	AT	HW
D	ISSUED FOR CLIENT REVIEW	APR.13/10	AT	HW
C	ISSUED FOR CLIENT REVIEW	MAR.31/10	JL	HW
B	ISSUED FOR CLIENT REVIEW	DEC.07/09	JL	HW
A	ISSUED FOR CLIENT REVIEW	NOV.24/09	JL	HW

STATE OF HAWAII HARBORS DIVISION

MOFFATT & NICHOL
Seven Waterfront Plaza Center
500 Ala Moana Blvd., Suite 400
Honolulu, HI 96813 808-543-6484
SSFM INTERNATIONAL

SEAL

Designed by: HW	Date: NOV.16, 2009	Rev. E
Dwn by: JL / Ckd by:	M&N Project No. 6826	
Reviewed by:	Drawing code:	
Submitted by: SUBMITTER'S NAME MOFFATT & NICHOL	Dwg Scale: AS SHOWN Plot scale: 1:1 (D SHEET)	

HAWAII COMMERCIAL HARBORS
2035 MASTER PLAN UPDATE

HILO HARBOR

FIGURE 4.1

DRAWING SCALES SHOWN BASED ON 22"X34" DRAWING

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4.2.2 Cost Estimates and Phasing for Hilo Master Plan

The overall cost for Hilo Master Plan improvements is estimated at $141.2 million (in 2010 Dollars), exclusive of any land acquisition. It is proposed to be accomplished in three phases to meet demand, which are described in more detail below.

During phases one and two, additional space is created for tour buses, taxis, shuttle parking, and operations. A one acre inspection, quarantine, and treatment area for DOA will be added in the central harbor area. In the final phase, additional cargo and berthing capacities will be created. A new Pier 5 Passenger Terminal will be added for cruise ships, releasing berth and cargo space for exclusive cargo use, and separating these from passenger activities. Pier 5 will require additional dredging of the harbor. All costs include a 35 percent contingency to reflect that they are early concepts.

Phase 1 (Estimated Cost $33.5 Million):

- Demolition of a portion of the Pier 1 Shed. Upgrade utilities and strengthen the area for approximately one acre of cargo handling and storage operations. The removal of part of the shed will allow the movement of the cargo ramp, and will create operational space to load and unload cargo at Pier 1.
- Construction of new Pier 1 user maintenance building and staff/visitor parking at the east end of the harbor property (by others).
- Construction of an additional 2.9 acres of hard surface (concrete pavement) at the east end of the harbor for bare chassis storage.
- Creation of one-acre space for inspection, quarantine, and treatment area for DOA at the central, southern limit of the harbor. No cost is included for a building.

Phase 2 (Estimated Cost $16.2 Million):

- Construct a new Harbors Division administration and maintenance building and staff and visitor parking at the east end of the harbor property.
- Extension and reconfiguration of the Pier 4 yard to provide additional wheeled slots.
- Construction of additional bare chassis storage at the west side of the harbor to support Pier 4.
- Consolidation of a new LCL cargo area next to the Kūhiō Street entrance (existing LCL cargo storage is maintained at Piers 2 and 3).
- Consolidation of all required import and export auto parking (1.6 acres) in the central harbor area.
- Slight reconfiguration of the one-acre DOA inspection, quarantine, and treatment area to accommodate the import and export auto parking yard.

- Demolition and relocation of the Radio Bay comfort station and UH facility. This allows for paved expansion at the east side of the harbor for additional wheeled chassis storage.
- Opening of the east side harbor entrance will be used for access to Harbors Division's buildings and the relocated Radio Bay facilities. Access to the new Harbors Division administration office and maintenance facility, plus Radio Bay facilities, will then be via the new east entrance enabling the Port to further limit access to the commercial harbor itself, thus providing enhanced security.

Phase 3 Full Build Out: (Estimated Cost $91.5 million):

- Construction of a new Pier 5 Passenger Terminal including an 830-foot dedicated cruise pier at the west side of the harbor. Although a variety of structural types can be used to construct the pier, a pile and deck structure is anticipated. The initial alignment of Pier 5 would be the same as the existing Pier 3 (so as not to encroach on the approach channel for Pier 3 and Pier 4), but can be adjusted.
- Westward extension of the Pier 4 berth by approximately 250 feet (subject to final design) to avoid encroaching on the Pier 4 berth area. It is from this extension that the new Pier 5 will be constructed.
- Dredging at Pier 5 will be required to provide sufficient water depth for visiting vessels, and possibly on the other side of the Kūhiō Bay entrance channel as well, to accommodate vessel maneuvers. Water depths on the order of 35 feet will be needed.
- Construction of a 0.75 acre reception, security center, and terminal facility and 2.0 acres for taxi, tour bus, van parking, and staging.
- With the construction of the dedicated cruise pier, the Kūmau Street entrance would now be used by both cruise-related and Pier 4 cargo-related vehicles. If this mixed use results in conflicts, Pier 4 cargo operations access could simply switch to Kūhiō Street – which may be little used after the full build out – freeing up Kūmau Street to be used exclusively for cruise-related traffic.
- Complete demolition of the remaining Pier 1 shed to leave the central area of the harbor completely open and flexible for varying uses, including grounded and wheeled chassis storage on Pier 1.
- With the open space that the demolition of the Pier 1 shed creates, further reconfiguration of the yard enables additional container storage to be located at the central area of the harbor and on Pier 1 and facilitates the extension of wheeled slots at Pier 4. Note: With the complete relocation of cruise operations to the west, there will be no conflicts with cruise operations, and it will be much easier to access storage areas along all piers from anywhere in the port in the event that market shares, and thus yard

distributions, should shift between users in the future. As such, the open central harbor area can be reconfigured to meet the changing needs of users; it would only be a matter of restriping the pavements and adding barricades.

- An approximately 2 acre area is set aside for UH research facilities, with access from Kūmau Street. The Pier 5 cruise pier could be designed for berthing of small UH research vessels along the west side of the pier, if required.
- The Hilo Master Plan requires the integration of the Ocean View Beach Lots into Hilo Harbor property. Overall, the current harbor property is expanded with an additional 5.5 acres of property to the west.
- Current cement and off-site petrochemical storage are adequate to meet future throughput projections.

4.3 KAWAIHAE HARBOR

4.3.1 Kawaihae Harbor Master Plan 2035 features

The Kawaihae Master Plan is shown in Figure 4.2. Salient features of the plan include:

Berths

To meet forecasted demand, Kawaihae Harbor will require additional berth capacity. Pier 2A will be extended by 340 feet, and a new Pier 2C will be built that will provide an additional 325 feet of berth capacity. The construction of Pier 2C will require the removal of DLNR Division of Boating and Ocean Recreation's (DOBOR) boat mooring facility. Both extensions will increase the berth capacity to four 400-foot long barges. See key 10 on Figure 4.2.

In the long-range picture, the Kawaihae Master Plan recommends the construction of a new berth at the Coral Flats. Two additional 400-foot long barge berths are created from the construction of an 865-foot long pier at the Coral Flats. The maximum length of wharf that could be accommodated at the Coral Flats without impacting the US Army LST/LSV ramp would be 1,025 feet. The new wharves increase the overall berth length at the harbor by 1,530 feet and can accommodate smaller vessels such as tow boats, etc. See key 21 on Figure 4.2.

Cargo Terminals

The customer services office and LCL break bulk area adjacent to the Main Gate remain. The container storage area inland of Pier 2 is reorganized to provide for roughly 60 percent of the recommended storage. The yard consists of one row of grounded exports adjacent to the pier and uniform rows of chassis behind.

At Coral Flats, roughly 40 percent of the harbor container storage is provided in a similar fashion of uniform blocks behind the berths. The storage includes grounded blocks for exports, 40-foot long chassis rows, 20-foot long chassis rows, and reefers. Twenty-two acres of

additional paved ground space is made available for container operations. See key 11 on Figure 4.2.

The entire 2.7 acres of recommended auto storage is provided south of Pier 2, where it is easily accessible from both Pier 2 and the new berths at Coral Flats.

Dry-Bulk Cargo

Hawaiian Cement has a hatch at Pier 1 and a storage facility landside of Pier 1, and remains in its current configuration. Pier 1 continues to be used for overflow cargo storage operations and other miscellaneous maritime-related uses deemed appropriate. Because of surge issues at Pier 1, especially during the winter months, berthing may be restricted unless surge mitigation projects can be completed.

In the long-term, the remaining Coral Flats upland area can be used for future dry- and neo-bulk cargo handling and storage operations.

Liquid-Bulk Cargo

Mid-Pacific Petroleum (Mid-Pac) and Big Island Energy have existing fuel storage facilities on Harbors Division's property, and both remain in their current configurations. Mid-Pac has fuel transmission pipelines to Pier 2A.

The Kawaihae Master Plan recommends that additional storage be located off from Harbors' property. Harbors Division will need to review this on a case-by-case basis. One alternative is to use Mid-Pac's existing site where there is room to construct additional storage. Another alternative is property immediately located across Kawaihae Road on the Department of Hawaiian Homelands (DHHL) industrial lands. DHHL has expressed a willingness to accommodate fuel storage development on their property.

Passenger Terminal

Cruise operations were considered during planning, but because of the priority for cargo space and the small harbor basin for navigation, it was not considered likely or feasible. In contrast, ferry operations could become a possibility, so an area west of the Coral Flats berths has been identified as a possible location for this activity. See key 21 on Figure 4.3. Pier 1 is also an alternative location for ferry operations, but because of the wave conditions especially during the winter, may have to be restricted from use during certain times of the year should such an operation be located there.

Other Facilities

If there are no suitable locations outside of Kawaihae Harbor, a one acre space for biosecurity, agricultural inspection, quarantine, and treatment operations for DOA has been identified adjacent to the South Gate customer services office area. See key 20 on Figure 4.2. There is substantial area in the Coral Flats upland area that remains available for development. Future use could include dry- and neo-bulk cargo handling and storage operations. In addition, there is

demand for industrial lots that can be used for truck staging and holding activities. The National Park Service has expressed its preference for keeping the Pelekane buffer zone undeveloped.

Harbor Entrance and Roadways

Traffic in and out of Kawaihae Harbor currently is through the Main Gate which separates truck in and out movements. Sufficient area is needed to accommodate internal circulation and queues at the security gate. See key item 1 on Figure 4.2. When the office is relocated and later with more use is used at an extended Pier 2C and Coral Flats, the South Gate entrance will take on greater importance, including provision of security and truck gates that will serve the Coral Flats and auto storage areas. At full build out, there would be five truck incoming lanes and five truck outgoing lanes servicing Kawaihae Harbor.

The roads used to access Kawaihae Harbor are in need of improvements, including Kawaihae Road, the climbing/deceleration hill that leads to and from Queen Ka'ahumanu Highway, and the intersection of Kawaihae Road and Queen Ka'ahumanu Highway. The HDOT Highways Division has planning studies underway for these. Close coordination between Highways Division and Harbors Division is recommended.

In the long-term, HDOT Highways Division has plans for a new Kawaihae Bypass Road that would provide additional roadway capacity to and from the harbor and a Draft Environmental Impact Statement is in preparation. The concept is to create direct spur(s) into Kawaihae Harbor at each of the gates, or at least at South Gate.

Navigational Improvements

Dredging to minus 35 feet will be necessary in front of the Pier 3 area to accommodate barges. In addition, Piers 1 and 2A experience surge conditions, especially during winter months as the wave energy enters the harbor and impacts operations. Continued coordination with the US Army Corps of Engineers is necessary to work out a possible solution to attenuate wave conditions through breakwater structures or other improvements.

