Kalaeloa Master plan

Technical Appendices

State Of Hawai'i

Hawai'i Community Development Authority

March 1, 2006

Prepared by: Belt Collins | EDAW | SMS | BAE | Ebisu

TABLE OF CONTENTS

Appendix a

regional economic report

Beyond Information. Intelligence.

Consulting

Database Marketing

Economic & Social Impact Studies

Research

REGIONAL ECONOMIC REPORT

SMS
1042 Fort Street Mall
Suite 200
Honolulu, HI 96813
Ph: (808) 537-3356
Toll Free (877) 535-5767
Fax: (808) 537-2686
E-mail: info@smshawaii.com
Website: www.smshawaii.com

DELIVERABLE No. 4

KALAELOA REUSE MASTER PLAN

Prepared by:

SMS Research & Marketing Services, Inc.

Bay Area Economics

Prepared for:

Belt Collins Hawaii, Ltd.

Hawaii Community Development Authority

***SMS* Affiliations and Associations:**

Alan Barker Associates
Experian
International Survey Research
Latham Synchronized Relationship Marketing
Stephanie Kaneshiro – Big Island Affiliate
Warren Dastrup – Kauai Affiliate
3i Marketing & Communications

EXECUTIVE SUMMARY

The present report is part of a planning effort intended to help the Hawaii Community Development Authority redevelop the Kalaeloa Community District, formerly Barbers Point Naval Air Station. The report provides an overview of regional economic conditions and growth rates. It goes on to identify likely implications for Kalaeloa.

The report addresses trends of three sorts: (a) historical trends that have shaped the region and the District; (b) emerging from these, market trends that help us project demand for particular land uses that could be located at Kalaeloa; and (c) long-term trends associated with the growth of the island and regional economy that can create demand for new products and activities. The market analysis identifies fairly stable demand, a share of which may be captured at Kalaeloa. The study of long-term trends identifies new opportunities that may be seized at Kalaeloa, and which other developments may be unable to meet.

Interim uses have been important in other base closure situations. Such uses should be sought out, to cover operations and redevelopment costs, but integrated into long-term planning.

The market study shows demand for:

- Housing development, especially rental housing; and

- Industrial development on a modest scale (in light of competition). The prospect for industrial development could be improved if a landowner developed and marketed Kalaeloa property as a specialized industrial area, such as a science park.

Resources at Kalaeloa make particular types of development highly feasible:

- Kalaeloa has space for large-scale development. One opportunity is to dedicate acreage to solar energy production. Solar production at Kalaeloa could allow conventional power plants nearby, in Campbell Industrial Park, to operate as hybrids, greatly limiting their need for fossil fuels.

- Kalaeloa is well situated for mass transit development. New roadways can be designed to integrate a transit corridor. Space can be reserved for a transit baseyard. Because the property is close to Barbers Point/Kalaeloa Harbor, the baseyard could serve immediately as a laydown and assembly area while the transit system is being built. Once the system begins operations, acreage can be set aside for parking by transit riders.

- The airport is designated as a reliever for commercial air traffic, and as a general aviation airport. It can hence support activity by one or two fixed-base operators, and might support a few airport-related businesses.

Transit development is most successful in dense urban areas. Development in Ewa has increasingly been automobile-oriented. At Kalaeloa, new development can meet current needs – for multifamily housing to address the needs of low- and moderate-income families -- and help to create an urban center that is transit-oriented.

The table on the next page summarizes the analysis.

Currently, Kalaeloa has substandard infrastructure. Its road links to the rest of Ewa are few. Effective reuse of the site must be accompanied by infrastructure renewal or development. This makes development challenging, but it can also push stakeholders to commit to higher densities at Kalaeloa, to provide a level of development sufficient to cover the costs of new infrastructure.

1. SUMMARY OF REGIONAL DEMAND ANALYSIS

OPPORTUNITIES FOR REDEVELOPMENT AT KALAELOA			ABSORPTION (annual average)			
			Region	Kalaeloa		
Land Uses	**Success Factor**	**Challenge**	***to 2025***	***to 2025***	***Longer***	**Notes:**
Residential						
Single Family for sale	Islandwide demand	Regional competition	about 2,000 units/yr	200	200	Would need to attract developer
Multifamily for sale	Islandwide demand	Regional competition	about 1,000 units/yr	200	200	
Multifamily, rental	Islandwide demand	Little competition	no trend: ?200 units/yr.	200	?	Developers on site
Commercial			60-100K sq,ft,/yr.			
Retail	Demand largely met	Little new demand		0	small	For Kalaeloa market only
Office	Office with other uses	Concentration in PUC		small	?	As accessory use
Mass Transit related	Site of terminus; space for parking	Competition from Kapolei	several stations	1	2	Station not in current plans
Industrial						
General	Demand, location	Competition, slow	80-160K sq ft/yr.	25K	50K	
Airport-related	GA, other at field	Small market size		most GA on Oahu		
				8 acres Air Cargo		Interisland only
Multimodal	Harbor near airfield	Small market size				
Mass Transit related	Space, link to harbor	Selection	const., base, stations			Space to develop new infrastructure
Public Facilities						
Recreation	Community demand	Cost, maintenance				Ample space; no evidence of return on investment
Education	Community demand	Cost, siting	DOE builds 1 school/yr	1 (for new housing)		

CONTENTS

EXHIBITS

1. INTRODUCTION

1.1 PURPOSE

This report is being written as part of the Master Plan project for Kalaeloa contracted by the Hawaii Community Development Authority (HCDA). The Plan is meant to be an economically realistic plan for development at Kalaeloa. This report's aim is to identify and assess regional demand and market forces which can help redevelopment occur at Kalaeloa. The analysis is intended both to estimate the extent of regional demand for land uses and facilities at Kalaeloa and to recognize activities in the region that may complement or compete with Kalaeloa.

Attention to economically viable uses of Kalaeloa is necessary in order to envisage and implement successful redevelopment of the district.

1.2 BACKGROUND

After the Naval Air Station closed in 1999, much of the Kalaeloa property was unused. The following sites (in Exhibit 1) have seen continuing or renewed use:

- Kalaeloa Airport: continues to be used by the US Coast Guard. This is also now the preferred site on Oahu for "touch-and-go" training activities for private pilots. The airport has been transferred by the Navy to the Hawaii State Department of Transportation (DOT). The airport tower is manned by a National Guard unit. DOT plans to have fuel available at Kalaeloa for general aviation aircraft in 2005 and to have an instrument landing system (ILS) in place within a year.

- The US Coast Guard continues to have four helicopters and four fixed wing aircraft at its base on the south side of the airport. It has its own fuel tanks.

- One large hangar is owned by the Department of Transportation, and parts are leased to private users. Another hangar is used by the University of Hawaii for the Pacific Aerospace Training Center. The University is operating a modest pilot training program at Kalaeloa.

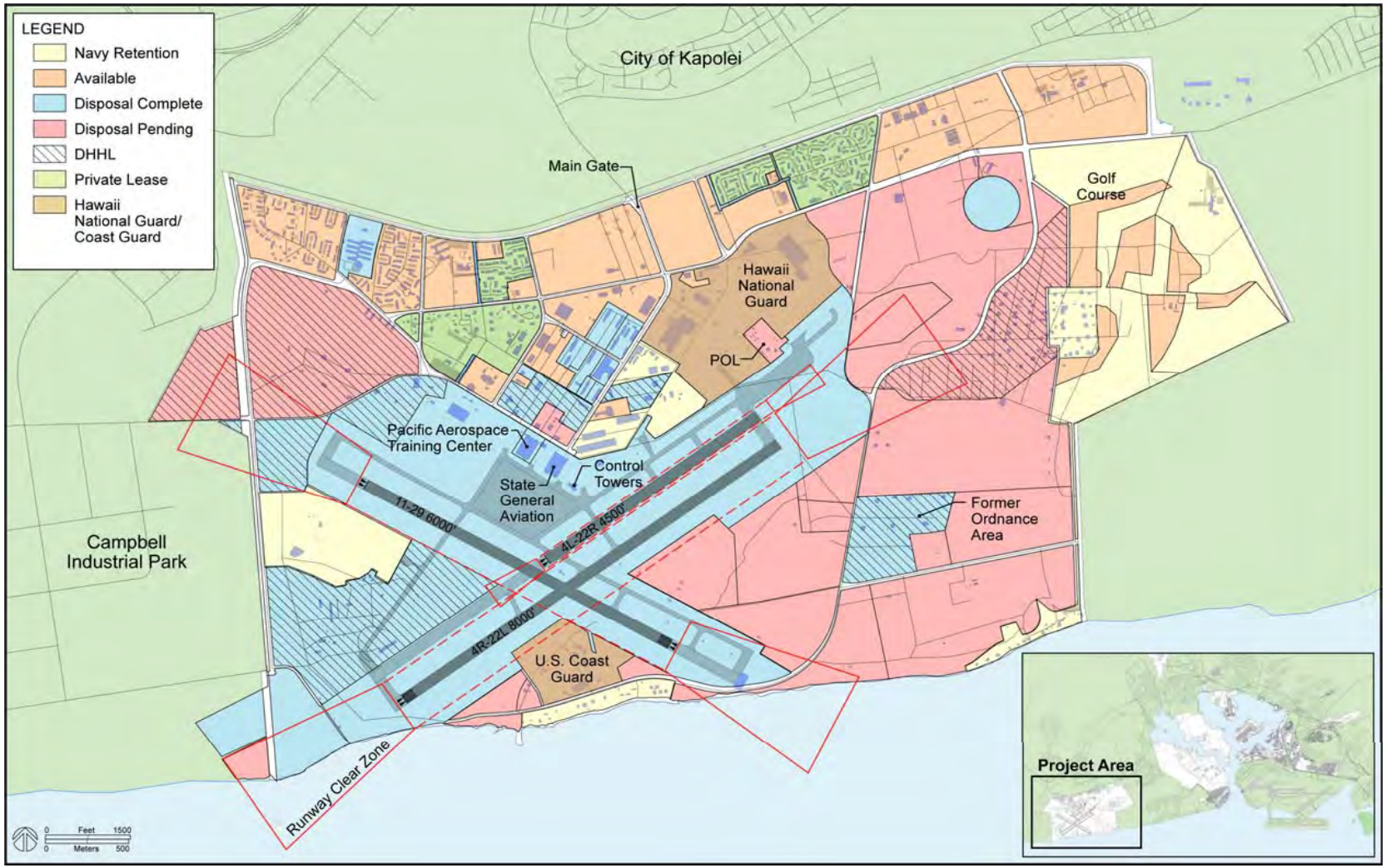
- The Hawaii Army National Guard has moved into buildings along the north side of the airport. It is moving much of its administration to Kalaeloa, and is using Kalaeloa as a mobilization point for training activities.

- The Barbers Point Golf Course was maintained by the Navy. It continues to be used by military and DOD civilian personnel.

- Four housing areas – On-Station Housing (also known as officers' quarters), Orion, Orion Park, and Makai – were transferred by the Navy to Ford Island Properties LLC, which holds the lease. Ford Island Properties has the right to convert to fee ownership as of mid-2006. Currently, about 550 units are habitable and rented. Ford Island Properties has sold the enlisted quarters to

Carmel Partners, but it retains both On-Station Housing and rights to broker additional Navy lands.

2. KALAELOA: CURRENT DISPOSAL STATUS OF PARCELS



- Barbers Point Elementary School continues to operate as a Hawaii Department of Education school. The land has been transferred to the Department.

- Beach areas are owned by the Navy, but open to the public. Nearby beach cottages are reserved for use by military and DOD civilian personnel.

- Barracks are occupied by homeless providers and the Veteran's Administration for programs aimed at their service populations. Also, the National Guard has moved its Youth ChalleNGe program, which provides high-school equivalent education for at-risk students, to two barracks at Kalaeloa.

These uses, combined, occupy about a third of the entire site. The remaining land and buildings are largely unoccupied. Interim uses, such as storage of cars belonging to military personnel on overseas deployments, have been supported by the Department of Hawaiian Home Lands.

Roosevelt Road has become an important link between the Ewa Beach area and Kapolei. It is widely used.

White Plains Beach can be used by the public, and it has become very popular. Life guards report as many as 1,000 cars parked nearby on weekend days.

Activities at Kalaeloa depend on infrastructure that was installed over the course of the last sixty years or so. Nearly all fails to meet County standards, and little has been improved in recent years. Infrastructure improvements and replacement will clearly be a major cost to be faced in order to support expanded activity on the site.

1.3 ORGANIZATION OF THIS REPORT

The report contains five sections:

- This Introduction;

- The Oahu Economy, setting the context for regional development;

- Leeward Oahu, providing more information on the region and emerging trends; and

- Key Drivers – an account of activities and land uses that could be important for redevelopment of parts of Kalaeloa.

It must be stressed that the report is part of an ongoing planning process. It is a survey of drivers and opportunities for development, not the plan itself.

2. THE OAHU ECONOMY

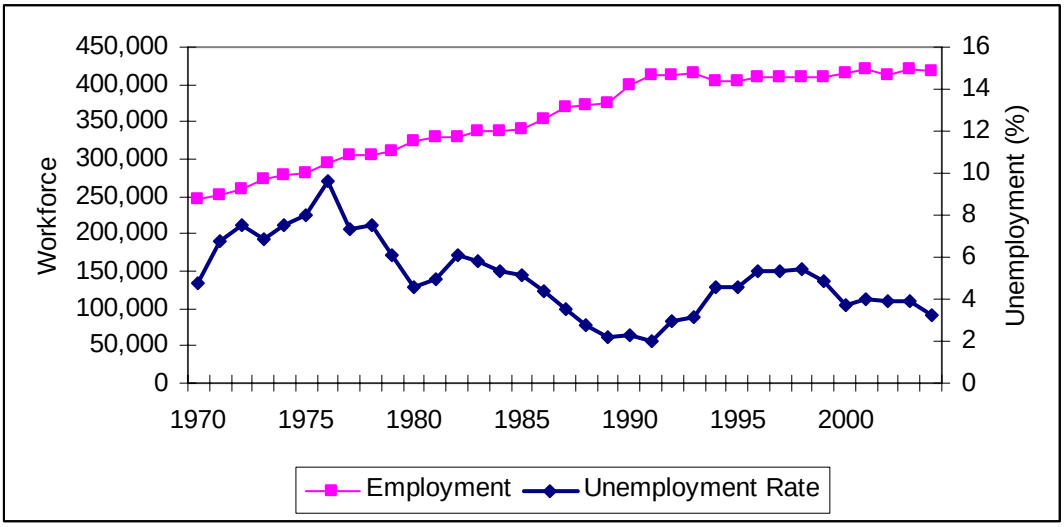
Because Hawaii is an island chain isolated from the rest of the nation, the local economy is shaped by isolation. For example, the local power companies must assure their customers of power generated solely in their own grids, since they cannot turn to others for help when demand spikes. Next, manufacturing in the islands has largely consisted of the processing of plantation crops. Most of that work has ended, now that Hawaii firms have global competitors who pay far lower wages.

Next, the local population consists of some 900,000 persons, supplemented by visitors. This is a small market for commercial activity. Despite Hawaii's success as a visitor destination, visitor attractions such as Sea Life Park have not been profitable. Repeat visitors tell tourism planners that Hawaii needs more attractions – but the customer base is simply too thin to support much new investment unless an attraction can draw both tourists and residents, and can draw customers for multiple visits. (The one attraction added on Oahu in recent years, Hawaiian Waters Adventure Park, has these characteristics.) The market is small, and costs are considerable.

2.1 HISTORICAL TRENDS

Oahu has a slowly growing workforce and an extremely low unemployment rate:

3. EMPLOYMENT ON OAHU, 1970 THROUGH 2004



Its prosperity is due in part to its role as the economic and administrative center for the state of Hawaii, in part due to major industries attracting capital from overseas.

During the twentieth century, Oahu's prosperity was based on three major industries: plantation agriculture, military activity, and tourism. The first covered most of the island by World War II, and retreated thereafter. Now, Oahu grows fresh pineapple and no sugar, so the value of diversified agriculture on the island is greater than that of

plantation agriculture. In recent decades, military activity has also declined. Still, Department of Defense spending in Hawaii is estimated as totaling $4.9 billion in 2003, of which nearly all is on Oahu. Members of the armed forces and their dependents account for about 12% of the Oahu population.

Tourists spend about $10 billion a year in Hawaii. On average, Oahu has more than 80,000 visitors present per day, half the state's visitor count. The industry has been subject to repeated shocks in recent years, with 9/11, the SARS outbreak, heightened concern over airline security and the airlines' financial problems. Despite these shocks, visitor numbers and spending have been increasing.

SMS estimates that visitor spending accounts for 35% of total retail expenditures on Oahu. However, the rate of growth of visitor spending is expected to be higher than for resident spending, so as much as half of new retail development could realistically be visitor-oriented.

In the 1990s, Hawaii saw few economic gains and little population growth. Income growth was low. Happily for consumers, introduction of big box retailers kept prices low, and the "Paradise Tax" – the higher cost of living in Hawaii compared to the US Mainland – declined from 36% in 1992 to 27% in 2000 (Brewbaker, in Hooper, 2000).