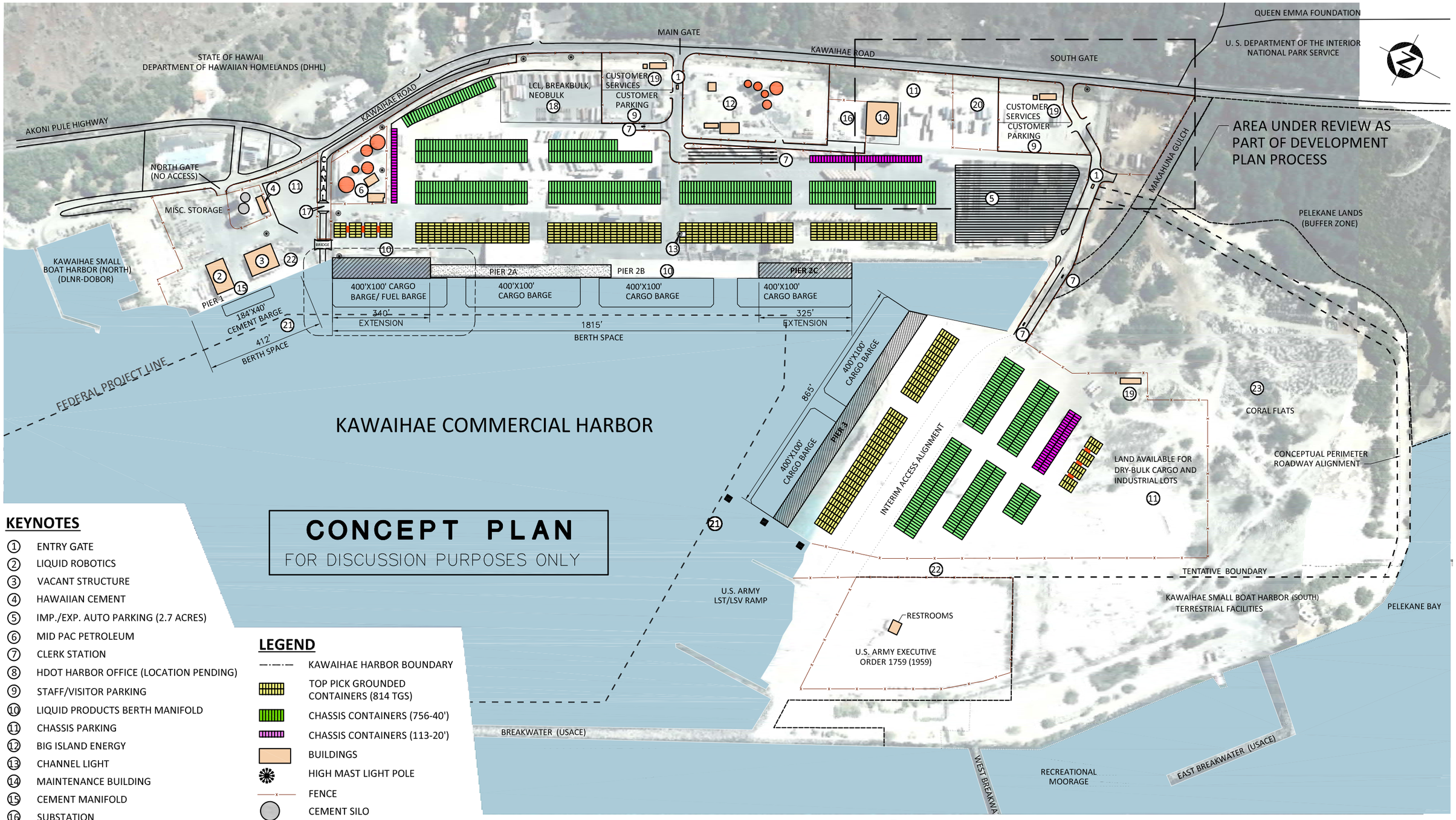
Pelekane Buffer Zone

The area between NPS Pu'ukoholā Heiau and the Coral Flats has been under lease to the NPS as a buffer area. Known as the Pelekane buffer zone, it provides one way of minimizing harbor impacts by providing distance between these two entities. In addition, the buffer zone is believed to contain a number of historic sites. Although there are no known archeological studies of the area, it has been said that it contains an early residential area for John Young, an Ali'i who was King Kamehameha's representative in this area and who is buried nearby. The buffer remains serving the purpose of providing an area of no development between the two entities.

In summary, the Kawaihae Master Plan provides for all the elements needed to meet the 2035 forecast. Container storage is rationalized with flexibility in mind. Greater use is made of the

Coral Flats and the South Gate area. The plan can also accommodate future ferry operations if required and remaining areas near Coral Flats allow the harbor to accommodate other business as yet undefined.

The primary disadvantage of the plan is the reliance on Pier 2A and a 340 foot extension to the north of Pier 2A, which is an area susceptible to downtime resulting from wave surges from the harbor entrance. This cannot be avoided as the area is needed since this plan maximizes available berth lengths that can be accommodated in the harbor. Measures to mitigate surge conditions in the harbor will need to be conducted if vessels are expected to use Piers 1 and 2A.



CONCEPT PLAN

FOR DISCUSSION PURPOSES ONLY

KEYNOTES

1. ENTRY GATE
2. LIQUID ROBOTICS
3. VACANT STRUCTURE
4. HAWAIIAN CEMENT
5. IMP./EXP. AUTO PARKING (2.7 ACRES)
6. MID PAC PETROLEUM
7. CLERK STATION
8. HDOT HARBOR OFFICE (LOCATION PENDING)
9. STAFF/VISITOR PARKING
10. LIQUID PRODUCTS BERTH MANIFOLD
11. CHASSIS PARKING
12. BIG ISLAND ENERGY
13. CHANNEL LIGHT
14. MAINTENANCE BUILDING
15. CEMENT MANIFOLD
16. SUBSTATION
17. BRIDGE - CLOSED TO TRAFFIC
18. LCL CARGO (1.5 ACRES)
19. OFFICE
20. INSPECTION AND QUARANTINE AREA (1 ACRE)
21. POTENTIAL FUTURE FERRY BERTH
22. POTENTIAL FUTURE FERRY STAGING AREA
23. POTENTIAL DRY-BULK CARGO / NEO-BULK CARGO / INDUSTRIAL LOTS

LEGEND

- KAWAIHAE HARBOR BOUNDARY
- TOP PICK GROUNDED CONTAINERS (814 TGS)
- CHASSIS CONTAINERS (756-40')
- CHASSIS CONTAINERS (113-20')
- BUILDINGS
- HIGH MAST LIGHT POLE
- FENCE
- CEMENT SILO
- PETROCHEMICAL TANK
- REEFER PLUGS
- NEW PIER / PIER EXTENSION
- RECONSTRUCTED PIER

KAWAIHAE HARBOR

160' 0' 160' 320'

SCALE: 1"=160'

Mark	Description	Date	Dr'n	Appr
E	ISSUED FOR CLIENT REVIEW	APR.23/10	AT	HW
D	ISSUED FOR CLIENT REVIEW	APR.13/10	AT	HW
C	ISSUED FOR CLIENT REVIEW	MAR.31/10	JL	HW
B	ISSUED FOR CLIENT REVIEW	DEC.07/09	JL	HW
A	ISSUED FOR CLIENT REVIEW	NOV.26/09	JL	HW

STATE OF HAWAII
HARBORS DIVISION

MOFFATT & NICHOL
Seven Waterfront Plaza Center
500 Ala Moana Blvd., Suite 400
Honolulu, HI 96813 808-543-6484
SSFM INTERNATIONAL

SEAL

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Reviewed by:	Drawing code:	
Submitted by: SUBMITTER'S NAME MOFFATT & NICHOL	Dwg Scale: AS SHOWN Plot scale: 1:1 (D SHEET)	

DRAWING SCALES SHOWN BASED ON 22"X34" DRAWING

HAWAII COMMERCIAL HARBORS 2035 MASTER PLAN UPDATE

KAWAIHAE HARBOR

FIGURE 4.2

File: P:\6826 2035 Master Plan for Kawaihae and Hilo Harbors\C400\Submittal\6826-202. Plotted: 4/22/2010 11:36 AM by TSENG, ALICE; Saved: 4/13/2010 4:56 PM by ATSENG

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4.3.2 How the Use of Coral Flats for Cargo Relates to Other Adjacent Uses

The United States (US) Army Landing Ship, Tank (LST) and Landing Ship, Vehicle (LSV) ramp and associated fenced backlands area at the Coral Flats remain in its current configuration for use by the US Army. The Army has its own easement to access their area, but the current right of way cuts through the area identified for future cargo operations. Therefore, it is recommended that Harbors negotiate with the Army to develop a different route where the two functions can co-exist without interfering with one another.

A new access alignment around the south end of the proposed Coral Flats container yard could be developed with further coordination with the US Army. Of greater concern would be the compatibility of any proposed passenger terminal and berth, and hence public use, in the area immediately adjacent the current US Army area. Careful consultation will be necessary with the US Army before a new passenger facility could be proposed or constructed in this area.

The final development of the Kawaihae Small Boat Harbor (South) will be independent from the proposed Coral Flats cargo terminal. A new perimeter roadway will provide exclusive access for recreational users and the public to the Kawaihae Small Boat Harbor (South), although the 2035 Master Plan envisions that the South Gate harbor entrance to the proposed perimeter roadway will be shared with commercial traffic for a short distance.

Consideration has been given to the nearby Pu'ukoholā Heiau. This majestic, sacred, and massive lava rock temple was built by hand in 1790 (or 1791). It has been carefully restored and preserved in recent years and is situated prominently above the harbor. There are many other historic places at the site, including other heiau features and the homestead of John Young, a close advisor to King Kamehameha I. The proposed harbor uses at the Coral Flats have been situated to avoid visual, noise, or other impacts to the sacred lands at Pu'ukoholā Heiau, and the National Park Service has been regularly consulted during the preparation of the 2035 Master Plan.

Figure 4.3: View from Pu'ukoholā Heiau towards Kawaihae Harbor

4.3.3 Cost Estimates and Phasing for Kawaihae Master Plan

The overall cost for Kawaihae Master Plan is estimated at $280.6 million (in 2010 Dollars). The Kawaihae Master Plan is based on forecasts outlined in the *Future Berth and Yard Requirement Report* (2009). Kawaihae Harbor will require substantial increases in berth length and yard area to meet the forecast volumes. It is projected that approximately 1,500 feet of new berth and more than 18 acres of additional cargo storage area is needed.

Additional navigational studies will be required to confirm the final length and orientation o the new wharf at Coral Flats, and its proximity to an extended Pier 2B. Based on the limited bathymetry available, the water depth is about 14 feet compared to 35 to 40 feet water depths along Pier 2. New dredging will be required to accommodate barges and vessels at the new Coral Flats pier.

Improvements recommended in the Kawaihae Master Plan are proposed to be accomplished in four phases. Phase 1 includes the Pier 2C Extension of 325 feet and the reconfiguration of the adjacent container yard. This would result in a sixty percent increase in capacity and will accommodate for an estimated 15 years of growth. Phase 2 adds another 340 feet of berth and streamlines the associated yard. Phase 3 demolishes the existing Pier 2A and constructs a new pile supported concrete pier. Inland container storage would be reorganized. Phase 4, at full build out, adds a new Pier 3 Cargo Terminal at Coral Flats, bringing the necessary capacity to meet 2035 forecasts. All costs shown below include 35 percent contingency.

Phase 1 (Estimated Cost $61.4 million):

- Demolition of the existing DLNR DOBOR's boat launch ramp at the south end of Pier 2B and construction of a 325-foot pier extension at the south end of the existing pier.
- Dredging south of Pier 2B for adequate water depth for barges.
- Reorganization of the Pier 2B yard to provide one row of grounded exports adjacent to the pier and uniform rows of wheeled chassis slots behind the grounded containers.
- Expansion of the import/export auto storage yard to 2.7 acre.
- Creation of one-acre space for inspection, quarantine, and treatment area for DOA located next to the South Gate customer services area providing easy access to Pier 2 and the future Coral Flats berths. This area is centrally located and close enough to the main cargo operations without interfering with the flow of cargo operations. The precise configuration can be changed within the area designated depending on the specific needs of the DOA.
- Reconfiguration of the Main Gate to provide for separated truck in-gates and out-gates to handle the increase in truck traffic and separate inbound and outbound functions. In total, there are 3 truck in-lanes and 3 truck out-lanes.
- Opening of a second access/egress point at the South Gate with security and truck gates

that will serve the import/export auto storage area and future Coral Flats development. A new customer service area for a second operator has been provided next to the South Gate. Without highway improvements, the entrance will be through the Middle Gate (See key 7 on Figure 4.2). The new gate may have a security booth west of the turnoff to a new perimeter roadway to the Kawaihae Small Boat Harbor (South).

- Development of lease lots to allow for staging of containers and shipping services in preparation for Phases 3 and 4 and generation of additional income for the sale of future lands. Dredge material can be used to build up this site.

Phase 2 (Estimated Cost $31.4 million):

- Addition of a 340-foot extension to the north end of Pier 2A. This provides berthing for four 400-foot barges. Note: The north Pier 2A extension will be susceptible to downtime due to storm surge issues in the harbor which will be very difficult to mitigate. Berthing preference would be given to the three or more southern berths along Pier 2 and the north end would only be used during calm seas and when the others are occupied.

Phase 3 (Estimated Cost $53.4 million):

- Demolition of the existing Pier 2A and construction of new pile-supported concrete pier.
- Reorganization of the container storage area inland of Pier 2A to provide one row of grounded exports adjacent to the pier and uniform rows of wheeled chassis slots behind.
- Although at present there are no pending plans for ferry service to Kawaihae Harbor, the area west of the future Coral Flats berths has been identified as a location that could serve future ferry operations, including the staging of vehicles. Winter surge issues at Pier 1 will likely preclude its use for ferries as there are limited opportunities to mitigate harbor surge at the berth.

Phase 4 Full Build Out (Estimated Cost $134.4 million):

- Construction of an 865-foot wharf at the Coral Flats for two new 400-foot barge berths. Note: An additional 160 feet could be added to the wharf if required, but at 1,025 feet, this would be the maximum length of wharf that can be accommodated at the Coral Flats without impacting the US Army LST/LSV ramp.
- Dredging at new Coral Flats berth for adequate water depth for barges.
- Construction of a new container yard at the Coral Flats to accommodate storage of grounded blocks for exports, 40-foot chassis rows, 20-foot chassis rows, and reefers.
- Modification of the South Gate yard access road to widen the roadway before reaching the container yard in order to provide two in-lanes to the terminal plus two out-lanes

complete with clerk booths for processing incoming and outgoing trucks.

- Pier 1 remains as is and will primarily be used by cement barges that currently calls once every two and one-half weeks. Cargo barges may use the berth at Pier 1 when ocean condition permits and Pier 2 is fully occupied since there is access to the main yard area pending an upgrade of the bridge that spans the harbor canal. Note: The emphasis should be to limit utilization of this berth due to harbor surge issues, particularly during the winter months, its distance from the main harbor working area, and the restricted apron width due to adjacent buildings.
- Bulk commodities operators Hawaiian Cement, Mid Pac, and Big Island Energy all remain in their current configurations. Their current storage capacities are projected to be more than adequate to meet future needs and their location does not conflict with other cargo operations.
- The US Army LST/LSV ramp remains in its present configuration.