Retail activity has been volatile since 1990. On the one hand, big box retailers were at first slow to come to Hawaii, seeing its population base as small. However, sales for the first stores were extremely strong, so these retailers have come to spread throughout the islands. The success of Costco, Wal-Mart, Sports Authority, Loews and Home Depot, however, have been accompanied by closures of J.C. Penney, Woolworth's and other stores. Again, visitor retail sales, especially ones targeting Japanese visitors around 1990, were a strong growth sector – one which saw reverses as Japanese visitor numbers, and then average spending per visitor day, declined.

Overall growth in retail spending has actually been slower than for the nation as a whole. Moreover, the only segment showing large gains in both of the five-year periods in Exhibit 3 is non-store retail, i.e., Internet and catalog sales.

4. RETAIL SALES, US AND HAWAII, 1992 TO 2002

All figures are millions of current dollars	1992	1997	2002	% change 1997/92	% change 2002/97
TOTAL NATIONAL RETAIL MARKET	**$ 1,894,880**	**$ 2,460,886**	**$ 3,170,815**	**30%**	**29%**
TOTAL HAWAII RETAIL MARKET	**$ 11,250**	**$ 13,293**	**$ 15,334**	**18%**	**15%**
Motor Vehicles and Part Dealers	$ 1,490	$ 1,761	$ 2,552	18%	45%
Furniture and Home Furnishings Stores	$ 134	$ 194	$ 258	45%	33%
Electronics and Appliance Stores	$ 205	$ 236	$ 290	15%	23%
Building Materials and Garden Equipment and Supplies Dealers	$ 327	$ 677	$ 748	107%	10%
Food and Beverage Stores	$ 2,079	$ 1,989	$ 2,258	**-4%**	14%
Health and Personal Care Stores	$ 649	$ 764	$ 961	18%	26%
Gasoline Stations	$ 551	$ 728	$ 778	32%	7%
Clothing and Clothing Accessories	$ 966	$ 1,751	$ 1,506	81%	**-14%**
Sporting Goods	$ 119	$ 376	$ 359	216%	**-5%**
General Merchandise Stores	$ 1,868	$ 2,273	$ 2,568	22%	13%
Miscellaneous Retail	$ 832	$ 468	$ 560	**-44%**	20%
Non-Store Retail	$ 66	$ 95	$ 164	44%	73%
Eating and Drinking Places	$ 1,841	$ 1,981	$ 2,332	8%	18%

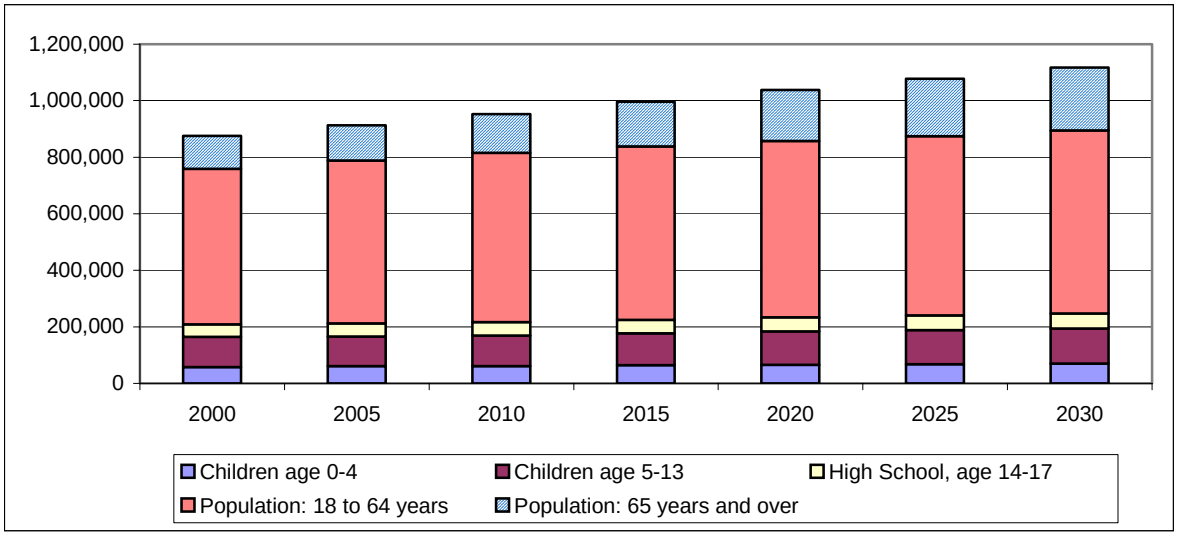
SOURCE: U.S. Census.

2.2 EMERGING TRENDS

Major trends visible now and likely to continue for some time include:

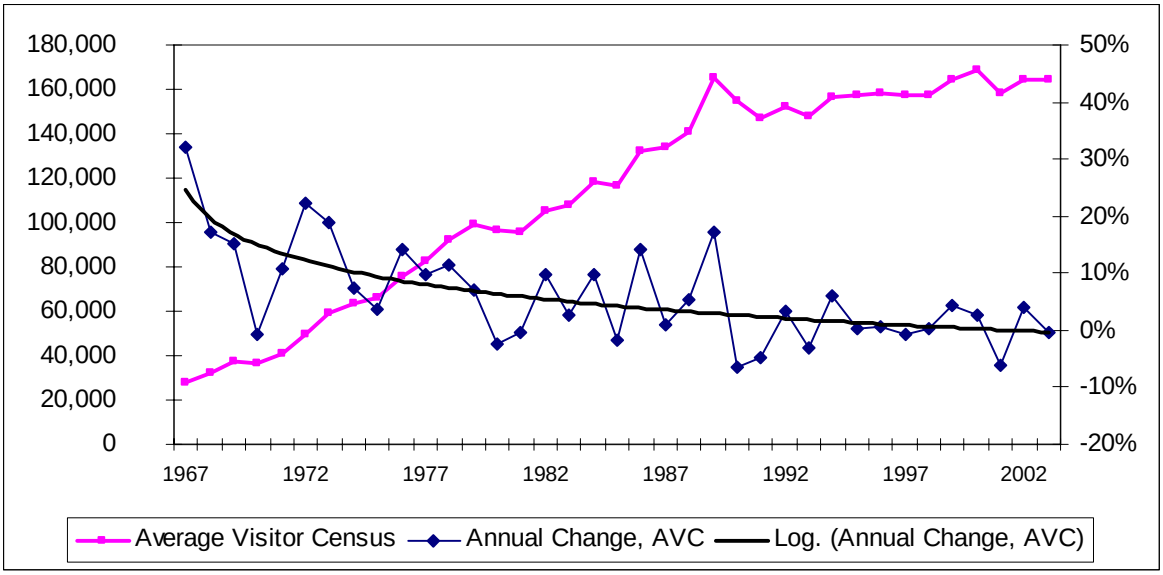
- An aging population, with the share of the population 65 and over reaching 20% by 2030, as shown in Exhibit 4;
- Slowing population growth;
- A long-term decline in household sizes, adding to housing demand;
- Slowing growth in visitor numbers – extending the historical trend evident from the trendline in Exhibit 5 -- and
- Slow economic growth.

5. PROJECTED POPULATION, OAHU, TO 2030



SOURCE: DBEDT, 2004b..

6. AVERAGE VISITOR CENSUS, STATE OF HAWAII. 1967-2003



SOURCE: DBEDT, 2004a.

Hawaii government economists expect unemployment to stay low.[1] This is reasonable, since few plantations, with large agricultural workforces, remain in the islands. In recent

[1] Hawaii State long-term population and employment projections derive from historical time series plus Input-Output models that have been refined over three decades, as well as from Federal estimates. Successive versions have been increasingly accurate predictors of long-term trends.

years, new unemployment claims have steadily declined to about 1,000 per week (http://www3.hawaii.gov/dbedt/index.cfm?section=READ_LatestData478). However, underemployment and unemployment have been problems for visitor industry workers during tourism slumps, and such slumps could easily recur in this volatile industry.

7. PROJECTED EMPLOYMENT, OAHU, TO 2030

	2000	2005	2010	2015	2020	2025	2030
Honolulu County							
Number Employed	405,450	420,277	438,685	455,223	471,354	487,663	504,308
Labor force	421,200	438,245	457,918	475,181	492,019	509,043	526,418
Unemployment rate (%)	3.7%	4.1%	4.2%	4.2%	4.2%	4.2%	4.2%
State							
No. employed	566,100	593,376	621,451	647,372	672,912	698,967	725,838
Labor force	591,350	621,484	651,906	679,132	705,960	733,331	761,564
Unemployment rate (%)	4.3%	4.5%	4.7%	4.7%	4.7%	4.7%	4.7%
Annual growth rates (%)		**2000-2005**	**2005-2010**	**2010-2015**	**2015-2020**	**2020-2025**	**2025-2030**
Honolulu County							
Number Employed		0.7%	0.9%	0.7%	0.7%	0.7%	0.7%
Labor force		0.8%	0.9%	0.7%	0.7%	0.7%	0.7%
Unemployment rate (%)		1.9%	0.5%	0.0%	0.0%	0.0%	0.0%
State							
Number Employed		0.9%	0.9%	0.8%	0.8%	0.8%	0.8%
Labor force		1.0%	1.0%	0.8%	0.8%	0.8%	0.8%
Unemployment rate (%)		1.2%	0.7%	0.0%	0.0%	0.0%	0.0%

SOURCE: DBEDT, 2004b.

2.3 TARGETED INDUSTRIES

Local economic development agencies have devoted great effort to identifying industries that could help Hawaii diversify its economy. Enterprise Honolulu has targeted "eight innovative industries with significant growth potential." Their list exemplifies both the opportunities and the significant barriers that must be overcome to develop a small economy located thousands of miles from continental markets and resources:

- Alternative Energy: This industry is crucial simply because Hawaii has no fossil fuels. Instead, Hawaii's resources include geothermal and ocean thermal sources, and abundant sun and wind. The challenge is to encourage technological development to make these sources economically viable and hence to be able to limit imports and even export local technology.

- Astronomy and Space Sciences: Hawaii has the leading ground-based observatories on Mauna Kea. Hawaii is a center for both astronomy and the optical technology used to advance astronomy.

- Defense and Dual-Use Technologies: Defense technological investments in marine science, aviation, communications, remote sensing and geographic

They minimize year-to-year variations, and hence fail to deal with some of the short-term swings that are most important for workers and policy-makers.

information systems support local research firms. These in turn are attempting to develop civilian uses for new technology.

- Diversified Agriculture: After the closing of most of Hawaii's plantations, both space and manpower are at hand for other agricultural ventures. The local market supports a modest level of vegetable and fruit production. For export, Hawaii growers need to overcome transportation costs, and hence succeed mainly in producing specialty products: coffee, macadamia nuts, papaya and tropical flowers. On the island of Hawaii, hardwoods are grown for local craftsmen, but an attempt to develop a commercial timber industry, using eucalyptus, has stalled for lack of capital.

- Film and Digital Media: Hawaii and Honolulu have active film offices, and the State has extended high-technology tax credits to film projects. For any locale within Hawaii, film offers only a short-term economic boost, unless film or digital media production involves a continuing investment, e.g., a sound stage. Honolulu has one government-financed sound stage in Honolulu. Another is being proposed on Campbell Estate land in Kapolei by a private developer.

- Information and Communications Technologies: Hawaii has a variety of software, telecommunications and related development firms. Oahu's information and communication technology sector includes some 730 firms with nearly 10,000 employees – including the local telephone and cable firms (Enterprise Honolulu, http://www.enterprisehonolulu.com/html/display.cfm?sid=254).

- Life Sciences – Biotechnology: Agricultural biotechnology is well represented in Hawaii. Major agribusiness firms grow seed corn and other crops, relying on both the year-round growing season and the opportunity to isolate experimental fields. Also, the University of Hawaii's College of Tropical Agriculture is a national leader in its field. The State is also interested in medical biotechnology.

  Governments throughout the United States and abroad are sponsoring biotechnology as an industry with strong growth potential, which supports new jobs at high wages. A 2001 study found that 28 states had venture or seed funds that encourage biotech growth; five of these had funds devoted solely to bioscience (Battelle, 2001). Sixteen states were drawing on tobacco settlement funds to support bioscience research. Twenty-six states had research parks or incubators that house bioscience firms. Nine of them had research parks solely devoted to bioscience, while fifteen had biotechnology incubators and another nineteen had incubators with wet lab space available for bioscience tenants. Hawaii is hence competing with much of the nation. [2]

[2] This paragraph is adapted from an earlier report for HCDA (SMS 2002), focusing on the Kakaako Waterfront area. Its findings bear repeating, in order to distinguish between the sort of venture that makes excellent sense for HCDA as an instrument of State development policy and initiatives that can sustain redevelopment within a local district:

> SMS was asked to gather data to assess the extent to which a newly energized medical complex in Kakaako could stimulate additional biotechnology development nearby. The premise would be that new biotechnology start-up ventures, firms depending on research products generated at the medical school, or partners in technology transfer, would be

- Marine Sciences. Again, university researchers in Hawaii are active in areas that might lead to technological spin-offs, and Hawaii's unique environment could help to develop new industries.

This list is based on careful consideration of Hawaii's strengths. However, there is significant competition in most of these sectors, and Hawaii's efforts have smaller funding, human capital and other resources than many competitors in the Mainland US. Factors important in attracting high tech firms (Milken Institute, 1999; University of Arizona Science and Technology Park, 2001) include:

1. CEO interest in an area;
2. Availability of skilled workers;
3. Access to universities and research organizations;
4. Overall quality of life for professional staff;
5. Access to venture capital; and
6. Cost of doing business (lease and energy costs; tax rates; general business climate).

Hawaii has important advantages in attracting firm leaders and professionals – items 1 and 4 – but is often at a comparative disadvantage with regard to the other four criteria. When small firms have been successful, as in the case of Verifone, they have moved operations and even headquarters to areas with greater human and financial capital.

The economic development analyses reviewed here could well foreshadow an important new breakthrough for Hawaii and the global economy – but few new technology ventures can be expected to be successful. From the State's point of view, it is important to encourage many innovators and entrepreneurs, since the failure rate is sure to be high. In planning for a particular district such as Kalaeloa, it is important to retain as much flexibility as possible, being open to various opportunities without overly committing resources to any one.

---

likely to want space near the medical complex. In Kakaako, they would be able to confer closely with UH researchers and use library facilities and databases in the medical complex. Can HCDA expect the space to the west of the medical school to be filled by biotechnology firms? . . . The results are mixed. On the one hand, the promise of biotechnology and Hawaii's distinctive resources are factors that must be taken seriously into account in State planning. The cloning researchers at the medical school have already proven that they can generate results of international interest and value to private firms. However, it is not so clear that promising research will translate into spin-off commercial ventures, much less demand for nearby space. In addition, competition among states for biotechnology is strong. As a result, lease rents in technology parks fall below typical Honolulu rents, and biotechnology firms may well to expect a package of incentives – convenient space, low rents, venture capital and tax incentives – from local governments seeking to diversify their economies. HCDA can be an important partner in nurturing biotechnology in Hawaii, but will need to work closely with other agencies to implement the vision of a knowledge-based economy.

2.4 CHALLENGES AND OPPORTUNITIES FOR OAHU IN THE TWENTY-FIRST CENTURY

In a prospering, but slow-growth, economic climate, Oahu and its people face long-term challenges:

- **Resource Depletion and Sustainability:** Demand from residents for energy and water has been increasing steadily. Neither can be supplied in infinite amounts, especially on an island. With the closing of Oahu's sugar plantations, agricultural demand for water declined – but so did the supply of water returned to the island's aquifers once it had been used for irrigation.

  Oahu can continue to build power plants, and could, at significant cost, find new sources of water as demand exceeds the capacity of its aquifers. In the coming decades, much engineering and political attention will be needed to providing and sustaining resources for urban life on an island. A major political step has been taken: the Legislature has mandated that Hawaii energy production become less dependent on fossil fuels. While about a quarter of the Big Island's power comes from geothermal, hydroelectric, and wind energy, Oahu depends almost entirely on oil- and coal-fired plants. (The island's most successful alternative energy initiative is the H-Power garbage to energy plant in Campbell Industrial Park.)

- **Redevelopment**: Sewer infrastructure in Honolulu is a century old in places. Much of the island's housing stock was built in the 1960s and early 1970s. Much of Oahu's residential stock consists of single-family homes in small lots that can only be rehabilitated one by one, as owners rebuild or raze them. Rebuilding of aging units will increasingly be a challenge. Again, multi-family housing built in the form of two- to three-story apartment buildings can only be effectively replaced if multiple parcels can be combined and larger structures built in their place.

- **Regional development and interregional communications:** For many decades, Honolulu was the center of Hawaii's economy and social life. Other communities on Oahu were suburbs. In Kapolei and, to a lesser extent, Central Oahu, attempts have been made to create independent communities, with homes, jobs, stores and a range of public facilities. For now, residential development has occurred far more quickly than job growth and the provision of public facilities. Ewa residents commute in large numbers. Traffic congestion on both collector roads and the freeway is seen as a grave problem. Transportation planning is and will continue to be a major challenge. (Exhibit 8 summarizes commuting data. It shows that the bulk of Leeward Oahu's workforce commutes to the Pearl Harbor/Central Oahu area.)

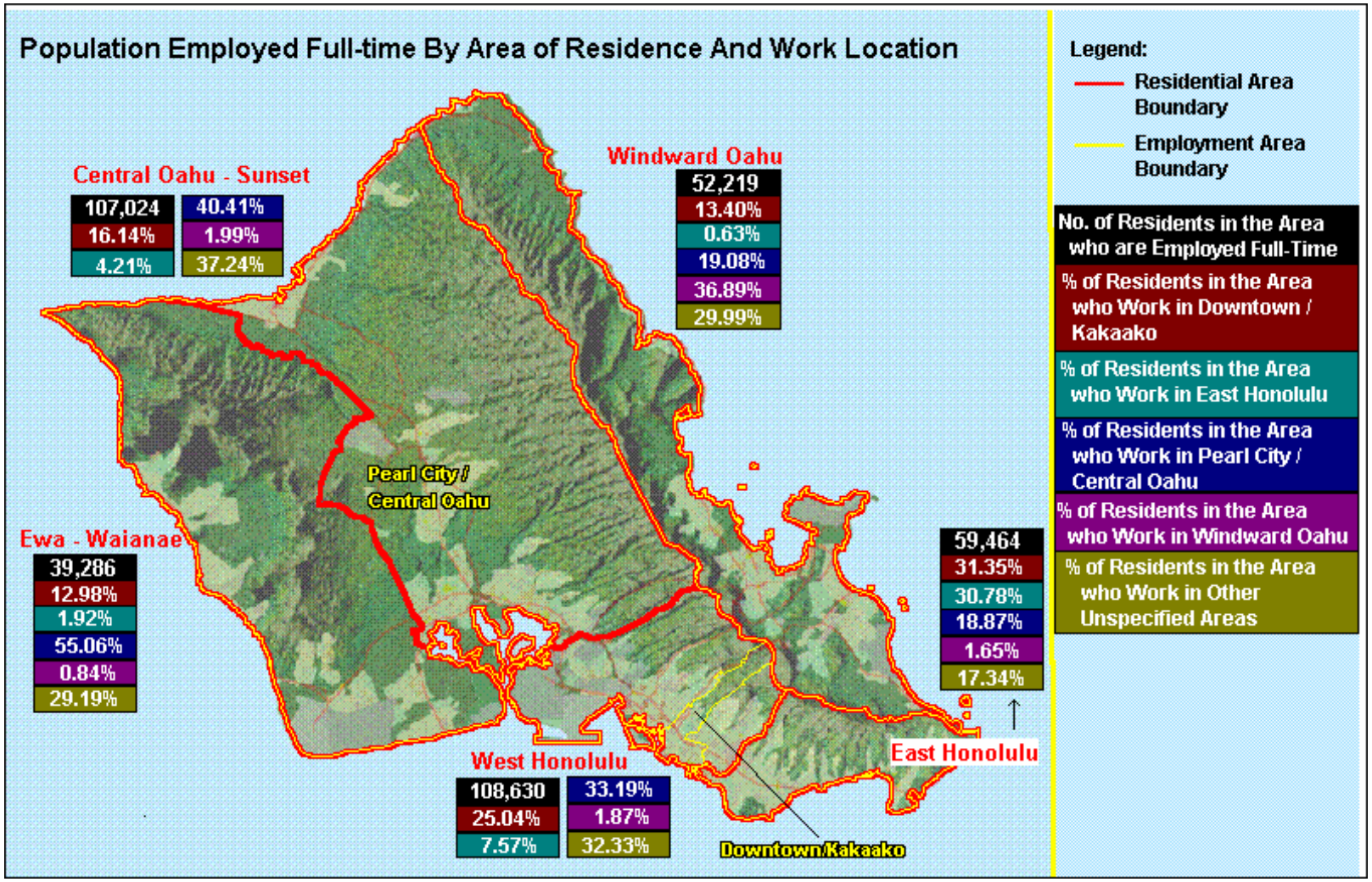
  As Kapolei becomes Oahu's Second City, not just a suburb, it will increasingly develop resources on which the whole island depends. It will have a four-year university. Its port will serve an important role in supplying the region and island. It will attract customers, workers, and firms from other areas. And it will depend

on expanded transportation networks, both within the region and linking it to the rest of Oahu.

- **Limited capital:** An aging population supported by a slowly growing economy is very unlikely to support large new expenditures and the taxation needed to support them. This is true at the Federal, State and island levels. Federal support for social programs and infrastructure has been declining. Hawaii communities and political leaders have fought to limit government budgets, and have tried hard to do more with less for years.

  Hawaii's major resource for new initiatives is non-residents. The excise tax system taps visitor spending. The counties depend on property taxes for much of their revenues. They are exploring ways to limit taxes paid by owner-occupants. The aim is to tax vacation homes and non-residents much more than residents, but property taxes on rental housing also increase. The result is a higher cost of living for low- and moderate-income residents and a disincentive for building rental multifamily housing, the type most needed by Hawaii's residents.

8. INTERREGIONAL COMMUTING, OAHU, 2005

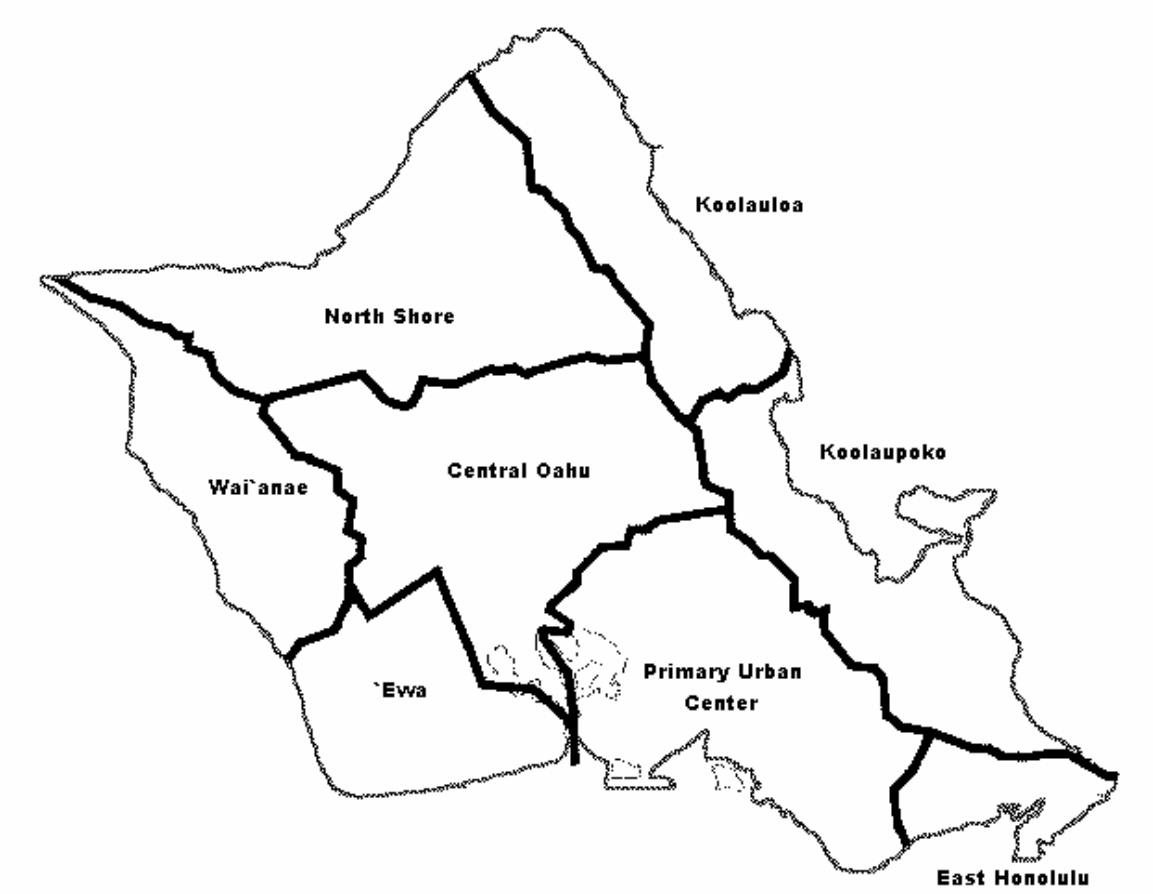


SOURCE: SMS Market Study, 2005.

3. LEEWARD OAHU

Kalaeloa (the former Barbers Point Naval Air Station) is in the Ewa Development Plan area, and in the region known as Leeward Oahu (including the Waianae Coast, Ewa, Central Oahu, and North Shore Development Plan areas). Most of the island's residential growth in the past twenty years has occurred in Central Oahu and Ewa.

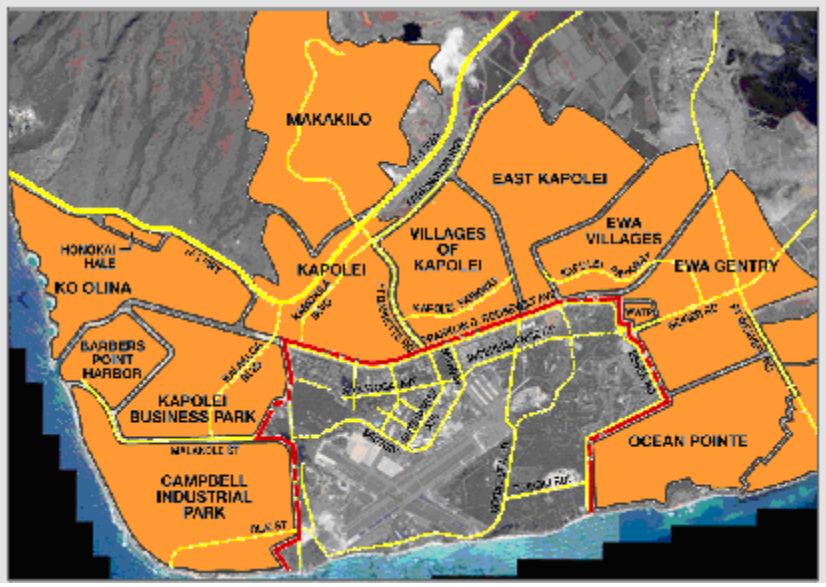
9. OAHU DEVELOPMENT PLAN AREAS



Over the last thirty years, Kapolei was designated, planned, and built as Oahu's "second city." Honolulu remains the center of government, the economy, and transportation, but Kapolei increasingly takes on activities that can be effectively relocated from the urban core. Government offices have been moved because of executive decisions. At first, the move created difficulties, since an agency's customers and associates in other agencies were likely to in Honolulu. Increasingly, Kapolei is about as convenient for Oahu's people to reach as Honolulu. In the private sector, moves to Leeward Oahu originally followed zoning definitions, such as designation of James Campbell Industrial Park as Oahu's only area for heavy industry. However, recent moves have occurred simply because it made financial sense to move to an area with low land costs and access to resources.

Exhibit 9 shows some of the major Ewa areas surrounding the Kalaeloa Community District. Makakilo, the Villages of Kapolei, Ewa by Gentry, Ewa Villages and Ocean Pointe have all seen residential development – but further development is possible in all of these. Honokai Hale is an older residential area. Ko Olina is being developed as a resort area with a mix of hotel, time share, and residential units. Kapolei now has commercial development – both retail and office -- and space for proposed residential development. Kapolei Business Park and Campbell Industrial Park have been developed for a mix of industrial and commercial uses.

10. COMMUNITIES SURROUNDING THE KALAELOA DISTRICT



3.1 POPULATION AND HOUSING

Leeward Oahu is likely to continue to be the major area of redevelopment and expansion for Oahu. Slow growth projections for the island as a whole can translate to very sudden growth at the regional level if it is concentrated there, as the growth rates in Exhibit 11 indicate.

11. HISTORICAL AND PROJECTED POPULATION, OAHU DEVELOPMENT PLAN AREAS

	Historical Population			Projected Population		
	1980	1990	2000	2010	2020	2025
Development Plan Areas						
Primary Urban Center	417,240	432,023	419,338	440,654	467,314	477,909
Ewa	35,523	42,931	68,718	96,332	141,864	164,462
Central Oahu	101,685	130,526	148,186	160,578	172,269	180,808
East Honolulu	43,213	45,654	46,735	52,789	52,436	51,705
Koolaupoko	109,373	117,694	117,994	121,596	118,324	116,748
Koolauloa	10,983	14,263	14,546	15,801	16,412	16,588
North Shore	13,061	15,729	18,380	19,338	19,947	20,102
Waianae	31,487	37,411	42,259	45,562	48,684	49,729
Leeward Oahu subtotal	**181,756**	**226,597**	**277,543**	**321,810**	**382,764**	**415,101**
Total	***762,565***	***836,231***	***876,156***	***952,650***	***1,037,250***	***1,078,050***

Average Annual Rate of Increase	Historical Rates		Projected Rates			
	1980 - 1990	1990-2000	2000-2010	2010-2020	2020-2025	2000-2025
Development Plan Areas						
Primary Urban Center	0.3%	-0.3%	0.5%	0.6%	0.4%	0.5%
Ewa	1.9%	4.8%	3.4%	3.9%	3.0%	3.6%
Central Oahu	2.5%	1.3%	0.8%	0.7%	1.0%	0.8%
East Honolulu	0.6%	0.2%	1.2%	-0.1%	-0.3%	0.4%
Koolaupoko	0.7%	0.0%	0.3%	-0.3%	-0.3%	0.0%
Koolauloa	2.6%	0.2%	0.8%	0.4%	0.2%	0.5%
North Shore	1.9%	1.6%	0.5%	0.3%	0.2%	0.4%
Waianae	1.7%	1.2%	0.8%	0.7%	0.4%	0.7%
Leeward Oahu subtotal	**2.2%**	**2.0%**	**1.5%**	**1.7%**	**1.6%**	**1.6%**
Total	***0.9%***	***0.5%***	***0.8%***	***0.9%***	***0.8%***	***0.8%***

NOTE: "Leeward Oahu" includes the Ewa, Central Oahu, North Shore and Waianae DP areas.
SOURCE: Honolulu Department of Planning and Permitting, 2004, based on DBEDT 2030 Series projections.

3.2 ECONOMIC GROWTH

During the 1990s, Leeward Oahu saw the closing of Oahu Sugar, Waialua Sugar, and Barbers Point Naval Air Station. The local job count declined. However, the growth of industrial space in Campbell Industrial Park and new commercial jobs in Kapolei shopping areas and along Fort Weaver Road have made up for the loss of civilian jobs. Kapolei remains a preferred site for new industrial development on Oahu.

By 2000, some 14,565 workers identified themselves as working in Ewa, and more than 61,000 worked in the Leeward region as a whole (US Census; Census Transportation Planning Package data, in Exhibit 12). The distribution of jobs by civilian industry is similar to that for Leeward Oahu as a whole. However, few Armed Forces work sites remain in Ewa, while military jobs make up nearly a fifth of all jobs in the entire Leeward region. Some 8% of the jobs in Ewa are in manufacturing: a large share, by Hawaii standards.

12. 2000 CENSUS DATA ON EMPLOYMENT BY PLACE OF WORK

	'EWA		LEEWARD O'AHU	
WORKERS BY INDUSTRY BY PLACE OF WORK	Number	Share	Number	Share
Agriculture	593	4%	1,727	3%
Construction	1,669	11%	4,002	6%
Manufacturing	1,219	8%	2,158	3%
Wholesale Trade	704	5%	2,013	3%
Retail Trade	1,099	8%	6,915	11%
Transportation and Utilities	827	6%	1,859	3%
Information Services	119	1%	1,180	2%
Finance and Real Estate	1,039	7%	2,807	5%
Professional Services	933	6%	2,749	4%
Health and Educational Services	2,974	20%	11,923	19%
Entertainment Services	1,733	12%	6,014	10%
Other Services	360	2%	2,335	4%
Public Administration	974	7%	4,549	7%
Armed Forces	329	2%	11,676	19%
TOTAL	14,565	100%	61,955	100%

NOTES: From Census Transportation Planning Package, US Census for 2000. Regions identified by combining Census Tracts.

3.2 LAND USES AND POTENTIAL LONG-TERM ABSORPTION OF LAND

3.2.1 Residential

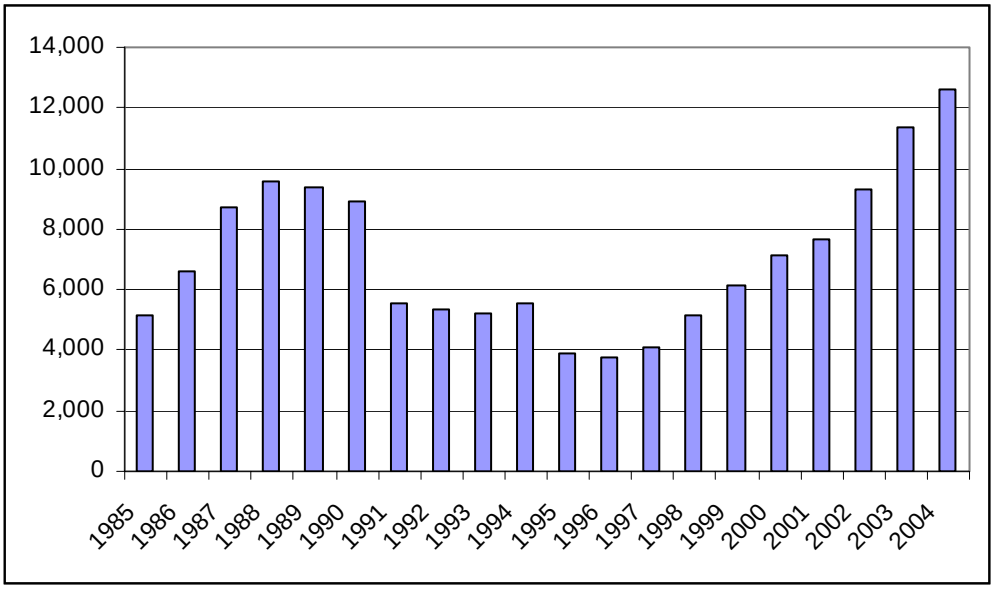
Hawaii housing prices have recently been booming. In May 2005, the median price for single family homes on Oahu was $610,000, 37% over the median for May 2004, while the median condominium price, $265,000 was 36% over the year before (according to Honolulu Board of Realtors press release, June 2, 2005, posted at http://www.hicentral.com). Resales of existing homes had been steadily increasing since 1996, as shown below. However, May 2005 saw a decrease in sales volume, which real estate experts attribute to limited inventory, not reduced demand.