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Hawai‘i Island Commercial Harbors
2035 Master Plan Update

APPENDIX 1
Stakeholder and Public Involvement Process

Hawai'i Island Commercial Harbors
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APPENDIX 1

Stakeholder and Public Involvement Process

STAKEHOLDER AND PUBLIC INVOLVEMENT PROCESS

Public involvement was a key element of the master plan process. Public information was distributed at a series of public meetings, and through a project web site, www. Hawai'iislandharbors.com The website contained information about the harbors, the planning process and posted all technical reports and maps for viewing and making comments. Input from harbor users, stakeholders and the public were sought continuously during the master plan process.

PUBLIC AND AGENCY INPUT

There were several opportunities for comment on the alternatives. Public meetings were held in December 2009. The reports were distributed and posted on the project website. Open comment period was held through January 2010. The project team reached out to specific stakeholders such as the National Park Service, US Customs and DHHL to make sure their comments were heard. A presentation was made on May, 2010 to the Hawaii Harbors Users Group (HHUG) and their comment period was extended through the month of May.

Following presentation of the alternatives at the December Stakeholder and Public Information meetings, the comment period was held open until the end of January 2010. The planning team continued meetings with agencies and users to better refine the data and plans. Given the high order of magnitude costs, the users group attempted to provide priorities for the work and to eliminate ideas that sounded good, but would be impractical or less cost effective. Priority was placed on cargo handling needs which is marine dependent. An additional presentation on the Masterplan alternatives was made at the May 3, 2010 meeting of HHUGS.

A listing of comments received during the open comment period and responses to those comments is in the project files. Additional comments will be sought during the Environmental Review period which will commence upon acceptance of the Master Plan by the HDOT Harbors.

The public involvement process is shown in the following flow chart. The harbor operators were a prime source of data, information on operations and issues confronted.

Figure A: Public Involvement in Master Plan Development

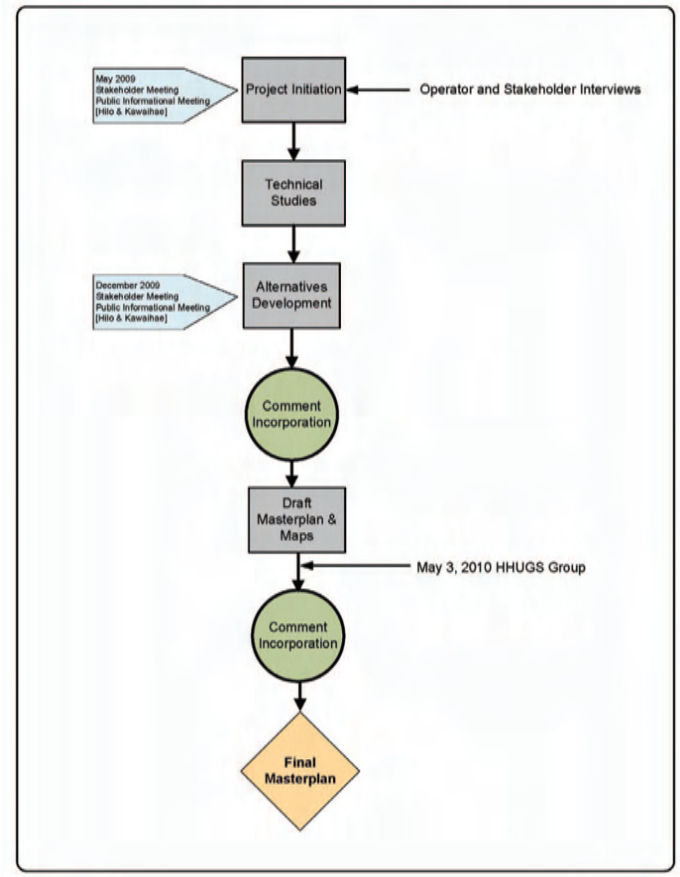

Table I: Individual Meetings Held with Harbor Users, Stakeholders and Public

Date/Loc.	User	Content
2/17/09 Honolulu	Matson Navigation	Barge schedules, Uses at Hilo and Kawaihae Harbors, Existing and Future Facilities, Existing and Future space needs, master planning efforts
2/18/09 Hilo	Elton Suganuma, Harbor Master, Harbors Division, State Department of Transportation (SDOT)	Hilo Harbor operations, Radio Bay and other adjacent uses, ingress/egress, Proposed Pier 4, Users, Security Issues
2/18/09 Hilo	Planning Department (Hilo), County of Hawai'i	COH Department of Agriculture, Envision Hilo 2020 Masterplan, Hilo Bayfront Trail, Hilo Community Development Plan, new import and export industries
2/18/09 Kona	Planning Department (Kona), County of Hawai'i	South Kohala Community Development Plan, meeting venues, community sentiments and Hawaiian community concerns
2/19/09 Kawaihae	Stephen Trout, US Army	Hazmat operations at Kawaihae, Army Stryker Brigade, operations at Kawaihae
2/19/09 Kawaihae	Elton Suganuma, Harbor Master, Harbors Division, State Department of Transportation (SDOT)	Kawaihae Harbor operations, DOBOR facilities and other adjacent uses, ingress/egress, Petroleum and Cement operations, users, Coral Flats, Security Issues, Coordination with NPS/Pu'ukohola Heiau
2/19/09 Kawaihae	Daniel Kawaiaea, National Park Service (NPS)	Pu'ukohola Heiau, damages from 2006 earthquake, vibration concerns from nearby roadways, recommended mitigations
2/20/09 Honolulu	Young Brothers	Barge schedules, Uses at Hilo and Kawaihae Harbors, Existing and Future Facilities, Existing and Future space needs, master planning efforts,
2/20/09 Kapolei	State Department of Hawaiian Homelands (DHHL)	DHHL Master Plans, Industrial lands adjacent to Kawaihae Harbor, Homestead lands, DHHL Regional Plans
2/26/09 Honolulu	State Department of Agriculture (DOA)	Bio-Security Act, Invasive Species, Requirements for Inspection and Quarantine facilities at Harbors, DOA operations and procedures for finds
8/31/09	Ed Underwood, Division of Boating and Ocean Recreation	Kawaihae Small Boat Harbors South

Date/Loc.	User	Content
Honolulu	(DOBOR)	and North, South SBH Phase 1 and Phase 2 Projects, Impacts to NHP
10/6/09 Honolulu	Indigo Seafood	Current status of aquaculture industry, development and evolution of operations, Availability of Kawaihae Facilities
12/4/09 Honolulu	Davis Yogi, Administrator, Harbors Division, SDOT	Review of Alternatives and Masterplan efforts, Hilo and Kawaiahae Harbors, Coral Flats, 2nd round of Stakeholder and Public meetings
1/28/10 Honolulu	Captain Ed Enos, Hawai'i Pilots Association	Pilot's Association comments on Draft Alternatives Maps, navigational issues associated with Hilo and Kawaihae Harbors, Operations of Pilots, General
1/16/10 Honolulu	AmeriGas and Petredec	Potential propane facilities, Statewide LPG needs, Relations to Masterplan, New terminal space and operational requirements, potential locations in State
2/23/10 Kawaihae	Daniel Kawaiaea, National Park Service (NPS)	NPS adjoining to Kawaihae Harbor and maintenance of existing buffer areas, coral flats water quality, lighting, military tank road, vibration concerns with respect to nearby heiau
2/23/10 Kona	Henry Simmons, U.S. Dept. of Homeland Security, U.S. Customs and Border Protection	Inspection areas, potential for operational changes, needs for inspection facility, current inspection activities
3/11/10 Honolulu	Ed Uchida, Planning Division, Directorate of Public Works, US Army Garrison	Expansion towards Army's LSV berth, impact on operations, Ammunition Safety Arc, new vessels for Kawaihae, Tank Road, Alternatives Comments
4/1/10 Honolulu	State Department of Agriculture (DOA) and COH Farm Bureau	Agricultural commodities handling and food safety issues, spatial requirements for inspection and quarantine areas, control of evasive species
4/20/10 Honolulu	PASHA Hawaii	Operations at Hilo and Kawaihae Harbors, future plans and markets, vessel descriptions, reactions to Masterplan alternatives

In addition to individual user meetings, Stakeholder meetings were held bringing together all users. Public Information Meetings were held to invite all members of the public to hear about the harbor master planning. PIM meetings were advertised in the newspapers, and on the radio. These are shown in the Tables 3.20 and 3.21 on the following page.

Table II: Stakeholder Meetings

Date	Location	# of Attendees	Agenda
5/19/09	Hilo Airport DOT Training Room	31	Project Overview Cargo and Passenger Forecasts
5/20/09	Hamakua Macadamia Nut Factory	32	Project Overview Cargo and Passenger Forecasts
12/10/09	Hilo Hawaiian Hotel	46	Summary of First Round Meetings Cargo and Passenger Forecasts Operational and Berthing Analysis Hilo Harbor Alternatives
12/15/09	Hamakua Macadamia Nut Factory	58	Summary of First Round Comments US ACOE Study of Pelekane Bay Circulation Sea Level Rise Analysis Operational and Berthing Analysis Kawaihae Harbor Alternatives

Table III: Public Information Meetings

Date	Location	# of Attendees	Agenda
5/19/09	Aunty Sally Kaleohano Luau Hale	19	Shifting LCL off harbor property Fuel storage strategies Grounded operations
5/20/09	Hamakua Macadamia Nut Factory	25	Same as above
12/10/09	Aunty Sally Kaleohano Luau Hale	39	Technical presentations by Tom Smith, USACOE on Pelekane Bay Study and by Chip Fletcher on sea level rise studies. Forecasts, Berthing Analysis by Moffat & Nichol. Discussion of cruise ships Hilo Harbor Alternatives
12/15/09	Hamakua Macadamia Nut Factory	35	Repairs from earthquake damage Demolition of Shed 2A Pier 2A Tiger application Technical presentations by Tom Smith, USACOE on Pelekane Bay Study and by Chip Fletcher on sea level rise studies. Forecasts, Berthing Analysis by Moffat & Nichol. Kawaihae Harbor Alternatives

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Hawai‘i Island Commercial Harbors
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APPENDIX 2
Summaries of Regional Plans Nearby Hilo and Kawaihae Harbors

Hawai‘i Island Commercial Harbors
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APPENDIX 2

Summaries of Regional Plans Nearby Hilo and Kawaihae Harbors

A. Hilo Bayfront Trails Master Plan (June 2009)

The County of Hawaii has planned a path system from the Wailuku River at Reed's Island to Hilo Harbor cruise ship terminal. Meant for the enjoyment of residents and visitors alike, the system of paths connects existing recreational sites along the Hilo Bayfront area, both mauka and makai of Kamehameha Avenue. The area stretches nearly three miles, most of which is publicly owned open space under the jurisdiction of the County or the State.

Figure 1: Hilo Bayfront Trails Master Plan

B. South Kohala Community Development Plan (November 2008)

The *South Kohala Community Development Plan* encompasses the unique communities of Waimea, Waikoloa, Kawaihae, and Puako as shown in Figure 2. Priority issues include: Preserve Culture and Sense of Place, Traffic and Transportation, Affordable Housing, Emergency Preparedness, and Environmental Stewardship and Sustainability. The resort destinations of Mauna Kea, Mauna Lani, and Waikoloa, each with large-scale high end hotels, shops, restaurants, and residential units, represent 40 percent of all hotel rooms on Hawaii island (3,400 units).

The Kawaihae sub-district is framed by the Kohala Mountains, several pu'u, and a diverse marine seascape. Kawaihae contains the only small recreational small boat harbor in NW Hawai'i and the only commercial harbor in West Hawai'i. All traffic to Kawaihae passes through the intersections of Kawaihae Road at Queen Kaahumanu Highway or Akoni Pule Highway. The objective for this sub area is to create a "balance of recreational, commercial, residential, and industrial uses around the harbor area and the restoration of the marine waters of Pelekane Bay."

Kawaihae Harbor, along with the canoe club area to its north and the small boat harbor to its south, constitute the main gathering places and development features of Kawaihae. A small commercial center on the mauka side of the harbor near Pier 1 includes restaurants, art stores, dive stores, and other small shops.

Figure 3 shows the County General Plan Land Use Pattern Allocation Guide (LUPAG) designations, and Figure 4 shows the County Zoning designations for Kawaihae. They indicate that this area is meant for future development, including industrial, medium density urban, or urban expansion uses. The future Kawaihae Bypass Road is an important element expected to facilitate and be an organizing feature for that future development.