The new-home share of the market has stabilized since the mid-1990s, and seems unlikely to increase quickly, despite the current boom. [3]

Oahu has seen a cyclic housing market pattern characteristic of small, isolated markets. Housing prices increase in boom times past the level that many would-be buyers can afford. With fewer buyers in the market place, sales decline, and the boom ends … until incomes and buying power increase again, and the cycle begins again. (Exhibit 15 shows how prices and the mid-level buyer's ability to pay converged then separated in the 1990s, only to converge and start to separate again more recently.

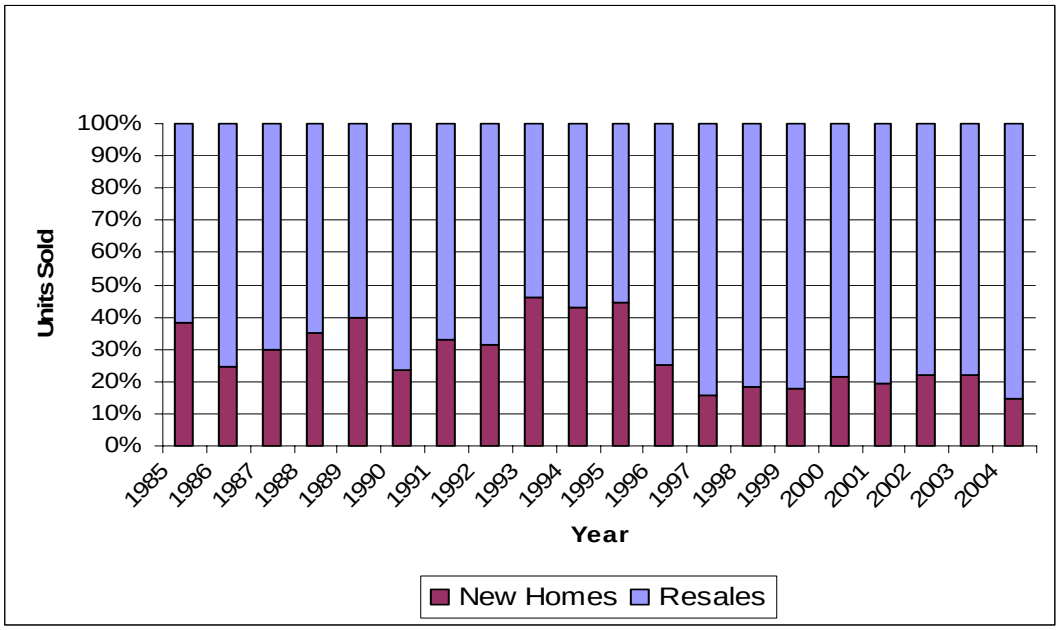
[3] In the first graph, "resales" are homes sold through the Multiple Listings Service system. The second is taken from a database developed by SMS of housing sales, based on the TMK system, which includes new home sales as well as resales. Hence the numbers involved are slightly different.

13. YEARLY HOME RESALES, 1985-2004



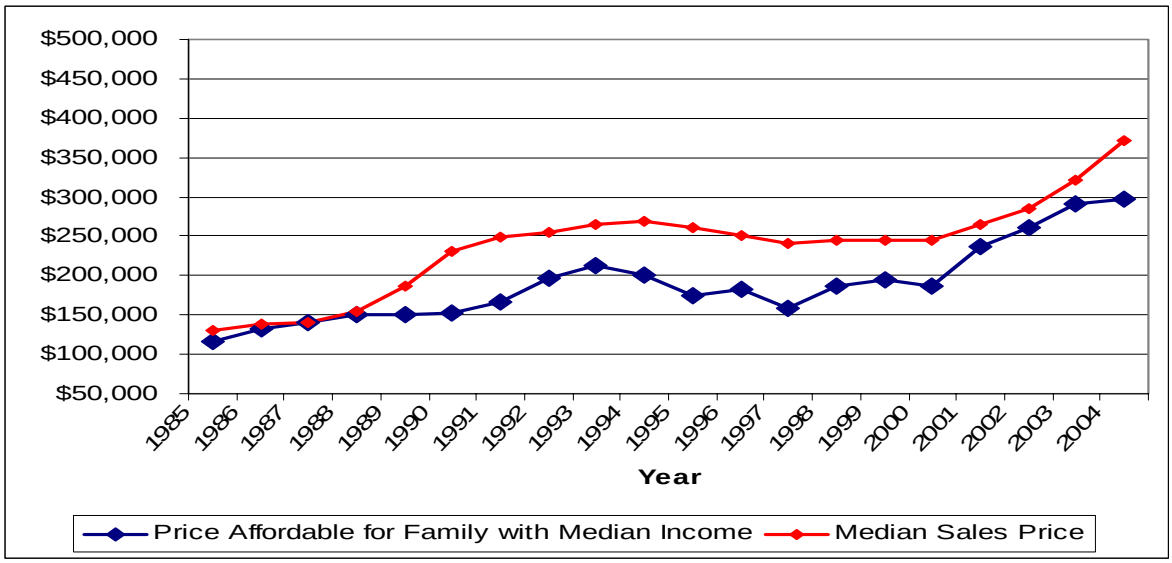
SOURCE: Honolulu Board of Realtors (http://www.hicentral.com)

14. NEW HOME AND RESALE SHARE OF OAHU HOUSING MARKET, 1985-2004.



SOURCE: SMS data set of fee simple sales, from TMK database.

15. MEDIAN AND AFFORDABLE HOME PRICES, OAHU, 1985-2004

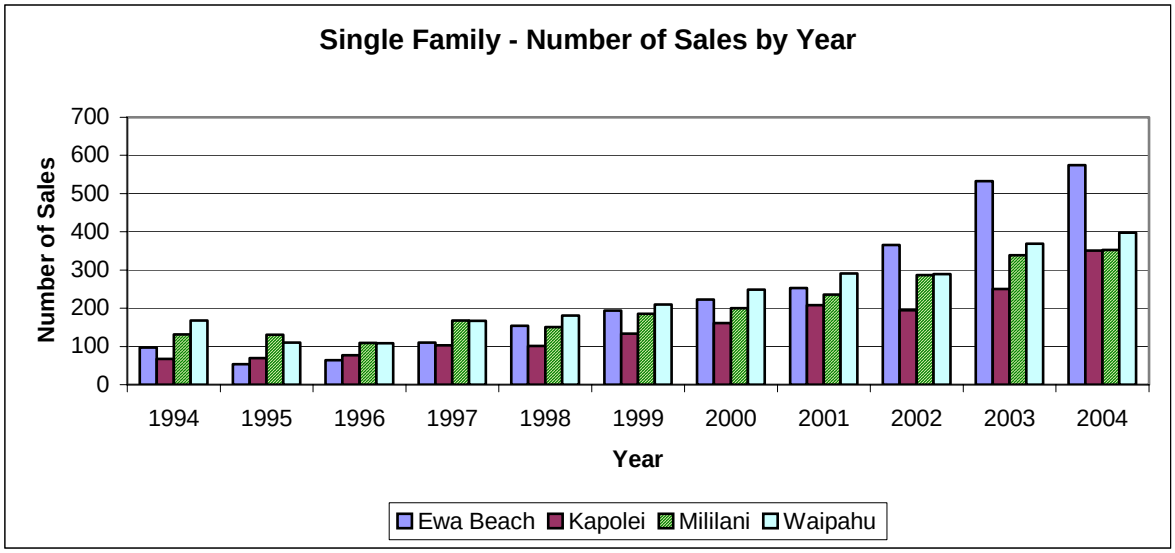


SOURCE: Adapted and updated from SMS 2003.

While Oahu is a single housing market, outlying and newer areas tend to have lower prices than other neighborhoods. Most of new home production since the early 1990s has been in Ewa and Central Oahu. As these areas become increasingly important parts of the market, prices have risen.

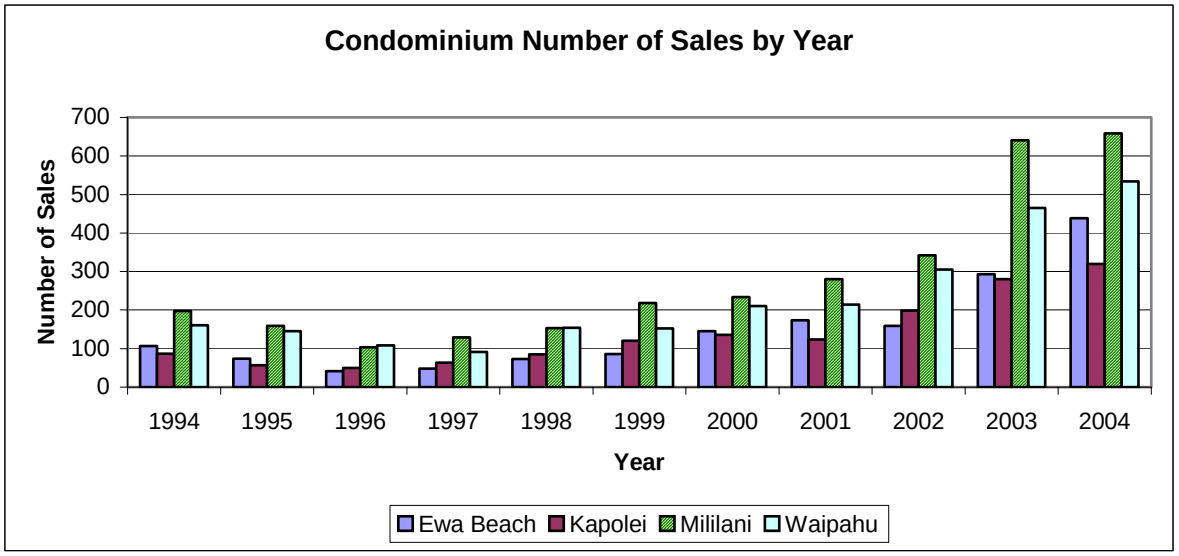
The next exhibits show sales volume and prices in major zip code areas in Ewa (Ewa Beach and Kapolei) and Central Oahu (Waipahu – including Waikele – and Mililani). The strong single-family market in Ewa is striking, since the Ewa Plain has been seen as having a less desirable climate than upland Mililani.

16. SINGLE FAMILY HOME SALES, LEEWARD OAHU, 1994 – 2004



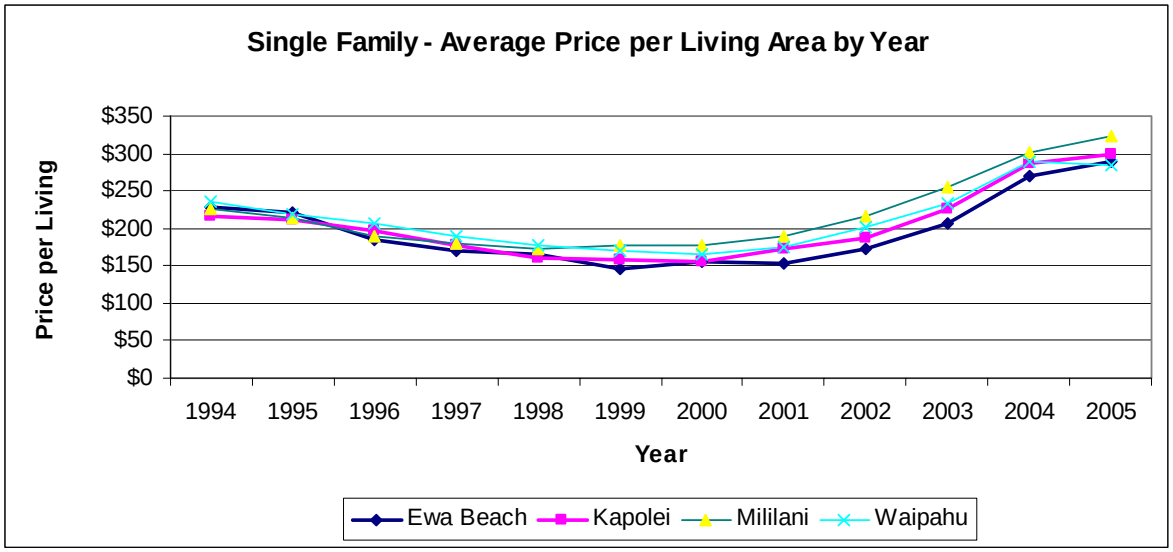
SOURCE: Dr. Michael A. Sklarz, FNIS.

17. CONDOMINIUM SALES, LEEWARD OAHU, 1994-2004



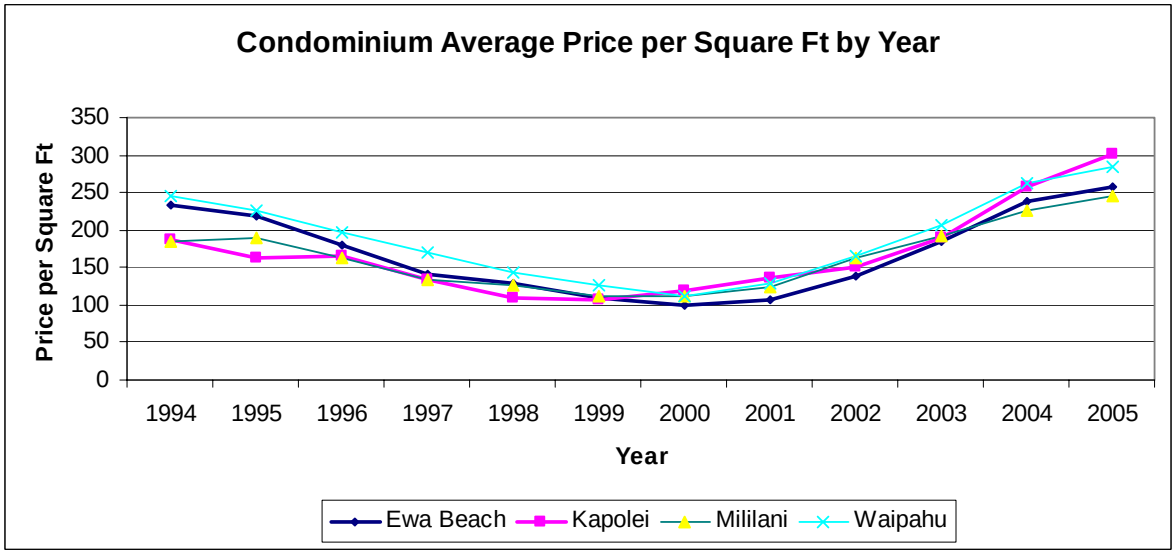
SOURCE: Dr. Michael A. Sklarz, FNIS.

18. SINGLE FAMILY HOME PRICES PER SQUARE FOOT, LEEWARD OAHU



SOURCE: Dr. Michael A. Sklarz, FNIS.

19. CONDOMINIUM HOME PRICES PER SQUARE FOOT, LEEWARD OAHU

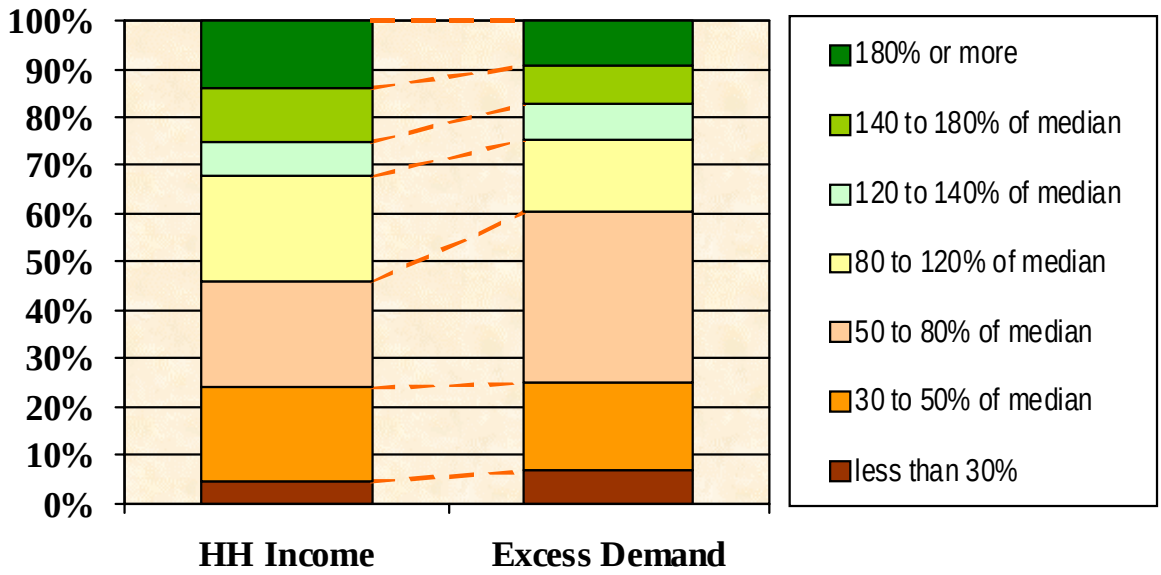


SOURCE: Dr. Michael A. Sklarz, FNIS.