Figure 2: South Kohala Community Development Plan District Overview

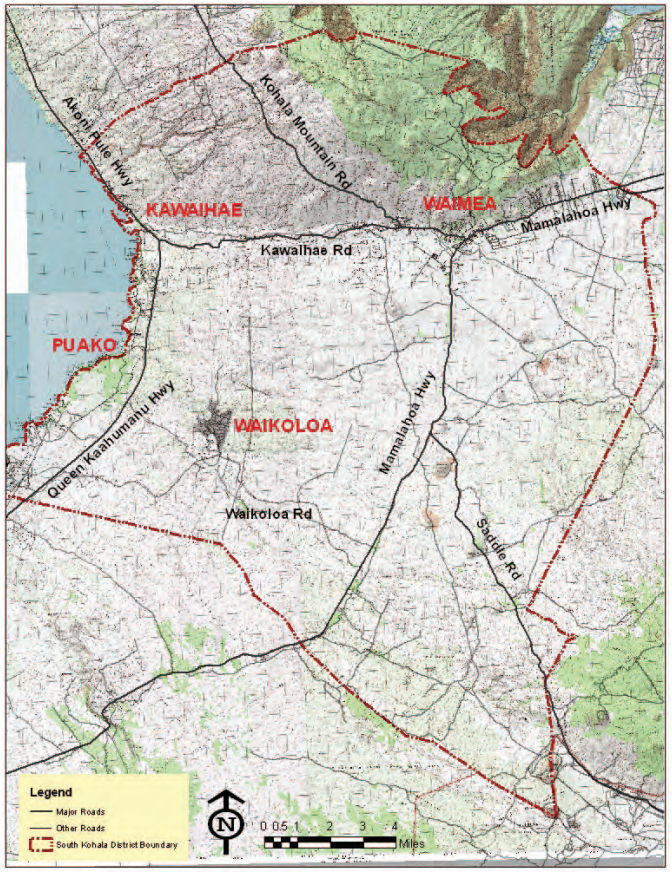
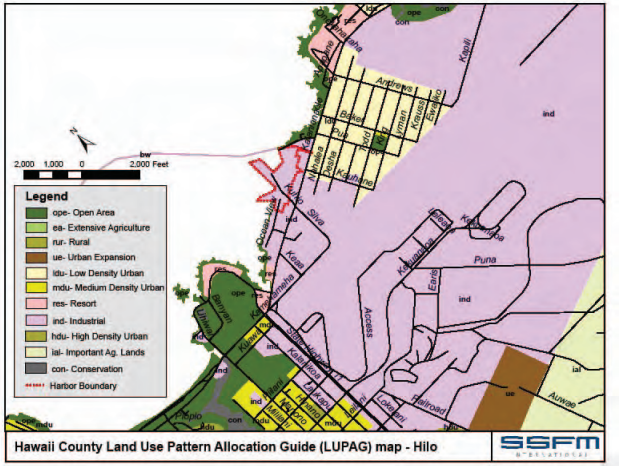


Figure 3: LUPAG Maps



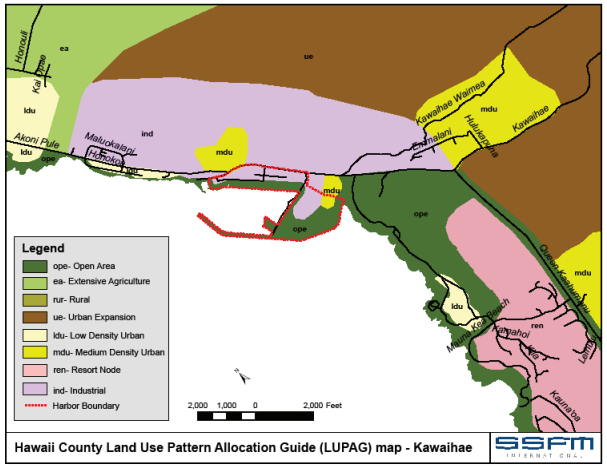
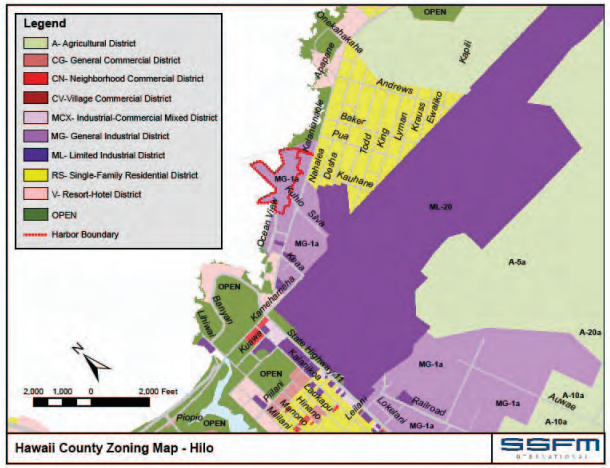
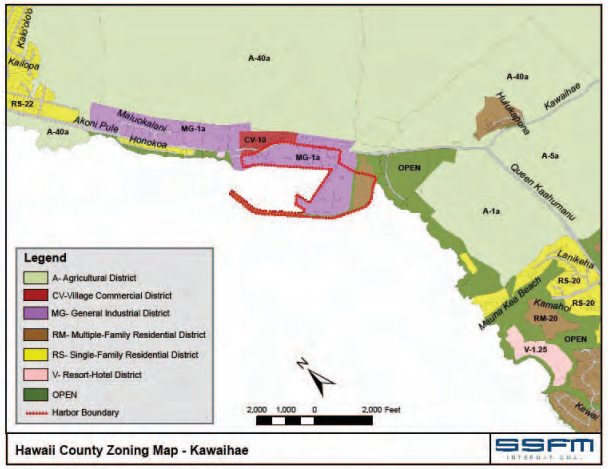


Figure 4: County of Hawai'i Zoning Map





The "Kawaihae Tomorrow" section of the CDP lists four overall goals:

I. Balance of recreation, commercial and industrial uses
II. New sources of potable water
III. Ocean water quality
IV. Traffic safety

Each goal has a number of implementing action strategies as shown in Figure 5. The Action Program begins with efforts to provide more potable water from the Ouli Well-field to be brought into the Kawaihae area. A 2006 agreement between the County Department of Water Supply and Bridge Aina Lea would bring 0.8 million gallons per day (mgd) to the area.

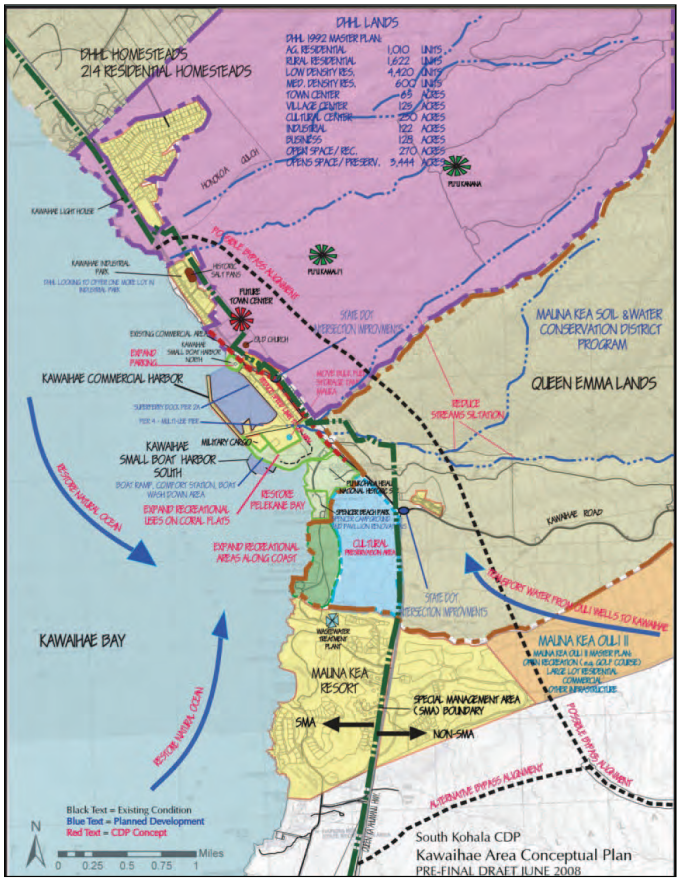
The second element of the Action Plan is to improve water quality along the Kawaihae coast. The 2005 *Pelekane Bay Watershed Management Plan* was prepared by Mauna Kea Soil and Water Conservation District. Goals were to increase ground cover density; minimize fires in the watershed; restore damaged groundcover and areas with bare soil; and reduce sediment deposits. Proposals for improvement included creating catchment basis, dredging the Pelekane Bay, or creating a washout channel to improve ocean circulation. In addition, upland land management techniques would be needed to reduce the amount of erosion and sediment reaching the Bay, or else problems would continuously recur.

The *Pelekane Bay Watershed Sediment Runoff Analysis* was completed in January 2008, but it progressed no further due to lack of a local sponsor. In 2009, a NOAA Coastal Restoration grant was awarded to Kohala Center to study effective methods of erosion control.

The USACE undertook a Deep Draft Harbor Navigational Study to analyze the circulation of the harbor and Pelekane Bay. Four alternatives were proposed with varying widths, depths, and lengths. Analysis included tidal readings, depth contours, wave heights, periods, channel speed, and water surface elevation. None of the four alternatives were recommended since they did not noticeably improve water quality. The results, which showed that a channel would quickly silt up again and perhaps worsen conditions by bringing sediment into the center of the harbor, were presented at a public information meeting in December 2009.

The Action Plan for traffic safety calls for designating areas for pedestrians and bicyclists, improving road design at intersections along Akoni-Pule Highway, and construction of the Kawaihae Bypass Road. These improvements would be the responsibility of the State DOT, Highways Division.

Figure 5: South Kohala CDP Conceptual Plan



C. DLNR-DOBOR South Small Boat Harbor Master Plan (2008)

There are two boating areas on either side of the commercial harbor. The North Small Boat Harbor currently contains 4.01 acres, a boat mooring, boat launch, and comfort station and is widely used by canoe clubs. The South Small Boat Harbor area is 7.75 acres.

DLNR DOBOR completed a master plan for the Kawaihae Small Boat Harbor (South) in 2008. When the project is built out, it will have a main floating dock with finger piers. There will be a two lane boat launch ramp made of concrete, loading docks, and fuel docks. Landside amenities will include 318 parking stalls, boat trailer parking, an accessible comfort station, ice fish storage, showers, and a boat wash-down area.

The Environmental Assessment for Phase I of the *South Small Boat Harbor Master Plan* was completed in 2008. It was expected to go out for bid shortly thereafter, except for the discovery of coral in the waters. Construction is pending agreement with USACE on a coral management plan.

Future areas have been reserved for buildings, including a boat club, retail shops, restaurants, and an office to be used by the YMCA and Surf Club that currently use portions of the south harbor for education and recreation programs.

DOT, Harbors Division and DOBOR have agreed that about 11 acres of the Coral Flats would be transferred to DOBOR, as shown in Figure 6.

Figure 6: Kawaihae Small Boat Harbor (South) Plan showing division between DOBOR and HDOT (Note: the perimeter road is conceptual at this time)

D. DHHL Regional Plan for Kawaihae

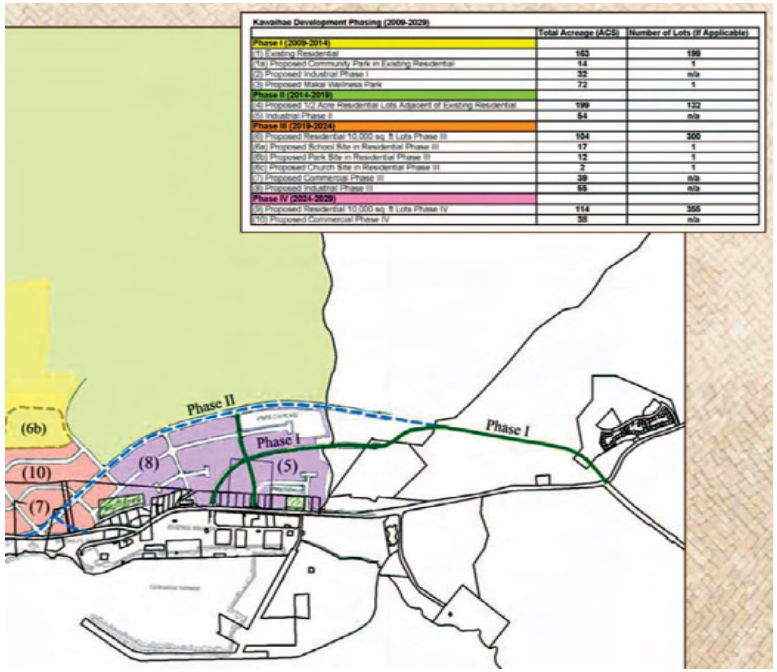
Lands mauka of Kawaihae Harbor, the ahupua'a known as Kawaihae I, are owned by the DHHL, a total of 10,000 acres. Of these, 356 acres are classified as income producing, industrial, and commercial. The Kawaihae Industrial Park is being proposed as 141 acres and implemented in 3 phases spanning between 2009 and 2024. There are 221 residential lots on 214 acres in two areas, Kailapa and Na Pua Ka 'Ilima. The majority of lands are in General Agriculture, comprising 1502 acres, mostly on lease to Kahua Ranch for cattle grazing as well as for eco-tourism (RV, horseback riding). That lease expires in 2011.

Water from the Lalamilo Water System poses a limitation on future development. At the mid elevations, there are many archeological and historical sites, which further limit the type and location of development. Nevertheless, there are important plans in place worth noting. In 1995, DHHL completed a ten-year master plan, but very little was implemented due to the lack of potable water. In 2002, DHHL adopted its Hawai'i Island Plan and in March 2009, DHHL issued a Draft Regional Plan for Kawaihae meant for a twenty year horizon. Its focus is upon finding opportunities and facilitating partnerships to develop its Kawaihae lands.

Phase I of the draft Regional Plan focuses on constructing amenities for the existing residential communities, including mail delivery, day care, and a community park. Phase II would create 132 half acre residential lots and 54 acres of new industrial lots adjacent to the harbor. Phase III would construct an additional 300 residential lots, a school, park, church/community site, and a 39 acre town center. In addition, 55 acres of industrial lands would be developed. Phase IV completes the residential lots and adds 38 acres of town center commercial land.

The draft Regional Plan anticipated major impacts and opportunities from the Hawaii Superferry starting in 2010. The loss of Hawaii Superferry should result in plan adjustments.

Figure 7: DHHL Kawaihae Regional Plan Conceptual Map

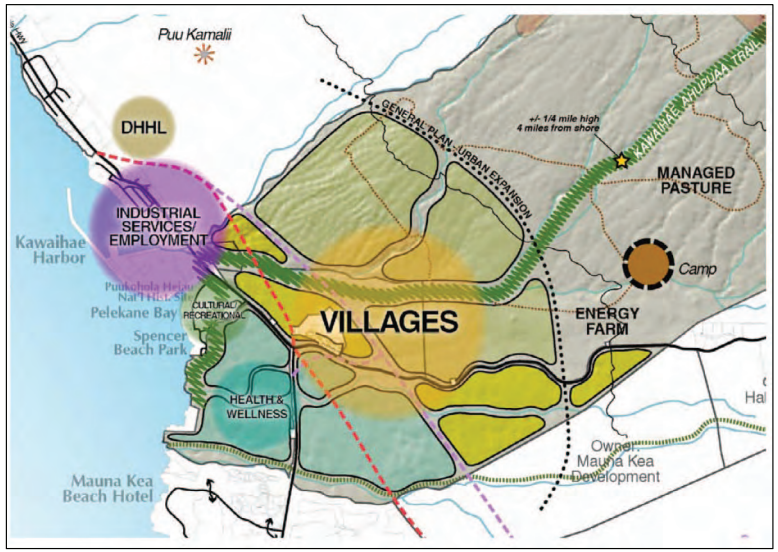


E. Queen Emma Foundation Kawaihae Ahupua'a Strategic Management Plan

Queen Emma Foundation (QEF), the investment arm of Queen's Hospital, owns the entire 10,200 acre ahupua'a of Kamehameha II, which is immediately adjacent to Kamehameha I, the ahupua'a owned by DHHL. There is a diversity of habitat zones, and major features of the ahupua'a include: Pu'ukohala Heiau National Historic Site; the historic residence of John Young; 118 acres of coastal lands including Spencer Bay and Maumae Bay white sand beach; 88 acres of land classified as commercial/industrial; and Important Agriculture Lands and Forest Reserve.

The *Queen Emma Foundation Ahupua'a Strategic Master Plan* was prepared as a guide to decision making by the land trust. The Foundation's stated mission is to "balance endowment income generation with the need for heritage protections objectives." Elements of the master plan include: Ahupua'a Heritage Trail; for the makai lands, a Coastal Health & Wellness Center; for the Midland/Upland lands, cabins and lodges; for Kawaihae, a commercial/industrial village; Residential communities in Kawaihae Village and/or Mauna Kea mauka.

Figure 8: Queen Emma Foundation Ahupua'a Strategic Master Plan Map (2009)

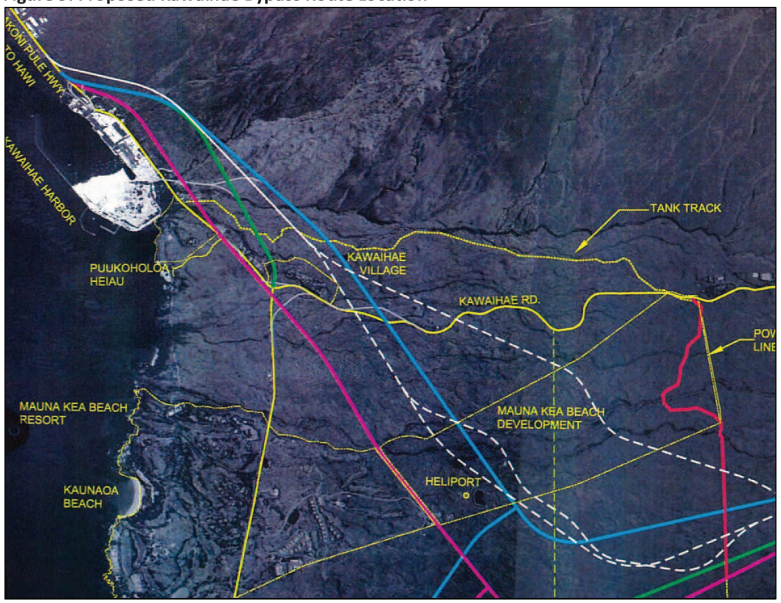


F. State DOT Kawaihae Bypass Road

The State DOT Highways Division issued a Draft EIS for the Kawaihae Bypass Road in 2008. There were several alternatives presented, but many seemed to favor the road being mauka of the village of Kawaihae with a number of spurs or connections down to Akoni-Pule Highway and Kawaihae Road and the harbor. Challenges include steep grades, gulch crossings, and historical/archeological features, including known burials.

Cost of the road was estimated at $221.6 million. It would be constructed in phases: from Kawaihae Road to Queen Ka'ahumanu Highway, in this section it would split into two roads, connecting to each of the major gates at the harbor; the second phase would branch off of Phase 1 and connect to Akoni-Pule Highway north of the harbor. The project is expected to start design in late 2010 and last for several years. Construction start date is not known at this time.

Figure 9: Proposed Kawaihae Bypass Route Location



Hawai‘i Island Commercial Harbors
2035 Master Plan Update

APPENDIX 3
Summary of Forecasts and Technical Analysis

Hawai'i Island Commercial Harbors
2035 Master Plan Update

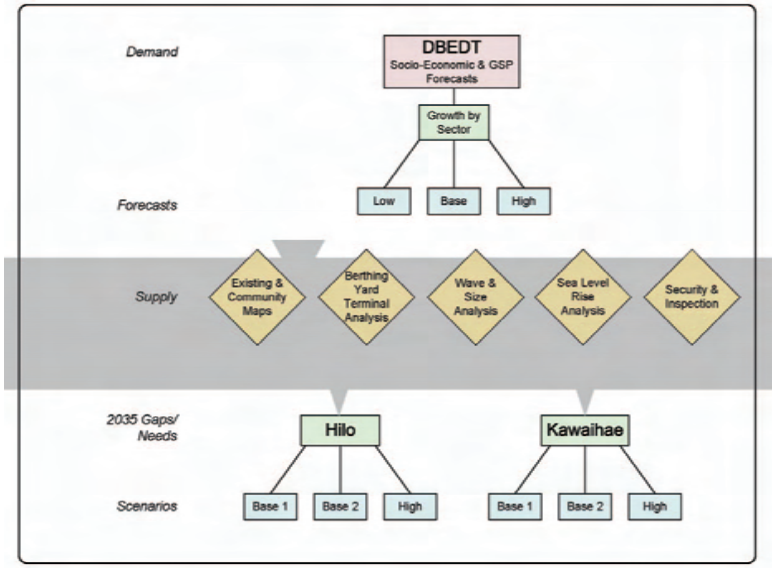
APPENDIX 3

Summary of Forecasts and Technical Analysis

APPENDIX 3: SUMMARY OF FORECASTS AND TECHNICAL ANALYSES FOR THE MASTER PLAN

This Appendix summarizes the results of the special studies conducted as part of the master plan effort. The full text of the special and technical studies is contained in a separate volume.

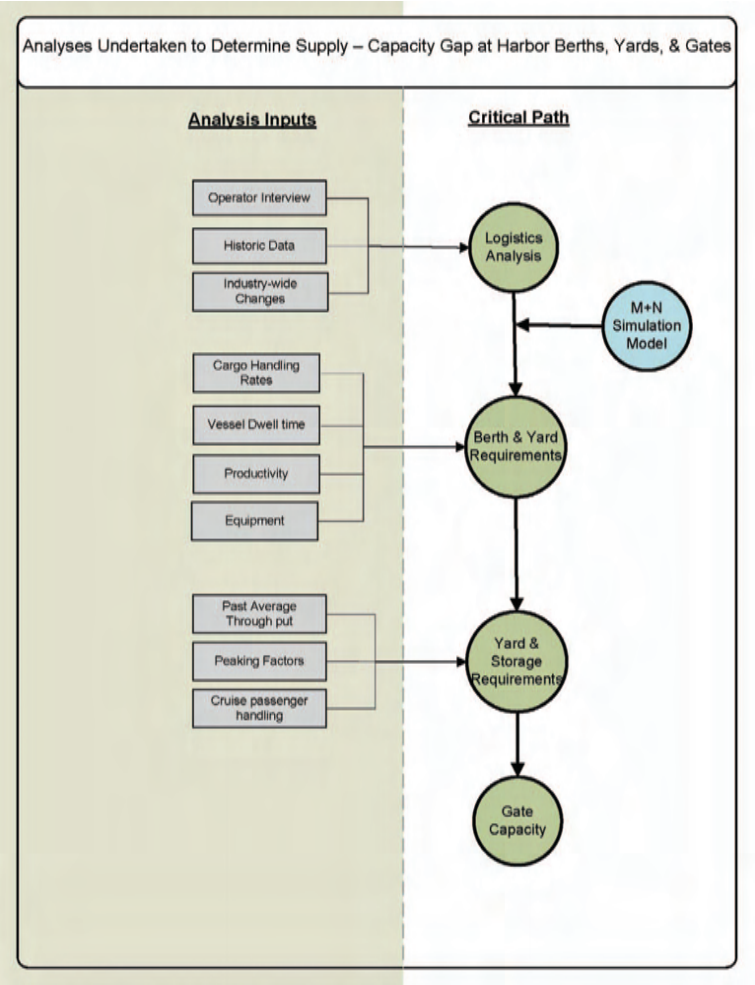
Figure A-1: Development of Forecasts & Scenarios



LOGISTICS ANALYSIS

Hawai'i's container volume originates in the West Coast from Seattle, Tacoma, Oakland, Los Angeles, and Long Beach. Current supply chains for the majority of Hawai'i Island container trade comes via Matson, Pasha, and Horizon with trans-shipment out of Honolulu. International carriers such as Nippon Yusen Kaisha (NYK) stop in Hawai'i, but only in Honolulu. Presented in Figure A-2 is a diagram of steps for the logistics analysis.

Figure A-2: Diagram of Logistics Analysis



Matson is a wholly owned subsidiary of Alexander & Baldwin, and is the principal carrier to and from the West Coast. They currently operate fourteen ships which carry between 200-250,000 TEU yearly. Cargo volumes were down 12 percent in 2009, reflective of Hawai'i's economic condition and the general slowdown in the nation's economy. Matson has responded to this slowdown by reducing the number of vessels calling Hawai'i from 11 to 10, and now 9. One vessel has been re-deployed to China routes.

Horizon is a wholly owned entity of Castle Harlan. It specializes in container shipping and logistics and operates only in Alaska, Hawai'i, Guam, and Puerto Rico using leased vessels.

Pasha operates automobile and rolling stock service between the West Coast (San Diego) and Hawai'i, and calls at Hilo, Kahului, and Honolulu. Pasha operates one vessel biweekly with plans for a second vessel within five years or less. Pasha does not operate at Kawaihae at present.

Matson, Horizon, and Pasha are all Jones Act service providers sailing under the American Flag. Jones Act requirements limit entry to the Hawai'i market. Analyses by Moffatt & Nichol of future volume conducted for the Hawai'i Island 2035 Master Plan in October 2009 suggest this will remain true as far as the 2035 forecast year, in other words, that Hawai'i Island is unlikely to see direct port calls. A more likely scenario, according to Moffatt & Nichol, is that future growth will be supported by adding more weekly calls, rather than by a new carrier.

Published tariff rates (this example comes from Horizon in 2009) show a base rate of $4,402 for a container ship from US West Coast to Honolulu and a Neighbor Island base rate of $4,452. Fuel charges are in constant flux, in the high teens of about 16 percent or $712 per container. Dockage rate is $1000 for 12 hours of 750 feet in Honolulu and $100 at Hilo plus a $77 per container unloading fee.

Cargo is transshipped from Honolulu to Hilo or Kawaihae using primarily Young Brothers and Matson barges. The transshipment charge is $90 for unloading and reloading a 40-foot container. Young Brothers' base rate is $921.66 per container.

MARKET SECTORS AND FORECASTS

In this section forecasts are presented for the combined harbor system by cargo type. This section is based on a technical report prepared by Moffatt & Nichol in October 2009. A copy of this report is included in the Technical and Special Studies Volume.

Methodology

Forecasts of activity at the Hawai'i Island commercial harbors are based on three important parameters:

- Gross State Product (GSP)
- A Low Case, Base Case and High Case future scenarios
- Individual growth influences for the eight major cargo sectors using Hawai'i Island commercial harbors

Gross State Product Forecasts

Container volumes have proven to have a strong correlation to State GSP. The Hawai'i 2035 Master Plan used long term economic forecasts developed by the State Department of Business, Economic Development and Tourism (DBEDT) published in July 2009. These projections are for the state and they include the share that Hawai'i County has of that growth. GSP is projected to grow 1.5 percent per year from $49.4 billion in 2007 to $75 billion in 2035. Statewide residential growth is estimated to average 0.8 percent per year, while Hawai'i county residential growth is expected to be much higher, averaging 1.7 percent yearly, a forecast condition that has been consistent for several decades.