The approach to residential sales taken here is standard in real estate studies in Hawaii. However, two additional points must be stressed. First, overall demand among Hawaii residents, as measured by intention to move, has been declining since it was first measured in 1992 (SMS, 2003). Many mature residents have bought the homes they hope to live in for the rest of their lives. Next, the for-sale market is only part of the total housing market. In the rental market, the news is much more grim. First, prices here are now rising, as in the for sale market, But inventory is static or declining. New units largely come on line with government support (e.g., Low Income Housing Tax Credits),

and in far smaller numbers than new for-sale units. Consequently, demand is increasingly concentrated in low- and moderate-income segments of the housing market:

20. HOUSEHOLDS EXPECTING TO MOVE, BY MARKET SEGMENT, 2003



NOTE: Market segments shown are defined by HUD income levels for families of various sizes. The two columns show the distribution of all households in the City and County of Honolulu by income segment, and the distribution of those households which expect to move.
SOURCE: SMS, 2003.

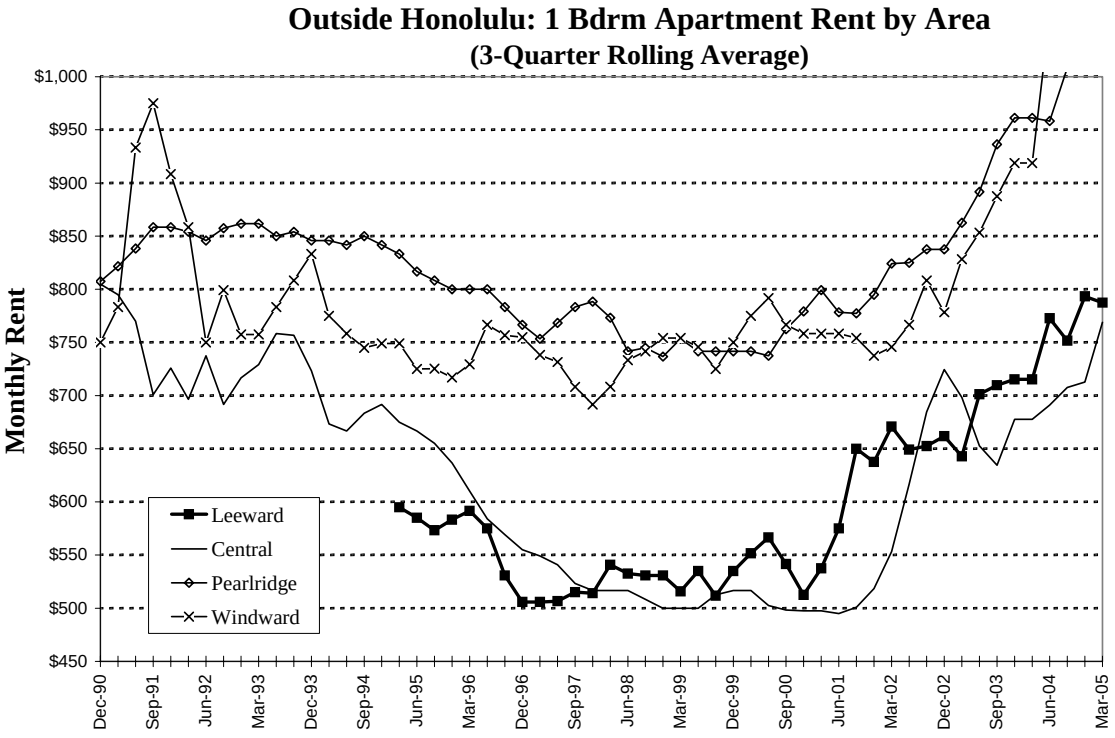
Rents have recently been rising, and could soon reach levels where they would justify limited production of new rental housing. On Oahu, rents are highest in Honolulu and East Honolulu. Central Oahu, Ewa and Waianae rents for one-bedroom units have been consistently lower. For two-bedroom units, rents are much the same throughout the area.[4] The number of units listed is modest, and has been declining throughout Oahu for years.

Major projects expected to meet housing demand in Leeward Oahu in the next decade include:

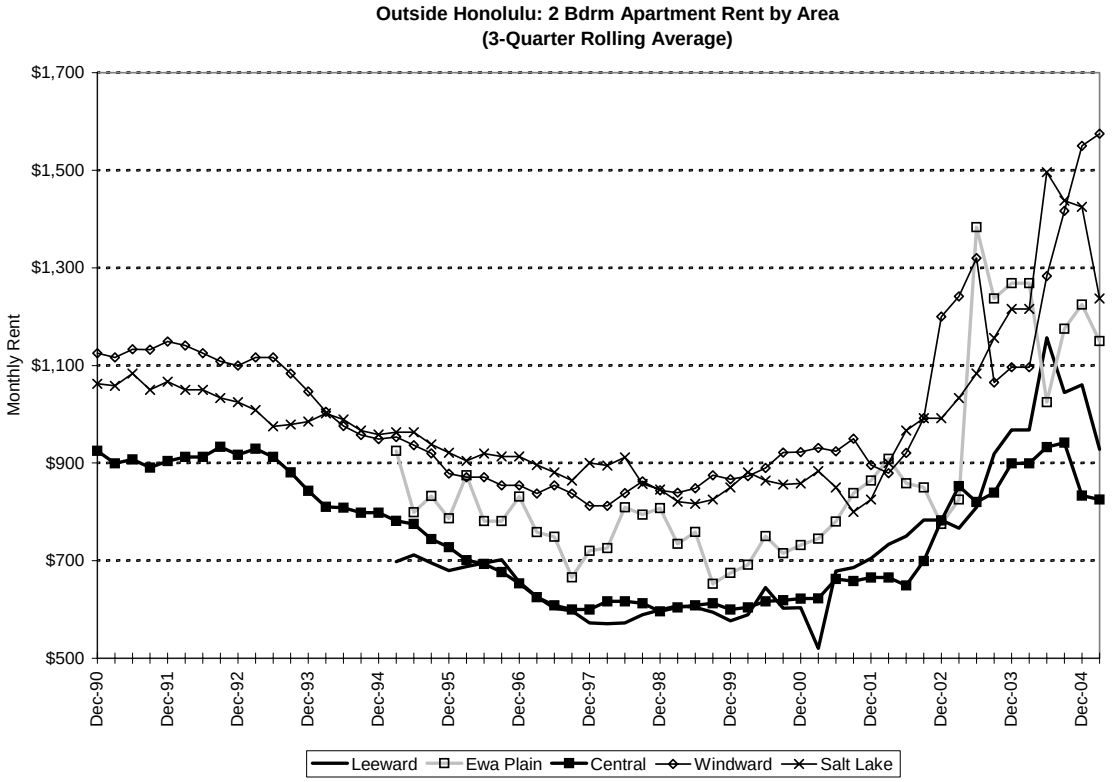
- Continuing development at Ewa by Gentry and Ocean Pointe;
- New Makakilo subdivisions by Castle & Cooke;
- Development in Kapolei by D.R. Horton;
- Resort residential development in Ko Olina;
- Projects on State land, for the Department of Hawaiian Home Lands and for the developer chosen by the University of Hawaii for the West Oahu campus.

[4] In the rental trend data, "Leeward" refers to the Waianae Coast and parts of Ewa.

21. ADVERTISED RENTS, OAHU, ONE BEDROOM



22. ADVERTISED RENTS, OAHU, TWO BEDROOMS



In addition, further development at Makaiwa Hills, West Kapolei; Waiawa Gentry, and Koa Ridge could continue production of for-sale housing at current levels well past 2020. (All of these proposed projects except the last have some major entitlements in place. All could go forward in the next 25 years.) Also, the Campbell Estate owns hundreds of acres east of the State's Kapolei expansion areas, also proposed for eventual housing development. Still, some of the proposed major projects could easily falter, leaving developers to search for new sites to continue construction. Kalaeloa could be an alternative site, so long as its landowners and redevelopment authority are willing to bid competitively against other major landowners – the Campbell Estate and, at Waiawa, Kamehameha Schools.

While the established Hawaii residential developers have tended to leave low-income housing development to non-profit associates, a few firms are now active in redevelopment of rental housing and could consider new development. Some of the developers in the UHWO competition have been involved in rental development on the Mainland US, and appear interested in similar projects in Hawaii. Still, Hawaii land, construction and development costs pose a challenge to new rental development that has not been successfully met since the 1970s. A Kapolei project for nearly 500 townhomes depends on donation of land by the State as well as tax credits (Gomes, 2005).

Military initiatives may reduce demand and increase rental supply. First, large contracts let for rehabilitation and construction of military family housing will improve on-base housing options, and hence lower military family demand for off-base housing. Next, the Ford Island legislation has resulted in (a) redevelopment of rental housing at Kalaeloa and Iroquois Point; (b) involvement of new rental-oriented developers in the Oahu market; and (c) planned construction of new housing on Ford Island. Much of the rental housing in Ewa – approximately a thousand homes at Iroquois Point – is offered first to the military, so civilians have access to these homes only so long as military families do not wish to live so far from their duty stations. Even with this limitation, redevelopment of these housing areas constitutes a significant addition to the island rental stock.

3.3.2 Commercial

Commercial space largely consists of retail and office space. These are discussed separately in this section. First, an analysis of data from the real property tax system indicates that: Leeward Oahu has less than 10% of Oahu's commercial space. Most of the Leeward space was built after 1990. Most of the Leeward space is in Kapolei. This information points to the rapid development of commercial space with the creation of Kapolei.

23. COMMERCIAL SPACE, OAHU

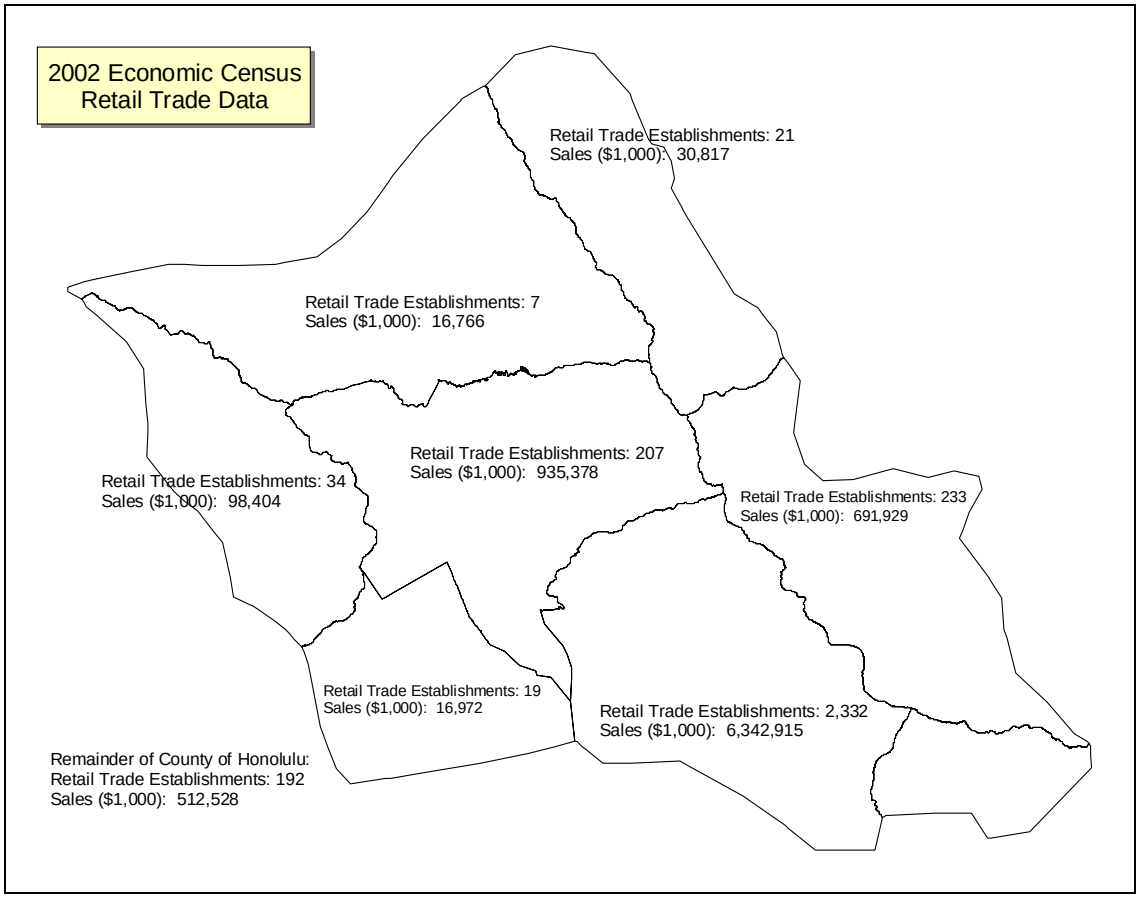
	Oahu (TMK 1-1-1 to 1-9-9)	Leeward Oahu (TMK 1-9-1 to 1-9-6)	Kapolei and Campbell Industrial Park (TMK 1-9-1 to 1-9-2)
Existing square footage	75,930,036	6,800,485	2,905,384
fee simple	41,595,353	4,540,284	1,939,684
leasehold	32,250,088	1,767,755	640,592
government owned	2,084,595	492,446	325,108
Year built (parcels)			
before 1950	487	18	6
1950s	501	16	3
1960s	875	57	8
1970s	1,231	34	6
1980s	1,118	45	11
1990s	413	79	46
2000 -	43	9	7
Share less than 15 years old	456	88	53
	10%	34%	61%
Year built (sqft)			
before 1950	4,455,925	170,037	88,165
1950s	4,624,651	191,485	98,970
1960s	12,583,175	770,521	78,866
1970s	16,597,424	540,150	18,931
1980s	23,223,425	990,974	238,436
1990s	11,579,574	3,622,129	1,910,309
2000 -	1,714,120	301,281	259,073
Share less than 15 years old	13,293,694	3,923,410	2,169,382
	18%	60%	81%

NOTE: The square footage for which building dates are available is slightly smaller than the totals shown for each region.

Retail space on Oahu is concentrated in Honolulu. Visitors are concentrated in Waikiki, and few spend large amounts of money beyond Ala Moana Center, two blocks from Waikiki. Residents also have spent most of their shopping dollars in town, as Exhibit 24 shows. Only 15% of all retail spending was in the Leeward region in 2002. However, the balance could shift somewhat, as large stores targeting the Leeward resident population increase in numbers. Leeward Oahu saw the first Hawaii outlet center, at Waikele. Kapolei now has a Home Depot, and spaces have been made for stores of similar size in the University of Hawaii West Oahu parcel. (Developers are currently bidding for rights to develop residential and commercial acreage, in exchange for infrastructure work and building the first phase of the UHWO campus along the North-South Road.)

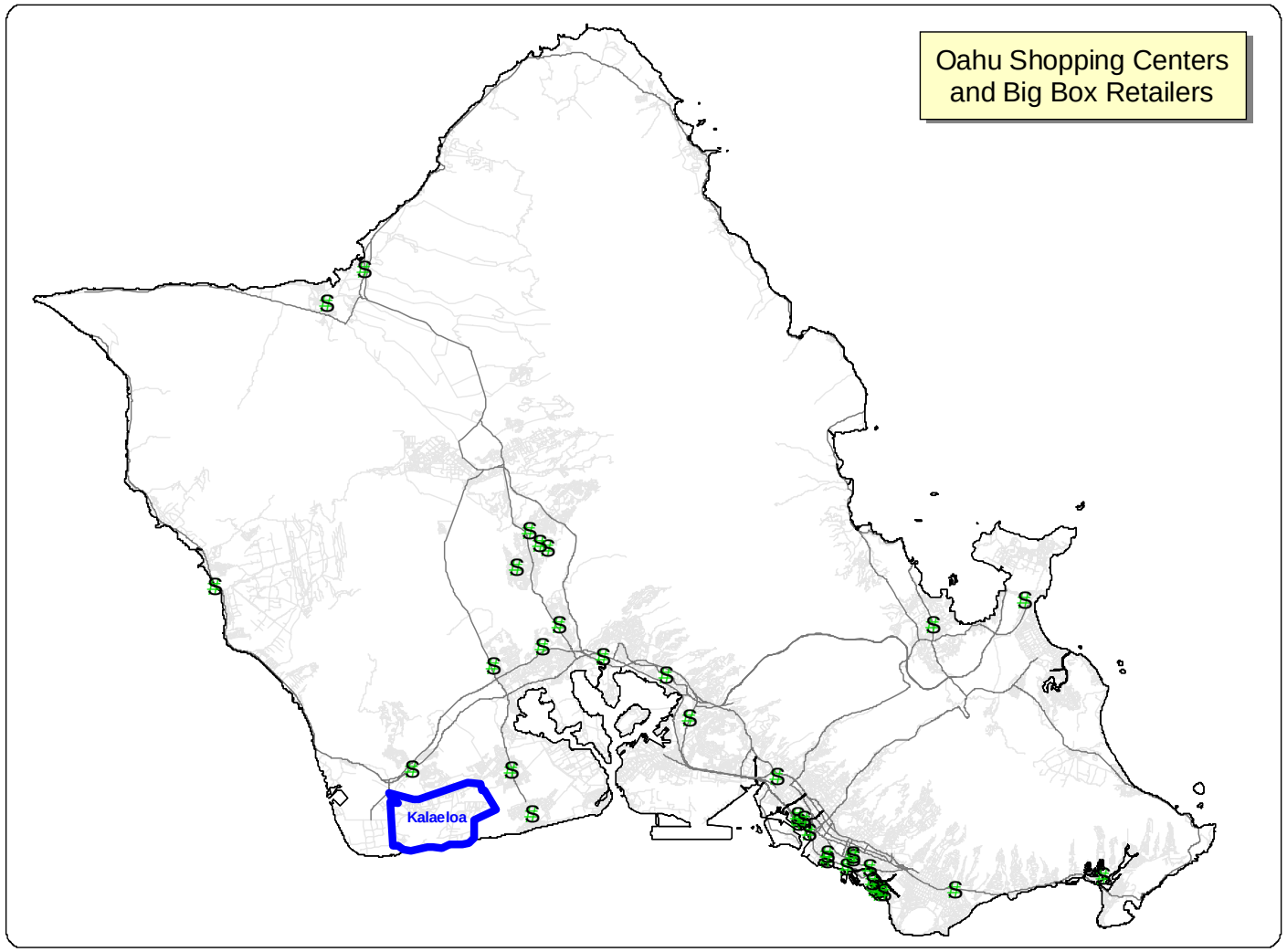
Exhibits 25 through 27 show the location of major retail centers on Oahu and of shopping centers in Central Oahu and Ewa. The last of these shows clearly how eastern Ewa has developed as a distinct commercial catchment area along Fort Weaver Road.