Table A-1: DBEDT Long Term Economic Forecasts

	2007	2015	2020	2025	2030	2035	CAGR
State							
GDP (mil. 2000$)	49,424	54,200	58,900	63,800	69,200	75,000	1.5%
Population	1,277,356	1,367,800	1,432,500	1,492,300	1,547,500	1,598,700	0.8%
Implied Productivity Rate (GDP less population)							*0.7%*
Hawaii County							
Population	172,547	199,500	221,900	242,600	261,800	279,700	1.7%
% of State	14%	15%	15%	16%	17%	17%	

Source: DBEDT July 2009

The forecast of containers and LCL loads that result from this forecast is shown in Table A-1. A total Hawai'i Island 2035 forecast of over 373,365 TEUs is projected up from the current 192,554, just short of a doubling. While this may seem optimistic to some, by comparison, the growth predicted in the early 1990s in the 2020 Master Plan was exceeded before 2007. Between 2002 and 2008, TEU volumes grew an average of 6.8 percent compared to residential population growth of 2.4 percent, suggesting heavy influence by the tourism and construction sectors.

Growth has been especially rapid in Kawaihae Harbor such that now it realizes a 60 percent share of volume versus 30 percent in 1998. This trend is expected to continue. So while cargo may be off in the current year, it is expected to resume to pre-recession levels and begin another cycle of escalation.

Table A-2: Container Forecasts for Hawai'i Island 2008 – 2035

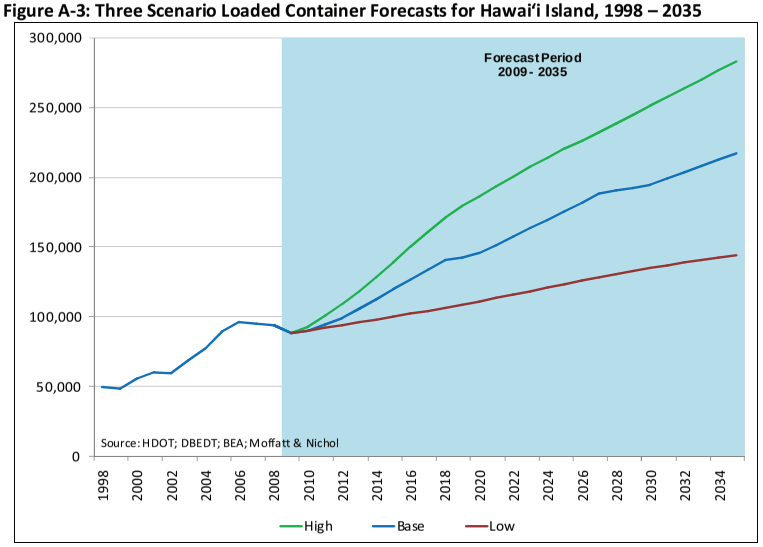
	2008	2015	2025	2035	CAGR*
Loaded TEU (Mixed Cargo)	**94,097**	**119,808**	**175,723**	**217,083**	**3.1%**
Imports	75,307	94,583	136,001	164,983	
Exports	18,790	25,225	39,721	52,100	
Empties	56,517	69,359	96,280	112,883	
Island Agriculture TEU	**3,048**	**2,624**	**2,644**	**2,666**	**-0.5%**
Imports	430	399	419	441	
Exports	2,618	2,225	2,225	2,225	
Empties	-2,188	-1,827	-1,806	-1,785	
Less-Than-Container Load	**41,350**	**38,590**	**41,361**	**42,518**	**0.1%**
Imports	28,704	26,627	28,539	29,338	
Exports	12,646	11,963	12,822	13,181	
Hawaii Island Total Loaded TEU	**138,495**	**161,022**	**219,728**	**262,267**	**2.4%**
Imports	104,441	121,609	164,960	194,761	
Exports	34,054	39,413	54,769	67,506	
Empties	54,329	67,532	94,473	111,098	
Hawaii Island Loaded + Empties	**192,823**	**228,554**	**314,202**	**373,365**	**2.5%**

Source: HDOT; DBEDT; Moffatt & Nichol

*Compound Annual Growth Rate (CAGR)

TEU volumes grow as a three times multiplier, reflective of the higher 2.8 percent GSP forecast and resulting in a compound annual growth rate of 4.2 percent. This would pertain for a decade, then slow.

Figure A-3: Three Scenario Loaded Container Forecasts for Hawai'i Island, 1998 – 2035



Growth by Sector

What follows is a general description of the cargo sectors and what might be expected to change in each.

1. Agriculture

While agriculture has been a traditional market sector at both ports, it has been on the decline since the shift away from mono-crop agriculture (sugar). Hawai'i Island, Hilo in particular, has a large share of the state's agriculture produce (39 percent). A shift to new crops has been in place for a while with markets established for exotic flowers, fruit, coffee, and other products. For forecast purposes, a level at 2008 volumes is assumed. This is a relatively small share of overall volumes, and any increase can easily be accommodated in the cargo forecasts.

2. Automobiles

Auto handling data provided by carriers proved to be conflicting, making it somewhat difficult to forecast. The historic trends on increasing numbers of units peaked in 2005-6 at 43,000 units per year, coinciding with peaks in GSP and visitor arrivals. Hilo handles about 60 percent of the auto volumes. Forecasts are assumed to be cyclical and tied to the visitor economy as well as resident population increases. Total automobiles moves are estimated at 59,000 in 2035.

3. Lumber & Cement

The demand for lumber and cement is correlated to construction activity. Lumber is primarily used for residential construction, whereas cement is used in nearly all forms of construction including roads and bridges, airports, hotels, commercial and residential buildings.

Construction levels in Hawai'i, as elsewhere, are down, however a 1.7 percent growth rate would inevitably result in demand for construction materials and wood is forecast at an additional 6,900 TEU.

Cement volumes, which increased 17 percent per annum from 1998-2006, but is now 42 percent below its 2005 peak. Demand is expected to rise again due to public sector construction activity and capital projects funded by the ARRA Act of 2009. Moffatt & Nichol estimates that after this bump in activity, demand for cement will level off at around 45,000 tons per year. Cement is increasingly being shipped in containers, but bulk shipments are expected to continue to dominate volumes

4. Petrochemicals

Hawai'i Island petrochemical volumes have increased 2.8 percent between 2000 and 2008, which is in line with the 2.7 percent population growth. Gasoline accounts for 35 percent of petrochemicals, and has grown 1.1 percent annually. Diesel and fuel oil has dropped off. Liquid petro gas has increased 2.1 percent.

Push towards fuel efficiency and production of alternate energy sources could diminish demand, and if this occurs, it is not likely to come in the later years of the forecast period. Therefore, the Master Plan assumes petro growth to 7.0 million barrels from the 2008 level of 4.9 million barrels. Energy used for petroleum burning plants could move that figure higher.

5. Less-Than-Container Loads (LCL)

There is a global trend towards containerization, with more and more goods being shipped in containers rather than being handled as break-bulk. In Hawai'i, Young Brothers (YB) is the only carrier that does break-bulk. Packing and unpacking for others, such as Matson, is done elsewhere. The study forecasts less LCL in 2035 than at present. The TEU forecasts for loaded mixed cargo, agriculture, and LCL are shown in Table A.2 above. The conversion factor used is 9.5 tons per TEU, which is an accepted average.

6. Cruise Passengers

Hawai'i has had cruise ship lines call such as American Hawai'i Cruises and several foreign cruise lines. Passenger cruises in Hawai'i expanded greatly in 2001 when Norwegian Cruise Lines (NCL) based three vessels here and for a few years, Hawai'i was one of the fastest growing destination markets in the US. But beginning in 2007, NCL re-deployed two of three of its Hawai'i vessels to other markets. Passenger embarkations at Hilo fell 20 percent.

As the economy recovers, Moffatt & Nichol predicts passenger activity will rebound, but that this will take nearly a decade. This provides time to put in place the infrastructure needed to improve the separation of passengers out of cargo operation areas.

The forecast is to reach 2007 levels of passengers by 2025-30.

BERTH AND YARD REQUIREMENTS

Using the forecasts and trends for cargo segments described in Section 4.2 above, the next step in analysis was to determine the capacity of the berths and yards to receive, discharge and load, and store the cargo. Estimates were made of berth length and yard storage area requirements to meet the demand of the Low, Base, and High cases.

The analyses also looked at whether the LCL cargo would be fully containerized or remain as break-bulk. If the cargo were to be consolidated and containerized it could be de-stuffed and distributed at off-dock facilities, at least in theory, should such facilities be built outside of the harbor property.

Methodology

The throughput of a berth is primarily a function of cargo handling rates and the amount of time the vessel remains at the harbor berth. Cargo handling rates are a function of available handling equipment, labor availability, and productivity. Both Hilo and Kawaihae handle a variety of different cargo types and many different types of vessels. Each vessel has a different cargo handling rate. In short, there is no single measure of berth capacity. To account for this, Moffatt & Nichol developed a customized model for the berths at Hilo and Kawaihae in order to compare the total foot hours of berth capacity to the required berth occupancy in foot hours. See Appendix C of the *Future Berth and Yard Requirements Report* (November 2009).

The yard capacity at a harbor is mainly a function of yard space, stacking density and cargo dwell times. Yard space is generally used as a buffer between vessel delivery and receipt of cargo and inland transport of that cargo. Multiple vessel calls complicates the measurement of the size of buffer needed. Dwell time is the amount of time elapsed between when cargo is set down in the yard and when it is picked up.

Capacity of the yard is the yard area and density multiplied by the number of times that cargo can be turned over (in a day, week, month, or year). The analysis for the Hawai'i 2035 Master Plan used dwell times as reported by the various operators and users. For bulk products, Hawaiian Cement, Tesoro, Mid-Pac Petroleum, and the Gas Co. were all contacted. Each felt they had ample storage capacity for present volumes and could easily store double current capacities.

Therefore, the analysis for yard requirements focused on containers, break-bulk, autos, and lumber. A customized simulation model was developed for each harbor, with provisions for

seasonal peaking, storage efficiency, and import/export distribution. The required number of slots per container was then converted into acres.

Berth Occupancy and Capacity at Hilo Harbor

The discussion below summarizes a multi-step customized model for forecasting berth capacity. The full report and analysis can be found in the Technical and Special Studies Volume.

Existing and Near-Term

Table A-4 below provides an estimate of 2009 throughput in each cargo segment for the entire year. A full table is included with the Moffatt & Nichol report as in the Technical and Special Studies Volume.

Table A-4: Estimate of 2009 throughput at Hilo Harbor

Cargo Segment	Estimated 2009 Throughput
Containers	48,393 TEUs
Break Bulk (LCL)	168,443 tons
Automobiles (RO/RO)	13,743 units
Lumber	19,064 thousand foot board measure (mbm)
Cement	16,234 tons
Petrochemicals	4,403,282 barrels (bbls)
Cruise Passengers	348,299 passengers (pax)

Source: Future Berth and Yard Requirements Report (2009)

For the Step 1 analysis, an average load per call is determined for each vessel based upon operator interviews and the 2009 throughput data. This average load per call multiplied by the vessel call frequency provides the annual throughput for that vessel. The loads are adjusted so the total of all the vessels in each cargo segment totals the estimated 2009 throughput for that segment.

Step 2 estimates the length of berth each vessel occupies when in port. From operator interviews, and 2009 schedule data, average discharge and load rates are estimated for each vessel to derive average call duration.

The occupied berth length multiplied by the call duration, and call frequency from Step 1, determines the annual berth occupancy for each vessel. The sum of all the vessels provides the overall berth occupancy for 2009. The result is that the total 2009 berth occupancy for Hilo Harbor is 3,976,944 foot-hours. Hilo Harbor currently operates with three berths known as Pier 1, Pier 2, and Pier 3. In addition, Pier 4 is a committed project that will be constructed in the near term by 2015. Table 4.5 outlines the length of each berth and what its primary use is.

Table A-5: Hilo Harbor Berth Capacity Summary

Berth Designation	Length	Primary Uses
Pier 1	1250 feet	Matson containers, autos, break bulk, cruise ships
Pier 2	725 feet	YB containers, autos, break bulk
Pier 3	652 feet	YB containers, autos, break bulk, Cement, Petrochemicals
Pier 4*	602 feet	Future YB containers, autos, break bulk, RO/RO

*Future committed project.

At present the harbor is open 24/7, but has office operating hours of 7 am to 4 pm, Monday to Friday and 7 am to 12 pm, Saturday. Shippers working outside the office hours provide security guards to safeguard cargo. This does not apply to barge operations which have their own security plan. The discharge and loading of containers, break bulk cargo, autos, and cruise passengers is generally restricted to those hours. Bulk cement and petrochemicals unloading will often continue throughout the night so the harbor (Pier 3) is at times in limited operation 24 hours.

Before simply multiplying the total berth length by the operating harbor hours a berth utilization factor is employed. Although possible, it is generally not advisable to operate cargo berths for 100 percent of their available hours. At high rates of occupancy berthing conflicts can occur where vessels upon arrival will not find a berth available to them and therefore must standby, or go to anchor while awaiting a berth. To avoid such circumstances, and in most instances ensure an available berth upon arrival, a generally accepted rule of thumb is for multiple berths (3 or more) to operate at no more than 60 percent of the available berth hours. Therefore, a berth utilization factor of 0.6 is included in Step 3 of the model.

On the basis of a 50 hour week for Piers 1, 2 and 4, and 125 hours for Pier 3 (24 hrs Monday to Friday and 5 hours on Saturday) the harbor has an existing berth capacity of 5,569,725 foot-hours and a near term berth capacity once Pier 4 is constructed of 6,620,325 foot-hours. As determined from Step 1 through 3 Hilo Harbor in 2009 appears to be operating at approximately 70 percent of capacity in terms of its current three berths. The addition of Pier 4 will reduce this to 60 percent of capacity.

2035 Projection

A full summary, including all inputs and outputs, for the Step 1, 2 and 3 analyses for the near term base and each 2035 throughput forecast scenario is provided in the Technical and Special Studies Volume.

Since the analysis of berth occupancy and capacity has been compiled on an annualized basis consideration should be given to increasing the total overall harbor berth length for each 2035 scenario by 10 to 15 percent to account for daily and weekly peak berth demands during the year. These demands will depend on vessel schedules in 2035 and thus cannot be fully

forecasted at this time. As a result, the following total berth lengths and corresponding berth length additions as shown in Table 4.6 are recommended for Hilo Harbor.

Table A-6: Estimated Total and Additional Berth Length Recommended for Hilo Harbor

2035 Forecast Scenario	Total Berth Length (ft)	Additional Length (ft)
Low Case with LCL Containerized Off-site	2423	None
Low Case with LCL	2423	None
Base Case with LCL Containerized Off-site	3162	None
Base Case with LCL	2807	None
High Case with LCL Containerized Off-site	4255	948
High Case with LCL	3812	505

The 948 feet of additional berth length is equal to about two large barge berths while 505 feet could accommodate one large barge, or two smaller ones. Further, when preparing actual development sketch plans further adjustments may be necessary to avoid odd leftover berth lengths that cannot accommodate average sized vessels depending on location.

Berth Occupancy and Capacity at Kawaihae Harbor

Existing and Near-Term

For Step 1 the average load per call is determined for each vessel from operator interviews and 2009 throughput data. The average load per call multiplied by the vessel call frequency provides the annual throughput for each vessel. The loads are adjusted so the total throughput in each cargo segment totals the estimated 2009 throughput for that segment.

In Step 2 average call durations are determined based on vessel discharge and load rates plus vessel call schedules. This assumes the range of average discharge and load rates used for each vessel in each cargo segment for Kawaihae Harbor. These rates were derived from 2009 schedule data and operator interviews. The estimated occupied berth length for each vessel as determined in Step 2 is multiplied by the call duration and call frequency from Step 1 to determine the annual berth occupancy for each vessel. Step 2 totals the berth occupancies for each vessel to provide the overall berth occupancy for 2009. The total 2009 berth occupancy for Kawaihae Harbor is 1,177,597 foot-hours. A breakdown of estimated 2009 throughput for Kawaihae Harbor is provided as Table A-7. Kawaihae Harbor presently operates with two berths known as Pier 1 and Pier 2. Table A-8 outlines the length of each berth and its primary use.

Table A-7: Estimate of 2009 throughput at Kawaihae Harbor

Cargo Segment	Estimated 2009 Throughput
Containers	73,736 TEUs
Break Bulk (LCL)	117,877 tons
Automobiles (RO/RO)	12,343 units
Lumber	861 tons
Cement	25,212 tons
Petrochemicals	123,500 bbls
Cruise Passengers	n/a

Table A-8: Kawaihae Harbor Berth Summary

Berth Designation	Length	Primary Uses
Pier 1	412 feet	Cement
Pier 2	1150 feet	Matson and YB containers, autos, break bulk, petrochemicals

2035 Projection

As with Hilo, for the 2035 throughputs the berth analysis model's three steps are repeated but with the change in call frequencies for each vessel that reflects the forecasted increase in throughput for each cargo segment. Table A-9 provides the berth occupancy for each forecast scenario in 2035. Again, for the cargo segments where only a base case has been forecasted the base case throughout is also used for the low and high case analysis.

The projected berth occupancy is very similar whether current break bulk LCL's are handled on-dock or off-site. However, for Kawaihae the projected berth occupancy does increase noticeably between the low case and base case (more than 60 percent), and it increases more than 100 percent comparing the low case with the high case. Kawaihae Harbor's existing berth capacity of 2,413,290 foot-hours is barely sufficient to handle the low case scenarios and well under what is required for the base and high cases.

Table A-9: Projected Berth Occupancies in 2035 for Kawaihae Harbor

2035 Forecast Scenario	Projected Berth Occupancy (foot-hours)
Low Case with LCL Containerized Off-site	2,043,658
Low Case with LCL	1,983,277
Base Case with LCL Containerized Off-site	3,276,477
Base Case with LCL	3,242,781
High Case with LCL Containerized Off-site	4,334,010
High Case with LCL	4,158,432

Since the analysis of berth occupancy and capacity has been compiled on an annualized basis consideration should be given to increasing the total overall harbor berth length for each 2035 scenario by 10 to 15 percent to account for daily and weekly peak berth demands during the

year. As a result, the following total berth lengths and corresponding berth length additions as shown in Table A-10 are recommended for Kawaihae Harbor. These additional lengths are significant as they equal to two to five typical barge berths.

Table A-10: Estimated Total and Additional Berth Length Recommended for Kawaihae Harbor

2035 Forecast Scenario	Total Berth Length (ft)	Additional Length (ft)
Low Case with LCL Containerized Off-site	1493	None
Low Case with LCL	1440	None
Base Case with LCL Containerized Off-site	2389	828
Base Case with LCL	2355	793
High Case with LCL Containerized Off-site	3162	1600
High Case with LCL	3022	1460

Yard Storage Capacity and Acreage at Hilo Harbor

Dwell times for the storage of containers and autos were provided by the two main operators of these cargo segments. For containers the final dwell times used are based upon those given but increased by 20 percent to account for annual variations that could result as volumes increase since past dwell times had been noted to be higher. For general cargo break bulk and lumber break bulk the dwell times were considered by operators to be about 50 percent higher than the dwell times for containers.

A base map illustrating the layout and storage areas at Hilo Harbor in May of 2009 was prepared along with a base map with the committed near term Pier 4 projected added. From the Existing Site Plan Plus Committed Projects map, Table A-11 below provides the approximate near-term storage area for each cargo segment in Hilo Harbor.

Table A-11: Near-Term Storage Area at Hilo Harbor

Area Description	Storage Area (acres)
Containers	16.0
Chassis	2.5
Break Bulk	2.4
Autos	1.5
Lumber	0.25

Generally all container exports (laden and empty) are grounded while imports are wheeled. For grounded containers they are stacked maximum 4 high. For grounded containers an average stack utilization[1] of 65 percent is used while 75 percent is used for chassis slots. These are in the range of generally accepted values to allow for digging of grounded containers and blocking. Although this may be a little conservative, since at Hawai'i grounded containers are for the most part empties and there is only one destination: Honolulu.

[1] Definition of Average Stack Utilization…

Based upon the existing storage area and past throughputs, it is estimated that general break-bulk cargo can be stored at about 1,300 tons/acre on average. There is no "accepted" value for this as break-bulk cargo can be almost anything. Lumber can generally be stored at 1,750 mbm/acre and autos at 340 units per acre based upon a storage area of 8 feet by 16 feet for the average auto.

Each operator indicated that peak monthly volume for containers, break-bulk, and lumber is about 20 percent higher than the average month so a peaking factor of 1.2 is used. Autos experience very high seasonal peaks, as much as 100 percent, so a seasonal peaking factor of 1.8 is used.

With average annual dwell times, available storage areas in acres, and storage densities per acre, plus storage utilization, and peaking factors individual throughput capacities for each cargo segment can be estimated. Table A-12 provides the determined existing 2009 annual throughput capacity for containers, break bulk, lumber, and autos at Hilo Harbor as well as for the near term capacity once Pier 4 is constructed. Also, provided in Table A-12 is the corresponding throughput in 2009 and peak annual throughput since 2004.

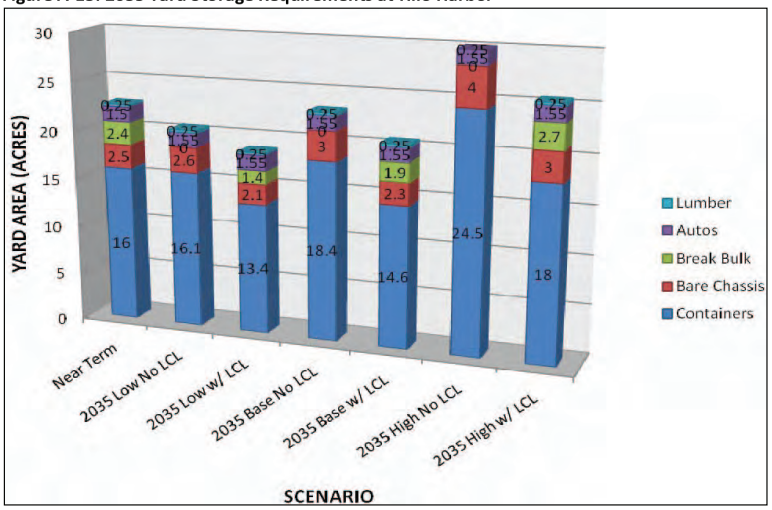
Table A-12: Estimated Annual Yard Capacities and Historic Throughputs for Hilo Harbor

Cargo Segment	Estimated 2009 Annual Capacity	Estimated Near Term Annual Capacity	Estimated 2009 Throughput	Peak Annual Throughput (2004 to 2008)
Containers	76,000 TEUs	100,000 TEUs	48,393 TEUs	63,759 TEUs
Break Bulk	220,000 tons	252,000 tons	168,443 tons	264,877 tons
Autos	33,800 autos	33,800 autos	13,743 autos	23,597 autos
Lumber	35,000 mbm	35,000 mbm	19,064 mbm	34,313 mbm

The overall total existing storage area for containers, chassis, break bulk, lumber, and autos in 2009 is about 20 acres and once Pier 4 is constructed it will be about 23 acres. This amount excludes office areas, cement storage, berth aprons, buildings, gate areas, etc.

To determine the total area of storage needed for each cargo segment plus bare chassis storage, and the harbor overall, in 2035 the forecasted annual throughputs are entered for each scenario and revised areas are provided. No changes are made to any of the density, dwell, peaking, or utilization factors. Figure A-13 shows the determined storage acres needed for each cargo segment and the harbor overall for each 2035 forecast scenario.

Figure A-13: 2035 Yard Storage Requirements at Hilo Harbor



As seen by the results above, the difference in required yard areas between those where LCL's remain as break bulk or are containerized off-site is small. The explanation appears to be because the LCLs are roughly two-thirds imports and therefore, if containerized, a substantial number of empty containers are generated for export that need storage and re-handling. Both of which consume yard, and berth, resources whereas if the LCL's are not containerized these empties do not exist. In addition, the data indicates that the operators handling LCL's are doing so very efficiently.

Under the low and base cases, the existing yard areas are sufficient to support the forecasted volumes. It is only under the high case that roughly 3 to 8 acres of additional yard area is required.

The remaining sector, cruise, currently uses about 1.5 acres of the harbor for each ship at berth. From discussions with HDOT and operators, this area is considered insufficient to accommodate all of the activities associated with a visiting vessel. Ideally a visiting vessel of the sizes that often call Hilo should have about 1.5 to 2 acres for taxis, tour buses, etc. plus about another 0.25 to 0.75 acres for security, embarkation/disembarkation, vendors, immigration, and etc. areas.

Reviewing the data from the berth occupancy analysis discussed above, even under the high case scenario where 590,000 passengers is forecasted, only one berth is likely required for cruise vessels, although, this will ultimately depend on cruise line schedules. Therefore, for future planning approximately 1.75 to 2.75 acres of yard area should be dedicated to cruise operations, an increase from 1.5 acres at present. See the full Moffatt & Nichol report in the Technical Volume.

4.3.5 Yard Storage Capacity and Acreage at Kawaihae Harbor

The two major operators at Kawaihae provided dwell times for the storage of containers and autos which shows the dwells to be less than those at Hilo. As was done for Hilo, final container dwell times used are based upon those given but increased by 20 percent to account for annual variations that could result as volumes increase since past dwell times had been noted to be higher when volumes were also higher.

For general cargo break bulk and lumber break bulk, the dwell times were not provided so it was assumed, based on general input from operators, that break bulk dwell times are 50 percent more than those dwell times for containers.

An Existing Site Plan illustrating the layout and storage areas at Kawaihae Harbor in May of 2009 was prepared along with an Existing Site Plan Plus Committed Projects that includes a rearrangement of the harbor yard areas once the current 3.9 acre area around the existing HDOT office is paved and the office itself is moved. From the Existing Site Plan Plus Committed Projects Table A-13 provides the approximate near term storage area for each cargo segment.

Table A-13: Near Term Storage Area at Kawaihae Harbor

Area Description	Storage Area (acres)
Containers	17.5
Chassis	4.4
Break Bulk	1.5
Autos	1.5
Lumber	0.25

Generally all container exports (laden and empty) are grounded while imports are wheeled. For grounded containers they are stacked maximum 4 high. The same stack utilizations as Hilo are used. As with Hilo, it is estimated that based upon data provided that general break bulk cargo can be stored at about 1,300 tons/acre on average. Lumber can generally be stored at 1,750 mbm/acre and autos at 340 cars per acre.

Similar to Hilo, the operators indicated that the peak monthly volume for containers, break-bulk and lumber is about 20 percent higher than the average month so a peaking factor of 1.2 is used. As well, auto imports and exports at Kawaihae experience very high seasonal peaks, as much as 100 percent, so a seasonal peaking factor of 1.8 is used.

Incorporating annual dwell times, available storage areas, storage densities, stack utilizations, and peaking factors, throughput capacities for each cargo segment can be determined. The estimated near term annual throughput capacity for containers, break bulk, lumber and autos for Kawaihae Harbor is given Table A-14 along with corresponding estimated throughput in 2009 and peak annual throughput since 2004.

The overall total existing storage area for containers, break bulk, lumber and autos is 22.8 acres while this will increase in the near term to 25.14 acres. This excludes office areas, cement storage, berth aprons, buildings, gate areas, etc.