24. RETAIL ESTABLISHMENTS AND EXPENDITURES, 2002, BY REGION

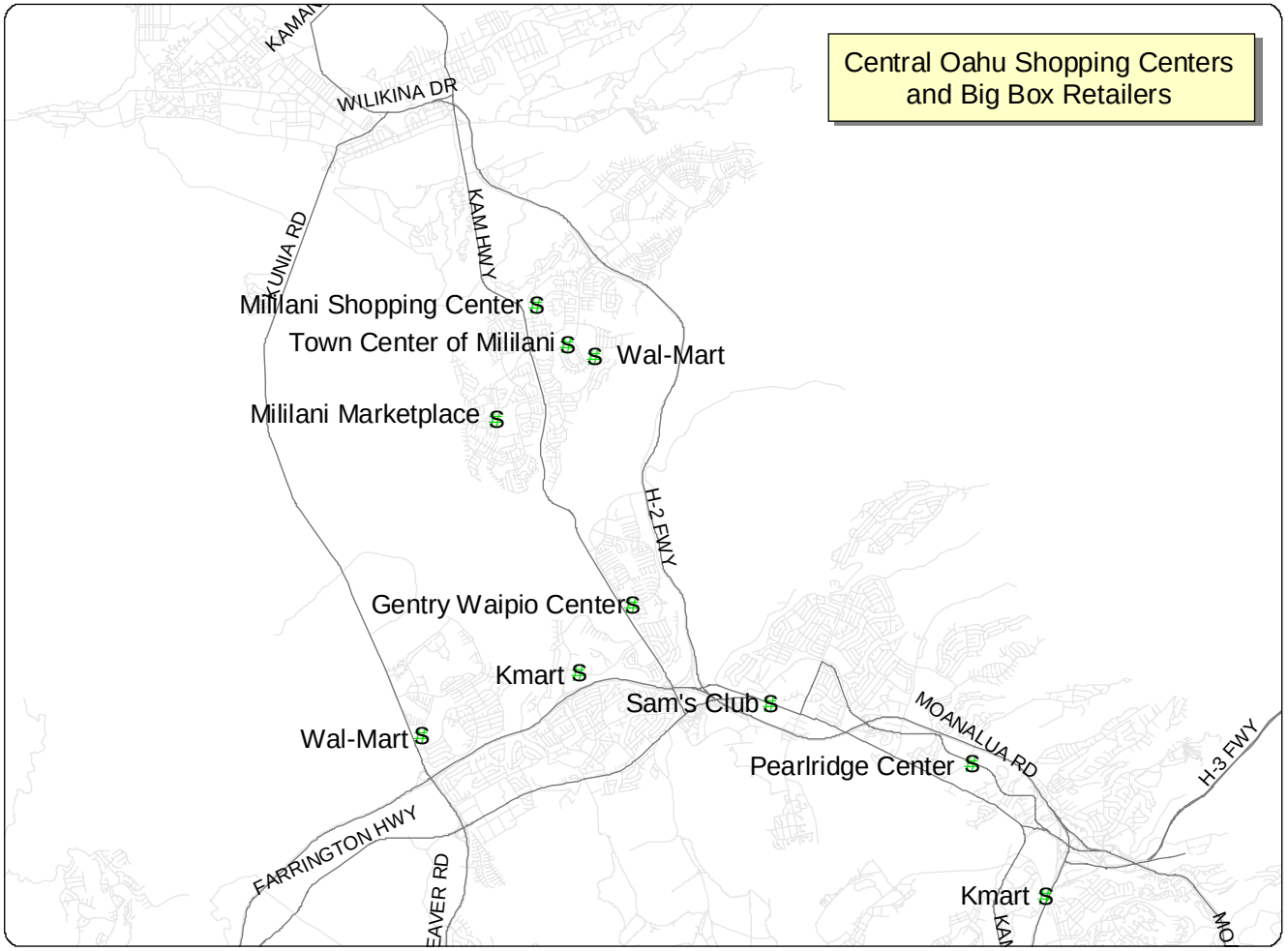


SOURCE: US Census.

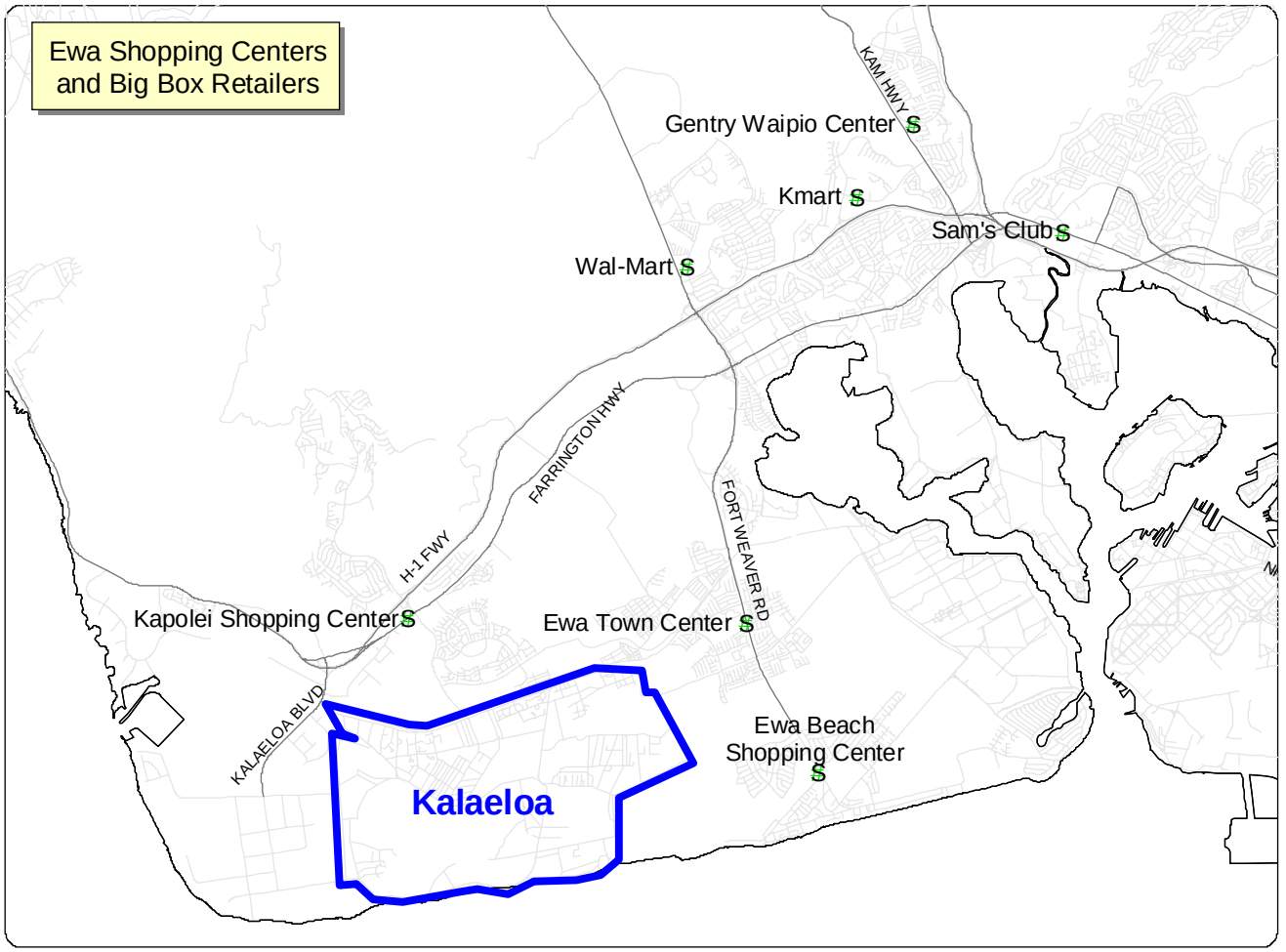
25. RETAIL CENTERS, OAHU



26. CENTRAL OAHU RETAIL CENTERS



27. EWA RETAIL CENTERS



NOTE:Kapolei Shopping Center recently expanded, with the opening of the Marketplace at Kapolei. This map does not show proposed future commercial areas, e.g., commercial parcels within the UHWO development or a commercial area proposed by DHHL at the intersection of Kapolei Parkway with the North-South Road.

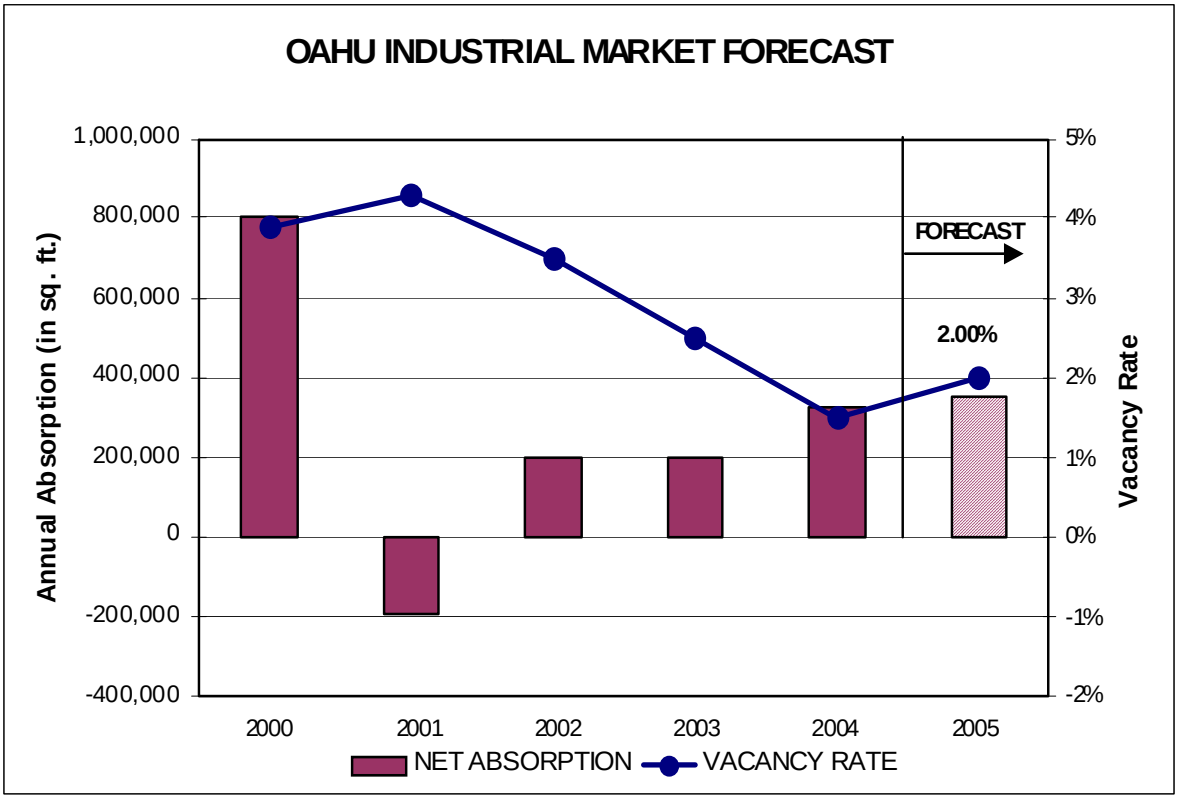
Since 1990, some office development happened outside of downtown Honolulu. Kapolei has four mid-rise office buildings: two government buildings, a Bank of Hawaii building for back office functions, and the Estate of James Campbell building. So far, there appears to be little demand for locating offices so far Leeward.

The historical data show an annual average development rate of 60,000 square feet of commercial space in Leeward Oahu in the last five years, and 260,000 square feet per year over the last 15 years. The larger figure reflects the creation of new shopping areas when Kapolei first emerged as a suburb, including construction in anticipation of future growth. (The Kapolei Safeway was the largest store the chain had ever built – and it remains the only supermarket in Kapolei.) Hence SMS expects regional commercial growth to be in the range of 60,000 to 100,000 square feet annually.

3.3.3 Industrial

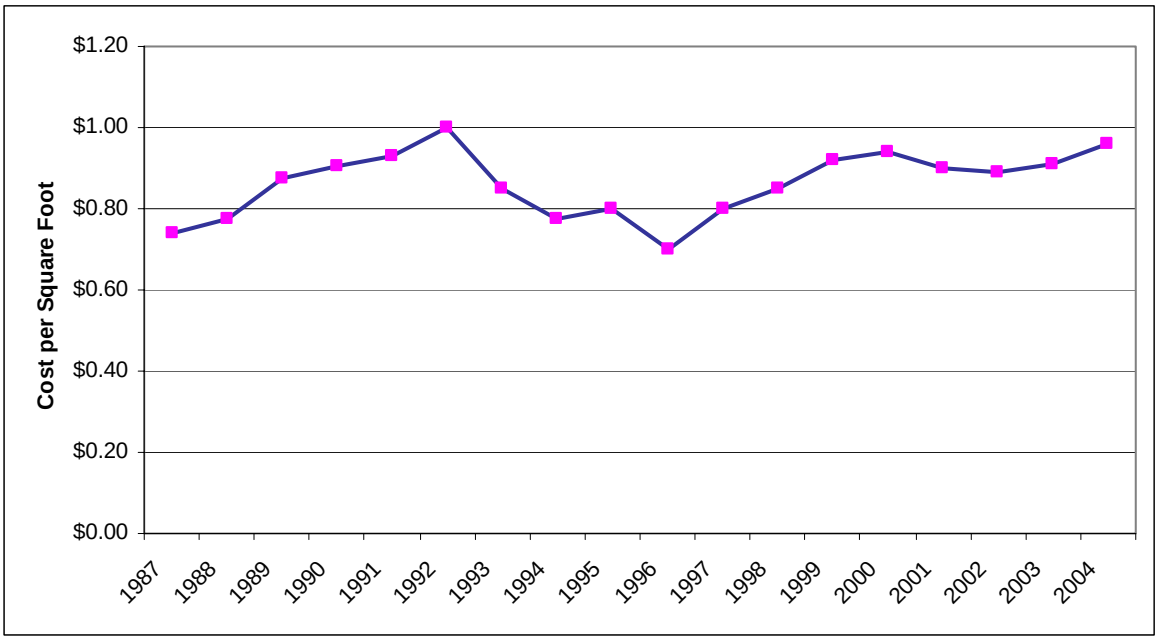
Industrial space on Oahu is extremely tight. Exhibit 28 shows very low vacancy rates. Still, new industrial development has increased only slowly while vacancies disappeared. (The 2005 bar shows current construction activity.) Lease rates have increased, but are only now returning to the rates charged in the early 1990s.

28. INDUSTRIAL VACANCY AND ABSORPTION, OAHU



SOURCES: Colliers International, 2005.

29. OAHU INDUSTRIAL LEASE RATES, 1987-2004



To gain a long-term perspective on development and availability of industrial space on Oahu, SMS compiled data on all industrial parcels on the island, noting the amount of built space on them and the timing of construction.[5] Leeward Oahu accounts for about 20% of Oahu's industrial land (as shown in Exhibit 30). However, more than half the industrial land in Leeward Oahu is vacant. This suggests that demand has not been particularly strong in the region.

30. INDUSTRIAL LAND, OAHU, 2005

	Oahu (TMK 1-1-1 to 1-9-9)	**Leeward Oahu** (TMK 1-9-1 to 1-9-6)	**Kapolei and Campbell Industrial Park** (TMK 1-9-1 to 1-9-2)
Industrial land (acres)	10,836	2,704	1,926
With buildings	6,839	1,342	1,081
Vacant	3,997	1,361	845
Vacant Share	37%	50%	44%

The next exhibit shows the pace of development. Nearly all industrial space on Oahu is in buildings built before 1990. About 10% of Oahu's industrial space is located in Kapolei, and that accounts for about half of all the industrial space in Leeward Oahu. Very little industrial development occurred in the Leeward region until the 1970s. Since then, the region still accounts for less than half of new industrial space built out.