Table A-14: Estimated Annual Yard Capacities and Historic Throughputs for Kawaihae Harbor

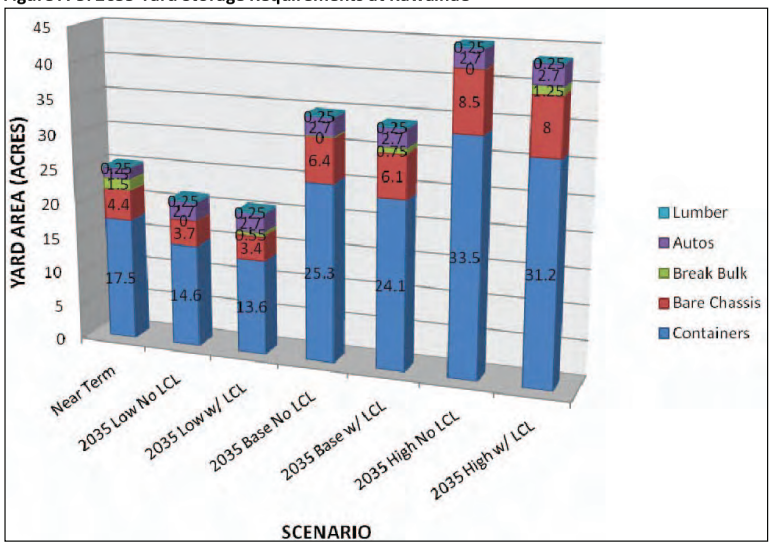
Cargo Segment	Estimated 2009 Annual Capacity	Estimated Near Term Annual Capacity	Estimated 2009 Throughput	Peak Annual Throughput (2004 to 2008)
Containers	127,000 TEUs	175,000 TEUs	73,736 TEUs	98,635 TEUs
Break Bulk	225,000 tons	157,500 tons	117,877 tons	253,559 tons
Autos	27,000 autos	13,500 autos	12,343 autos	19,071 autos
Lumber	35,000 mbm	35,000 mbm	861 mbm	1175 mbm

To determine the total area of storage needed for each cargo segment, and the harbor overall, in 2035 the forecasted annual throughputs are entered for each and revised areas are provided. Figure A-5 provides the estimated storage acres needed for each cargo segment and harbor overall for the six 2035 forecast scenarios.

The results in Figure A-5 show that like Hilo, that the difference in yard area needed for volumes where LCL's remain as break bulk, or are containerized is negligible. Like Hilo, the explanation appears to be because the LCLs are roughly two-thirds imports and therefore, if containerized, a substantial number of empty containers are generated for export that need storage and re-handling. Both of which consume yard, and berth, resources whereas if the LCL's are not containerized these empties do not exist.

For the two low case scenarios the existing and committed yard areas appear sufficient to support the forecasted volumes. Under the base case container volumes grow well beyond the current estimated volumes and capacity and thus dominate the needed yard space to the point where about 9 additional acres is needed. In the high case container volumes are substantially higher than the estimated present yard capacity so the analysis shows that an almost doubling of container space is needed, and thus overall the harbor requires an additional 18 to 20 acres of yard storage. The full analysis of yard and storage needs is contained in the Technical and Special Studies Volume.

Figure A-5: 2035 Yard Storage Requirements at Kawaihae



Gate Capacity

As with berth occupancy and yard capacity, the volume of trucks picking up and dropping off containers would be expected to dominate the traffic and hence gate volumes at each harbor. Each cargo segment with the exception of petrochemicals at Hilo is expected to generate truck and auto traffic at each facility. See Appendix C of the Technical Reference Volume II.

The volume of gate traffic is totally related to the number of containers moving through the harbor. Each container is assumed to create two truck trips, one to enter, and one to leave. Truck are assumed to carry a single container since, compared to the mainland, travel distances are typically short. Trucks that drop off one container and then pick up another ("double transactions") reduce the amount of gate traffic. In Hilo, the double transaction rate is about 60 percent, and in Kawaihae it is nearly 90 percent.

Gate activity associated with cruise passengers is a very different phenomenon. Such trips include both day trips for passengers, and trips for deliveries, maintenance, and labor for the ship. As a general rule of thumb when in port, one-third of passengers stay aboard, one-third disembark and walk around, and one-third take tours by taxi and bus. However, the numbers in Hilo have proven quite different. The December 2008 Hawai'i Cruise Study showed a higher

number of passengers who disembark in Hilo use shuttles and tour buses than who walk (5 percent).

For purposes of this Master Plan, it is assumed that for each call, there are 2,500 passengers and 800 staff. Currently, the only day that a cruise ship is in port at Hilo is Tuesday, but that is expected to both vary and increase in the future. Hilo, as a port of entry, must address customs issues. Tables A-15 and A-16 below show the average number of trips that can be expected in an average month and in a peak month for the Low, Base & High Cases.

Table A-15: Estimated Vehicle Trip Counts for Hilo Harbor in 2035

Containers	Annual Ave. Daily Truck Trips	458
	Peak Monthly Daily Truck Trips	549
	Peak Hourly Truck Trips	102
Lumber	Annual Ave. Daily Truck Trips	n/a
	Peak Monthly Daily Truck Trips	n/a
	Peak Hourly Truck Trips	n/a
Cement	Annual Ave. Daily Truck Trips	n/a
	Peak Monthly Daily Truck Trips	n/a
	Peak Hourly Truck Trips	n/a
Truck Totals	Annual Ave. Daily Truck Trips	471
	Peak Monthly Daily Truck Trips	564
	Peak Hourly Truck Trips	105
Auto Im/Ex	Annual Average Daily Trips	n/a
	Peak Monthly Daily Trips	n/a
Cruise, Taxi, Bus, Etc.	Daily Vehicle Trips	239
Staff, Labor, Etc.	Annual Average Daily Trips	94
	Peak Monthly Daily Trips	113

Table A-16: Estimated Vehicle Trip Counts for Kawaihae Harbor in 2035

Containers	Annual Ave. Daily Truck Trips	758
	Peak Monthly Daily Truck Trips	910
	Peak Hourly Truck Trips	169
Lumber	Annual Ave. Daily Truck Trips	n/a
	Peak Monthly Daily Truck Trips	n/a
	Peak Hourly Truck Trips	n/a
Cement	Annual Ave. Daily Truck Trips	n/a
	Peak Monthly Daily Truck Trips	n/a
	Peak Hourly Truck Trips	n/a
Petrochemicals	Annual Ave. Daily Truck Trips	3
	Peak Monthly Daily Truck Trips	3
	Peak Hourly Truck Trips	1
Truck Totals	Annual Ave. Daily Truck Trips	765
	Peak Monthly Daily Truck Trips	918
	Peak Hourly Truck Trips	172
Auto Im/Ex	Annual Average Daily Trips	n/a
	Peak Monthly Daily Trips	n/a
Cruise, Taxi, Bus, Etc.	Daily Vehicle Trips	n/a
Staff, Labor, Etc.	Annual Average Daily Trips	153
	Peak Monthly Daily Trips	184

WAVE AND SURGE CONDITIONS ANALYSIS

An assessment of surge conditions and wave protection at both harbors was conducted by Moffatt & Nichol in 2010.

The Hilo Harbor wave and surge analysis was based on telephone interviews conducted with harbor users and terminal managers from YB and Matson, with the Harbor Master, and with a coastal engineer from the USACE. Results of the interviews concluded that wave conditions are seasonal with adverse conditions occurring during the winter months only.

Adverse wave conditions do not significantly affect vessel maneuvering on berth approach and do not limit the types of vessel that may call at the existing or proposed berths to a significant extent (except for restrictions arising due to berth mooring geometry). Adverse wave conditions negatively affect moorings behavior on three or four occasions per year, however this is due to poor berth mooring geometry to a greater extent than the severity of wave/surge conditions.

The berths proposed in the various 2035 Master Plan alternatives are not expected to experience significantly worse wave conditions than at existing berths, however detailed studies will be required to confirm this at the next project stage. In particular, the east-west geometry of Pier 4 differs significantly from that of existing berths so its expected behavior may not be reliably extrapolated from experience.

The Kawaihae Harbor wave and surge analysis reviewed a 2003 study conducted by the USACOE entitled *Kawaihae Deep Draft Harbor Modifications Study* and a 2006 study by Thompson, Demirbilek and Briggs entitled *Wave Climate and Wave Response, Kawaihae Deep Draft Harbor, Island of Hawai'i, Hawai'i.* Although Kawaihae Harbor benefits from some natural protection from northerly waves, in the winter months, energy swells are common and often disrupt harbor operations, at Pier 1 in particular. At Pier 1, wave heights over four feet occur about 12 percent of the time and at Pier 2 10 percent of the time.

Previous studies have identified options for improving conditions at Kawaihae. These options range from lengthening the north end of the breakwater, constructing a new breakwater, deepening the entrance channel and basin to increase the draft. Despite the demonstrated potential for making these improvements, to date it has been concluded that the costs of modifications is not justified based on current and projected use of Kawaihae Harbor.

The implications of the wave analysis to the 2035 Master Plan options are that the northernmost future berth at Pier 2 which services cargo and fuel barges will approach the higher energy region of 0.4 to 0.6 amplification factor. This may mean that wave conditions at that berth will be somewhat more severe than at the existing Pier 2 berths.

The orientation of the proposed Coral Flats Pier is by necessity such that vessels are not aligned with waves in the optimal head-to or stern-to direction. This may mean that, for a given wave conditions, barges at this berth may be more susceptible to excessive motion than other berth orientations in the harbor. Wave reflections from the Coral Flats Pier will, in general, be directed towards Pier 2B. The amount of wave reflection will depend on the type of berth face proposed for the Coral Flats Pier. For example, the wave reflection coefficient of a rock slope under a pile-supported deck is typically 20 to 30 percent whereas that from a vertical wall may exceed 90 percent.

The effect of the orientation of the Coral Flats Pier is difficult to predict as moored barge behavior is highly sensitive to the frequency and direction of the impinging wave. However, given that the height amplification factor in this region is less than 0.2, it is likewise expected that mooring conditions will be acceptable. For wave reflection mitigation, a low reflectivity berth face is recommended. There would be greater probability of wave reflection issues due to the longer berth face. Mooring conditions at Pier 2 B would be improved.

GLOBAL CLIMATE CHANGE ANALYSIS

Professor Chip Fletcher of University of Hawai'i School of Ocean and Earth Science and Technology (SOEST), was hired to study the amount of land area vulnerable to marine inundation at high tide due to sea level rise. This was done for both harbors, and the complete report is available in the Technical and Special Studies Volume.

The Fletcher report summarized global mean sea level rise due to decreased global ice volume and warming of the ocean. While demonstrating that there are local variations, the report projects that based on the weight of scientific evidence, a one (1) meter rise by the end of the century is an approximate metric for planning purposes. Island subsidence will occur in subtle (3-11.5 mm), but increasingly accelerated, annual increases.

By studying the fine-scale elevations of the harbors at 30 cm vertical resolution, Table 4.17 demonstrates the time it might theoretically take to reach vertical levels of inundation.

The mapping methodology used light detection and ranging (LIDAR) from State Civil Defense, and FEMA dated 2007, and was processed using ArcMap; the sea level rise scenarios were mapped to create pictorial images as shown in Figure A-6 for Hilo and Figure A-7 for Kawaihae. The effects of sea level rise of this magnitude include: groundwater rise, wave overtopping, lack of runoff drainage, and coastal erosion.

At Hilo Harbor, the areas of significant impact include the adjacent undeveloped lands to the east of the commercial harbor and to the residential parcels west of the harbor. At Kawaihae Harbor, the areas of impact include the edges of the Coral Flats area, and in particular the mouth of Makahuna Gulch that empties mauka streams into the harbor basin. The design of new facilities, roads, and bridges on Coral Flats needs to account for the long-term effects of sea level rise.

Table A-17: Time Until Passive Inundation

Elevation of lands	Rate of local SLR		
	3 mm/yr	5 mm/yr	11.5 mm/yr
30 cm	100 yr	60 yr	26 yr
60 cm	200 yr	120 yr	52 yr
100 cm	333 yr	200 yr	87 yr
140 cm	466 yr	280 yr	122 yr

Source: Fletcher and Barbee, 2009

Hilo and Kawaihae can eventually expect to experience the chronology on the right column of Table A-17 according to sea level studies cited in Fletcher and Barbee report.

At Hilo Harbor, sea level rise of 30 cm will inundate a minimum of 1.59 acres of dry land at high tide. A rise of 60 cm will lead to inundation of a minimum of 2.96 acres of land at high tide, and

a rise of 1 m will inundate at least 5.46 acres of land at high tide. At Kawaihae, a rise of 30 cm will inundate a minimum of 3 acres, and 60 cm of rise will inundate at least 5.6 acres. A rise of 1.4 m, a standard used by the state of California as a planning target for sea level rise by the end of the century, will flood at least 7.85 acres of land at Hilo Harbor and at least 19.2 acres at Kawaihae Harbor at high tide. Table 4.10 shows the land area vulnerable to inundation at the two harbors.

Table A-18: Inundated Land Area at High Tide

Elevation	Hilo Harbor	Kawaihae Harbor
30 cm	1.59 acres	3.02 acres
60 cm	2.96 acres	5.60 acres
100 cm	5.46 acres	9.08 acres
140 cm	7.85 acres	19.20 acres

Source: Fletcher and Barbee, 2009

Figure A-6: Hilo Sea Level Rise Map

Figure A-7: Kawaihae Sea Level Rise Map