[5] Cases in the Honolulu TMK database with PITT code 400 were considered as "industrial." PITT codes may or may not overlap with zoning. They are useful for current purposes, since they are use-oriented and developed by an agency, the Real Property Tax Branch, whose determinations may be challenged by landowners.

Averaging data for the last five and 15 years, the mean rate of new industrial construction in Leeward Oahu appears to be in the range of 80,000 to 165,000 square feet of space per year. However, demand for new space does not necessarily translate into demand for additional industrial land; unbuilt parcels account for half of Leeward Oahu's industrial land.

31. INDUSTRIAL SPACE, OAHU

	Oahu (TMK 1-1-1 to 1-9-9)	Leeward Oahu (TMK 1-9-1 to 1-9-6)	Kapolei and Campbell Industrial Park (TMK 1-9-1 to 1-9-2)
Existing space (sq. ft.)	49,949,070	9,634,420	4,961,177
fee simple	21,180,009	7,424,848	3,442,067
leasehold	24,563,386	1,955,336	1,265,699
government owned	4,205,675	254,236	253,411
Year built (parcels)			
before 1950	356	1	1
1950s	285	5	3
1960s	884	54	21
1970s	580	135	38
1980s	500	126	24
1990s	317	69	29
2000 -	49	13	3
Share less than 15 years old	366 12%	82 20%	32 27%
Year built (sq. ft.)			
before 1950	5,090,623	924	924
1950s	4,404,813	178,408	169,153
1960s	11,328,200	1,140,252	587,340
1970s	11,235,753	2,755,426	1,685,715
1980s	10,152,530	2,922,537	1,032,982
1990s	5,509,014	2,123,402	1,384,596
2000 -	1,324,764	399,892	98,515
Share less than 15 years old	6,833,778 14%	2,523,294 27%	1,483,111 30%

NOTE: The square footage for which building dates are available is slightly smaller than the totals shown for each region.

West of the Kalaeloa district is the James Campbell Industrial Park. With 1,367 acres, this is Hawaii's largest industrial park. It includes much of Oahu's heavy industry – notably, the two refineries plus power plants. Land in the park is nearly all sold, and largely developed. The adjacent Kapolei Business Park covers 890 acres. Infrastructure and landscaping for the first 135 acres have been completed. The Campbell Estate is currently working on sale and light-industrial development projects for the Business Park. Plans are also being developed for industrial use of about 200 acres near the Kalaeloa Barbers Point Harbor.

To the east of the Kalaeloa District is the Honouliuli waste water treatment plant. Land north of the plant is owned by the Estate of James Campbell and zoned light industrial. Gentry Properties has gained rezoning of about 46 acres of land south of the plant (across Geiger Road) as light industrial as well.

Recent additions in the Kapolei Business Park include a Home Depot and the new plant of the Honolulu Advertiser. The newspaper's editorial and administrative offices are still in downtown Honolulu.

Ewa offers space, access to a port and the highway, and relatively low prices. Lease rents are reportedly lowest on State-owned land near the harbors. Sales prices for industrial land on Oahu are highest within Honolulu, and lowest in Ewa and Koolaupoko. (Reported fee simple land values range from $12 to $22 per square foot in the Kapolei area to $100 to $150 in Kakaako [CB Richard Ellis, 2004].)

Campbell Estate experts see industrial development in Kalaeloa as a sensible continuation of their own development activity. They warn, however, that industrial land is absorbed very slowly. The data shown above underline this point, since ample industrial land exists to support demand for many years.

3.3.4 Resort

Oahu has nearly 36,000 visitor units, just under half of the State total. Waikiki has long been Hawaii's largest single visitor destination. Outside this dense cluster of hotels and condos, Oahu has two supplementary destinations, at Ko Olina and Turtle Bay. The latter has long had one hotel. Plans and basic permits for expansion have been in place for twenty years, but little expansion has occurred. Ko Olina, north of the Kalaeloa Barbers Point Harbor, was planned as a multi-hotel project. A Marriott hotel has been open for a decade. It was recently joined by the first phases of a time share project. Since 2000, upscale townhomes and single-family projects have been successful in Ko Olina.

Ko Olina has room for more hotels or time shares, and for additional residential development. Another hotel is planned, along with an aquarium and commercial space. While the Ko Olina developer's option on nearby lands lapsed, the Campbell Estate is developing plans for a residential and commercial development in the area between Ko Olina and Kapolei (sometimes termed "Kapolei West").

While permits allow as many as 7,000 visitor units in the Ko Olina area, the actual density is likely to be less than this number suggests. Hotel and time share development is likely, but low-rise residential projects have been the major growth and profit center for Hawaii resorts since 2000. Developers currently active in Ko Olina resort residential projects include both US Mainland and local firms (Centex Destination Properties and Interwest; locally, Armstrong and Brookfield).

3.3.5 Public Facilities and Community Institutions

In community discussions of the reuse of Barbers Point Naval Air Station, many people emphasized need for park space and education facilities.

Recreation: In the intervening years, the City and County has developed the Central Oahu Regional Park and Waipio Peninsula Soccer Park. These provide sports facilities

for the region and island, but are far enough from Kapolei to limit access by Ewa and Waianae Coast residents.

Under the Reuse Plan, beach areas at Kalaeloa were opened for public use and much of the eastern side of the district was to become a regional park. Existing sports fields in Kalaeloa continue to be used by community groups. However, City funds for maintaining and developing these resources are scarce.

Plans are advancing for a major community center sponsored by the Salvation Army and funded by the Joan Kroc Foundation. It would be located on DHHL land near the North – South Road. It would offer a wide range of sports and cultural facilities. While the proposal appears to have a good chance of success, it will still be necessary to raise funds locally for maintenance of the facilities and programs.

Education is of great concern to Leeward families. At Kalaeloa, Barbers Point Elementary School is an anomaly – a small school, operating below physical capacity, surrounded by an open area (where the Coral Rose housing once stood). Other schools are much newer, but crowded. Overall, public school populations have changed little in the last ten years. In that time, a total of five regular schools and one charter school opened in the region (out of a current total of 84 schools).

32. SCHOOL ENROLLMENTS, 1995 TO 2004

	Enrollment			Number of schools,
	1995-1996	2000-2001	2004-2005	2004-2005
Public Schools				
Central District				
Elementary	20,369	17,092	16,059	30
Middle	4,391	5,059	5,016	6
High	9,482	8,174	8,347	6
Leeward District				
Elementary	19,146	19,458	19,296	30
Middle	4,129	4,709	5,644	5
High	8,532	8,614	10,110	6
Charter Schools			208	1
	66,049	63,106	64,680	84

NOTE: The school districts cover a larger area than Leeward Oahu; schools in Pearl City and Aiea are included in the Central District.

Mililani and Kapolei have Hawaii's largest middle schools. Ewa has two of Hawaii's largest elementary schools: Holomua, on the eastern side of the region, and Kapolei. The Department of Education develops plans for new schools in concert with plans for new housing. It has, however, proven very difficult to achieve concurrent development, providing schools as needed, rather than when public outcry becomes very loud.

Honolulu has the bulk of Oahu's private schools. These need land, buildings, and endowments as well as support from parents, and are not easily grown in new communities. Ewa has three church-based schools, and a new private school in Kapolei. Together, these serve about 700 students – a far smaller share of the regional population than the 18% of Hawaii's school age population which now attends private

schools. Ewa's private school students, along with their parents, largely commute to town.

Clearly, there is ample interest in private schools to support new initiatives in Ewa. Also, public school development has not kept pace with demand from residents. Barbers Point Elementary School is not particularly well placed to serve current and most future residents of the area. With further housing development in the City of Kapolei and within Kalaeloa, the number of students nearby will grow, but the school will still be poorly located, near James Campbell Industrial Park.

Demand for new schools is likely to be strong on the east side of Kalaeloa, given potential residential growth both within the district and across its borders. A middle school on that side would clearly serve regional growth.

4. KEY DRIVERS FOR GROWTH IN KALAELOA

This section identifies potential for development at Kalaeloa, drawing on the regional analysis in the last section, and then moving on to more specific opportunities emerging through the development of Leeward Oahu. It should be stressed that successful development at Kalaeloa will likely move through three overlapping phases: opportunistic siting of interim uses; development to meet regional needs; development to the point that Kalaeloa becomes a center for regional activity in its own right.

4.1 INTERIM USES

Areas at Kalaeloa are now used for storage of motor vehicles and other short-term uses. These uses provide much-needed lease rents and can help assure surveillance of the area against vandalism and other crimes.

When bases close, there is often a significant gap in time between the departure of the military, and the ability to complete reuse planning, environmental remediation, and commence new development. Several bases have pursued interim use of existing facilities as a short-term strategy to generate activity and cash flow until new development can commence to attract the uses identified in the base reuse plan.

Interim use can be challenging because of the need to develop a pragmatic approach to current facility condition, building code compliance, infrastructure condition. The most successful approaches have been to find interim uses for a building that match its previous use, avoiding the need for prohibitively expensive building code upgrades. The large open areas at former bases often work well as lay-down area for steel fabrication and other heavy industrial and construction activities.

One of the most successful examples of interim use has been at the former Mare Island Naval Shipyard in Vallejo, CA. There, the former shipyard facilities were leased to a variety of heavy industrial users, including those attracted by high cube space with high capacity cranes. Outdoor areas were leased for laydown areas by contractors working on a number of new bridge construction projects in the region. Altogether, interim uses are generating in excess of $5 million per year at Mare Island. These facilities will ultimately be replaced by new light industrial development targeting high tech businesses.

Short-term interim uses are to be encouraged. In the course of planning, current uses, or uses at current density levels may also be considered interim. As noted above, interim uses associated with mass transit development are especially promising.

4.2 RESIDENTIAL DEVELOPMENT

Thousands of acres in Leeward Oahu have already been identified as sites for for-sale housing development. The pace of development has quickened since the 1990s, but major developers have not been willing or able to increase production greatly during the

current boom. As a result, the current inventory of residential land could suffice for many years. For-sale residential development at Kalaeloa could proceed, but in competition with long-laid plans.

Lessons Learned from Other BRAC Cases

New market-rate residential development has been one of the primary uses for former bases, particularly in locations with strong housing markets and regions that are constrained by a lack of developable land for new housing. Bases with historic residences, find that these irreplaceable buildings can be highly marketable. In other locations, lower-end enlisted personnel housing has been updated and enhanced to offer more affordable entry-level housing choices.

At some bases, existing military improvements have been removed in their entirety to allow the development of new communities, with residential as the primary use. At the former Lowry Air Force Base in Denver, CO, existing improvements were demolished and the 1,800 acre site is being redeveloped to accommodate 4,500 new residential uses, a 156-acre community college campus, a town center with professional offices, and 800 acres of new parks and open space.

In the San Francisco Bay Area, a number of former bases have new residential development as the primary use, including Mare Island Naval Shipyard, Alameda Naval Air Station, Treasure Island, Hamilton Army Field, and Bayview/Hunters Point. Although the plans for most of these locations include other uses, including office and industrial, these uses have lagged due to the current weak market for these uses.

The attractiveness of residential at former bases is a function of the strength of the local housing market. Residential development at former bases often experiences significant lead times, much more so than with new suburban development, because of the need to complete environmental remediation, complete conveyances, and provide new infrastructure.

Opportunities for Kalaeloa

Residential development would increase the value of lands in Kalaeloa more than any other large-scale use. While access to major roadways and competition from other sites are problems for residential development, they are hardly insurmountable.

Renovation and rental of space at Kalaeloa has been highly successful in recent years, and the developers active on-site – Ford Island Development and Carmel Partners – are experienced in multifamily development and rental operations. There is no historical basis for projecting an annual growth rate for new rental space – it simply hasn't been built over the last two decades or longer – but demand is evident. The challenge will be to match the cost of new construction with rents. For planning purposes, SMS estimates that construction of about 200 new rental units per year at Kalaeloa could be absorbed for the foreseeable future. This figure reflects both the strong demand for rentals and the need of most renters to commute to work in Honolulu or Pearl City. When rents rise, competition from sites closer to jobs can be expected.

Stakeholders have noted that HCDA might allow housing subdivisions in Kalaeloa to be built to rural standards, e.g., without sidewalks, and hence at lower cost than in nearby areas.

4.2 INDUSTRIAL DEVELOPMENT

The last section identified demand for up to 165,000 square feet of industrial space per year in Leeward Oahu. Industrial areas in Ewa and Central Oahu have been filling up, making additional land at Kalaeloa attractive for future development. With large flat, vacant areas, Kalaeloa can capture a share of industrial demand. However, the landowners will need to do more than call empty lands "industrial." (For many years, Kenai Industrial Park, next to Barbers Point/Kalaeloa Harbor, was nearly empty. It offered industrial land, but no enclosed space, and little activity resulted.) Industrial development has increasingly involved building new facilities to meet the specific needs of tenants.

Two approaches to industrial development at Kalaeloa are discussed in this sub-section. Airport-related demand is discussed later .

4.2.1 Science Park Concept

One way to encourage development on a new site is to target a particular segment and be prepared to meet its specific needs. For the Department of Hawaiian Home Lands, Townscape, Inc. assembled a team in 2001-2003 to study and refine the idea of establishing a "Life Sciences Park" on DHHL lands within Kalaeloa. This was seen as a long-term project, intended to supplement development of biotechnology in Honolulu. A key idea was that Kalaeloa would offer space for a large-lot science park, in contrast to office and lab space in urban Honolulu.

When the proposal was re-examined in 2002, its authors found several recent crises – the collapse of the "dot.coms," shrinking of telecom firms, and much reduced investment in biotechnology, along with 9/11 – to be cause for caution (Townscape, 2002).

Opportunities for Kalaeloa

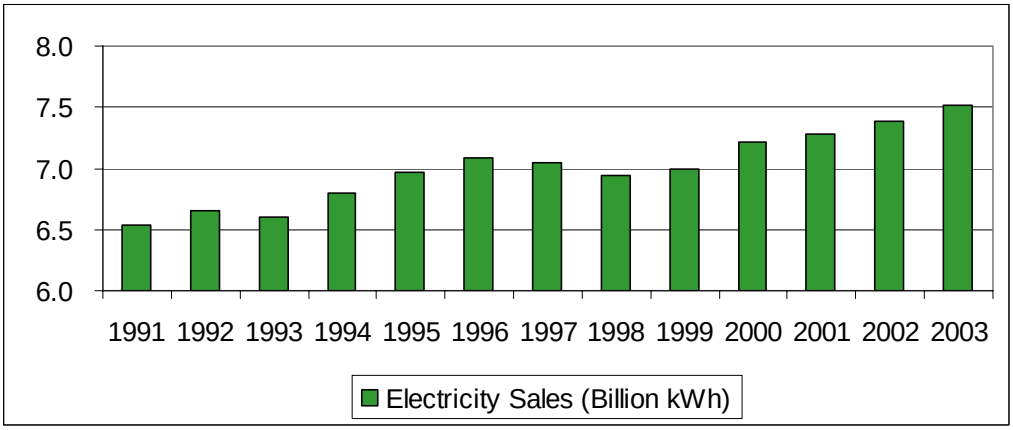
The premise of the Townscape proposal is appealing, but the claim that the science park project would be profitable in ten years is not well demonstrated. Absent a developer closely tied to bioscience interests, the idea of a highly specialized research park does not fit Hawaii experience. The Mililani Tech Park was intended as a specialized industrial park. Its long-term success has been due to mixed-use zoning, good roadway access, and a welcome offered to all potential tenants, whether or not these are "high tech."

Accordingly, the science park idea is considered here as a variant of industrial development at Kalaeloa. A tech park could emerge over time within the redevelopment district, and deserves further efforts. However, it might best be considered part of a larger process of industrial land development.

4.2.2 Energy Park

Another use that could capitalize on a large flat acreage with poor access is energy development. This fits with Oahu's growing demand for electricity. Moreover, Hawaii is committed to develop alternative sources of energy. On the island of Hawaii, Hawaiian Electric Lighting Company maintains a grid with geothermal, hydroelectric and wind power production in addition to fossil-fuel plants. On Oahu, a garbage-to-energy plant in Campbell Industrial Park produces electricity from a renewable resource, and a new series of wind turbines is being proposed by Hawaiian Electric near its Kahe Point plant, just north of Ko Olina. Much more development will be needed if Oahu is to approach having 20% or more of its power generated from alternative resources.[6]

33. TOTAL ANNUAL ELECTRICITY SALES, OAHU, 1991-2003



SOURCE: DBEDT 2004.

Development of large scale energy facilities at former military bases has been pushed to the forefront by President Bush's recent announcement seeking to locate nuclear power plants and oil refineries there. Numerous base closures have taken advantage of Department of Energy grant programs to explore innovative technologies to promote energy conservation and generation from alternate sources. The focus of many base closure efforts on the generation of significant new employment, or addressing regional needs for housing or other uses limited by land constraints, has made the development of large-scale energy generation facilities a lower priority.

Opportunities for Kalaeloa

With much of the island's energy generation already located nearby, expansion of this activity to Kalaeloa could pose few difficulties. The planning team considered use of land near the runways for photovoltaic or solar panels. During the reuse planning

[6] Hawaiian Electric has announced plans for a 100-megawatt plant in Campbell Industrial Park that would burn fossil fuels but could be adapted to biofuels (Lum, 2005).

process, the idea of a coal- or oil-fired plant was discussed. Either Hawaiian Electric or an independent power producer with a contract to supply the Oahu grid could develop or operate a new facility.

Power generation and transmission proposals have triggered much debate in Hawaii. Development of a new fossil-fuel plant at any site is likely to be opposed; development of alternative energy facilities would still likely be subjected to close scrutiny by community and environmental groups. Kalaeloa offers sites at some distance from residential centers, and under a permitting authority that, while respectful of local concerns, is independent.

4.3 COMMERCIAL DEVELOPMENT

The preceding section showed that retail development is unlikely at Kalaeloa, since retail growth has been slowing and other developers are actively working to develop commercial space at sites with better access. Little current demand for office development in the region is evident.

Lessons Learned from Other BRAC Cases

Most base reuse efforts have included office uses as a component of a larger mixed-use development. The types of office users have corresponded to the regional economy. Some facilities, such as the former Lowry Air Force Base, have located professional services and local firms as a component of a primarily residential reuse plan. The former Loring Air Force Base, in Limestone, ME, now the Loring Commerce Center, successfully implemented a strategy to attract a cluster of call center firms by demonstrating the availability of labor and the interest of call center operators in clustering with nearby facilities.

While the office market is currently weak in most places in the U.S., the office condominium market has been strong. Office condos typically offer separate office spaces of 5,000 to 10,000 square feet in a business park (or sometimes vertical office building) setting. It appeals to owners of small and medium-sized firms who are interested in the financial and tax advantages of owning their office space. This type of product has more typically been built in brownfield settings, but may present a potential for bases with a strong population base and numerous small businesses. Business owners considering a move to the Ewa region would represent a target market for office condos at Kalaeloa.

Opportunities for Kalaeloa

Office condominium development could be included in the larger redevelopment effort, but it will likely need to await demand associated with other uses on site at Kalaeloa.

4.4 VISITOR INDUSTRY

The growth of Ko Olina will probably bring increased traffic on Kalaeloa roads, as workers commute between the resort and Ewa Beach. A key question is whether, with more visitors in the region, demand for tourist attractions will likely grow. Regional cultural attractions include the Ewa Railway and Hawaii's Plantation Village in Waipahu. The Hawaiian Waters Adventure Park in Kapolei opened in 2000. It markets its rides both to resident and visitor markets. The attractions with the largest number of visitors – the USS Arizona Memorial, followed by the Polynesian Cultural Center – are far to the east.

34. ATTENDANCE AT OAHU CULTURAL ATTRACTIONS, 2001-2003

	2001	2002	2003
Battleship Missouri Memorial	377,844	362,703	360,000
Bernice P. Bishop Museum	410,565	399,495	507,268
Byodo-In Temple	(NA)	109,641	(NA)
The Contemporary Museum	35,474	35,753	38,581
Damien Museum and Archives	22,395	20,826	(NA)
Diamond Head State Monument	1,300,000	(NA)	564,331
Foster Botanical Garden	44,277	44,433	40,620
Fred Ohrt Water Museum	2,978	-	-
Halawa Shaft	1,889	-	-
Halawa Xeriscape Garden	3,786	-	-
Hawaii Maritime Center	52,172	(NA)	(NA)
Hawaii's Plantation Village	15,904	19,730	(NA)
Honolulu Academy of Arts	250,488	252,843	258,286
Honolulu Police Department Museum	7,500	7,800	9,300
Honolulu Zoo	560,000	500,101	500,000
Ho'omaluhia Botanical Garden	90,347	83,827	93,324
Iolani Palace State Monument	69,938	56,005	55,571
Judiciary History Center	37,311	37,031	40,000
Mormon Temple Grounds (Church of Jesus Christ of Latter-Day Saints, Hawaii Temple Visitor's Center)	111,057	97,119	105,197
Polynesian Cultural Center	758,314	730,443	750,371
Puu o Mahuka Heiau State Monument	20,000	(NA)	21,973
Queen Emma Summer Palace	15,757	14,614	17,074
Royal Mausoleum State Monument	115,000	(NA)	-
Sea Life Park Hawaii	310,000	310,000	308,000
Tennent Art Foundation Gallery	2,050	2,500	2,500
Tropic Lightning Museum	12,541	11,508	14,525
Ulu Po Heiau State Monument	5,000	(NA)	6,570
U.S. Army Museum, Ft. DeRussy	104,774	91,604	89,190
U.S.S. Arizona Memorial	1,443,956	1,507,560	1,476,396
U.S.S. Bowfin Submarine Museum	226,517	222,326	215,869
University of Hawaii Art Gallery	52,000	50,000	50,000
Waikiki Aquarium	340,498	328,622	313,314
Waimea Valley Audubon Center	235,319	273,382	78,475

SOURCE: DBEDT, 2004.

Hawaii visitor attractions have had great difficulty increasing attendance figures and profitability. In recent years, Waimea Falls Park and Sea Life Park have been reorganized, while Paradise Park has closed. The size of the market is simply too small to support theme parks. On the other hand, smaller attractions have been able to stay open through a combination of reliance on volunteers and marketing to appropriate audiences.

The location of Ko Olina a few miles from Kalaeloa does not, then, guarantee any increase in visitor traffic. A facility with a clear attraction – whether cultural, historic, or of any other kind – can hope to draw a modest number of visitors. There is no reason for HCDA to expect such a facility to become a source of significant revenues as well as a public benefit. (It could, of course, have important cultural and educational impacts on Kalaeloa and the region.)

4.4 THE UNIVERSITY OF HAWAII, WEST OAHU CAMPUS

The campus is currently scheduled to open in Kapolei in 2007. The current two-year school has about 800 students. These would move to the new campus, and be joined by additional classes. Enrollments could grow quickly to about 7,600. In the long term, as many as 15,000 students could be enrolled at UHWO. The campus will draw on regional demand from throughout Leeward Oahu.

However, Exhibit 34 shows that University of Hawaii enrollments have not greatly changed since 1992, and there is no reason for HCDA to expect that UHWO will bring a large new population to the area. The campus development plan will instead provide a mix of housing and a large amount of new retail space along the North - South Road.[7]

35. UNIVERSITY OF HAWAII ENROLLMENTS, 1992-2003

Year	Univ of Hawaii at Manoa	Univ. of Hawaii-West Oahu	UH Community Colleges, Oahu	Oahu Share of UH Enrollments
1992	19,865	692	19,828	80%
1993	20,090	676	20,907	81%
1994	20,041	744	21,490	80%
1995	19,801	716	20,532	80%
1996	18,252	648	19,643	80%
1997	17,365	648	19,256	80%
1998	17,013	685	19,301	80%
1999	17,612	687	19,794	80%
2000	17,263	665	18,622	80%
2001	17,532	740	19,590	81%
2002	18,706	834	20,032	80%
2003	19,863	810	20,613	80%

SOURCE: DBEDT, 2004a.

[7] This discussion is based on the Request for Proposals issued to developers. At this time, a developer has been chosen, but the University and the developer have not announced specific plans for the 500-acre University parcel beyond development of UHWO.

In time, UHWO training programs could affect the surrounding community, and cooperative agreements with nearby businesses and recreational facilities would benefit both the university and the community. However, the major UH training program at Kalaeloa is administered by Honolulu Community College, and is not slated to become a UHWO program.

Lessons Learned from Other BRAC Cases

The large area of many former military bases can be attractive to educational facilities, particularly if the facilities are in good shape and code-compliant for educational use and disability access. Other educational institutions have removed existing buildings and entirely redeveloped campuses:

- The 217-acre former Fitzsimmons Army Medical Center, near Denver, CO, was acquired by the University of Colorado Health Sciences Center, which relocated its campus to take advantage of the larger setting. The master plan for the site calls for its redevelopment into 9 million square feet of space for a medical school and biotech research center, including space for private biotech research companies.

- Reese Air Force Base in Lubbock, TX, is now the Reese Technology Center, with Texas Tech University locating three of its research institutes there.

- Williams Air Force Base in Mesa, AZ, has become Williams Gateway Airport, and is home to the Williams Campus, a consortium of institutions, including Arizona State University.

- The former Moffett Field Naval Air Station in Sunnyvale, CA (Silicon Valley) was transferred to the adjacent NASA Ames Research Center. NASA is using 213 acres of the site to create a multi-university Research Park with institutions that seek to collaborate with NASA in research activities, as well as have a greater presence in Silicon Valley. Carnegie Mellon has already opened a branch campus there, and the University of California Santa Cruz, California State University San Jose, and Foothill DeAnza Community College are currently in the planning stages for campus facilities. At buildout the Research Park will include more than three million square feet of space, including 500,000 square feet of R&D space for private companies, and conference center, and housing at a site on the NASA Ames campus.

Opportunities for Kalaeloa

The University of Hawaii has spent about twenty years deciding to build UH West Oahu before it found a mechanism – one calling for little or no near-term capital expenditures – that appears likely to result in a new campus in a few years. At Kalaeloa, the University has acquired a hangar and a dormitory – but the dormitory has not been refurbished, and the aeronautical training program is far smaller than had been planned.

In part, the small size of the UH program is a consequence of 9/11. More generally, Hawaii educational institutions lack the funds and vision for major expansion to occur at

Kalaeloa. A common thread in the above cases, the development of education and research facilities by several institutions working together, deserves emphasis. It will be important for Kalaeloa development for educational programs from different colleges to cooperate, both for their own success and for eventual expansion at Kalaeloa.

4.5 NEW TRANSPORTATION OPTIONS AND CORRIDORS

4.5.1 Roadways

Ewa currently depends on H-1, supplemented by Farrington Highway, for east-west travel. Fort Barrette and Fort Weaver roads provide access to the highway and the rest of the island for the major development areas. The road system is supplemented at present by use of Roosevelt Road in Kalaeloa as a regional connector, linking the Ewa Beach area to Kapolei, the Waianae Coast, and H-1.

The long-planned North-South Road will travel from a new H-1 interchange to Kapolei Parkway, opening up the central Ewa plain for further development. It is not at present planned to reach the Kalaeloa District. Only a short extension would be needed to link up with Kalaeloa roadways.

Opportunities for Kalaeloa

A new connection to Malakole Road in Campbell Industrial Park would link the district to the harbor and existing industrial areas. Such a road could help to promote warehousing and industrial uses in the northwest sector of Kalaeloa.

A proposed link to Kamokila Boulevard would be less obviously useful, since there is little in the Kalaeloa District facing the Kapolei office area. In the long term, this could help to supplement other north-south linkages

A link to the North-South Road could increase use of Roosevelt Road as a connector to the Ewa Beach / Ocean Pointe area. It would not necessarily increase demand for commercial space within the Kalaeloa district. Both the University of Hawaii and the Department of Hawaiian Homelands have plans to develop commercial areas along the North-South Road,

4.5.2 Kalaeloa/Barbers Point Harbor Facilities and Activity

The harbor at Kalaeloa/Barbers Point was developed to supplement Honolulu Harbor. It is Hawaii's second major harbor in terms of cargo volume, largely because it serves the nearby oil refineries. Shipping activity is currently increasing, as the Harbors Division is encouraging customers to move from Honolulu to Leeward Oahu. Sause Brothers barges now use Kalaeloa/Barbers Point rather than Honolulu. As space in Honolulu Harbor becomes increasingly crowded, need for new facilities – notably container yards – is apparent. Current plans call for development of container yards at Kapalama. Kalaeloa/Barbers Point has been discussed as an alternative site for container operations. In the coming years, with warehousing increasingly located in Leeward

Oahu, use of the port for materials imported to the island will make sense to shippers and local purchasers.

36. OAHU HARBOR CARGO ACTIVITY, 2001

Port and commodity	Total	Receipts	Shipments
Honolulu	16,562	10,689	5,873
Petroleum and petroleum products	4,829	4,224	605
Lumber	405	224	180
Primary manufactured goods	4,976	2,309	2,667
Food and farm products	1,981	1,177	804
Manufactured equipment, machinery and products	3,422	3,419	1,283
Vehicles and parts	949	414	536
Barbers Point	3,867	2,222	1,642
Petroleum and petroleum products	3,789	2,211	1,574
Cement and concrete	67	-	67

NOTE: Commodity shipments are in thousands of short tons.
SOURCE: DBEDT, 2004a.

Lessons Learned from Other BRAC Cases

Former base port facilities have been successfully reused at harbors that are constrained in their expansion. For example, 266 acres in the former Navy Fleet Industrial Supply Center Oakland and Oakland Army Base, in Oakland, CA, were transferred to the Port of Oakland, the third largest port on the West Coast. This area has been incorporated into an enlarged multimodal facility developed by the Port as part of its expansion.

The former Long Beach Naval Shipyard, in Long Beach, CA, is having its 454 acres redeveloped into a marine container terminal, intermodal railyard, ship repair facility, and liquid bulk and break bulk cargo facility. This will be an addition to the Port of Los Angeles and Long Beach, the largest port facility on the West Coast. This site will also include Long Beach Police headquarters and a training facility.

There is significant interest by liquefied natural gas (LNG) providers in establishing new U.S. terminals to meet increasing demand. Military shipyards and facilities represent an attractive opportunity. However, a proposal to establish an LNG facility at the former Mare Island Naval Shipyard, in Vallejo, CA, ran into strong community opposition, as well as opposition from the homebuilder redeveloping most of Mare Island, and was subsequently scuttled.

Opportunities for Kalaeloa

Kalaeloa is well positioned for any activity that would link harbor and air operations. However, open industrial land is plentiful between the harbor and the airfield, so any

multimodal activity at Kalaeloa would need to capitalize on being very close to the airfield.

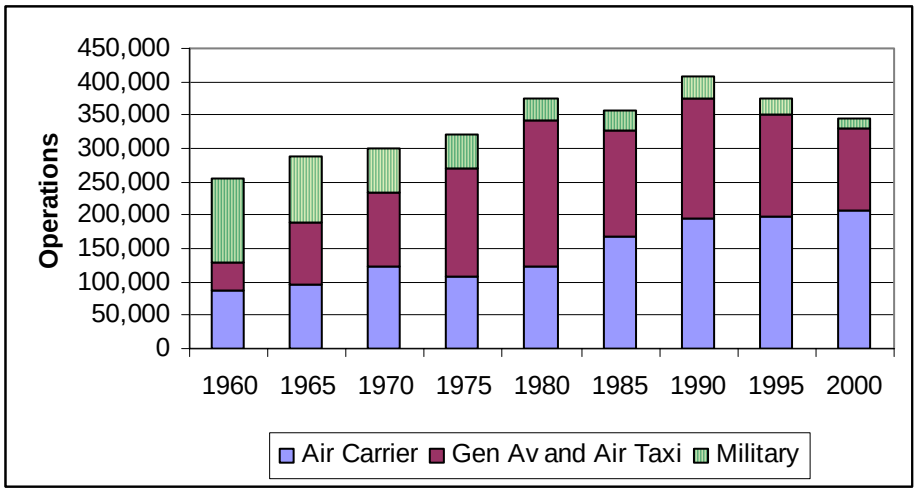
4.5.3 Kalaeloa Airport

Kalaeloa Airport has been incorporated into the State Airports System. It is designated as an emergency reliever airport for commercial flights to Honolulu. It has been planned as the leading site for general aviation activities on Oahu. Currently, Coast Guard planes and helicopters are based at Kalaeloa, but no others have fuel at the airport, so can hardly treat Kalaeloa as a home base.

Honolulu International Airport is far larger. In recent years, it has seen less growth or even a decline in activity, due to the changes in aviation after 9/11/2001 and due to growth of direct flights between Neighbor Islands and overseas destinations.

When air operations are seen in the long term, it becomes obvious that the recent decline in air carrier activity is much smaller than the decline in military activity since the time of the Vietnam conflict. Any resurgence of warfare in Asia could lead to an increase in military activity at Hickam AFB, which shares runways with Honolulu International.

37. AIR OPERATIONS, HONOLULU INTERNATIONAL AIRPORT



SOURCE: Hawaii State Department of Transportation, Airports Division, 2004. http://www.hawaii.gov/dot/airports/publications/cysmallone.pdf

Next, general aviation operations have declined appreciably since the early 1980s. While there is no immediate reason to expect this sector to increase in the near term, for planning purposes it is useful to remember that Oahu has supported a higher level of small airplane activity in the past.

38. AIR CARGO TONNAGE, HONOLULU INTERNATIONAL AIRPORT

	Cargo and Mail		
	Interisland	Overseas	Combined
1960	12,165	19,216	31,381
1965	17,540	62,062	79,602
1970	28,516	58,926	87,442
1975	45,537	108,143	153,680
1980	69,923	133,342	203,265
1985	56,308	182,041	238,349
1990	81,603	331,283	412,886
1995	86,215	373,194	459,409
2000	96,357	400,485	496,842

NOTE: All amounts are short tons.
SOURCE: DBEDT, 2004a.

Existing Conditions at Kalaeloa Field

The State of Hawaii's Department of Transportation Airports Division (DOT-Airports) is in the process of improving Kalaeloa's infrastructure in order to attract general aviation (GA) tenants. In addition to offering Avgas fuel service, DOT-Airports will be installing an instrument approach landing system (ILS) at Kalaeloa within the next 12 months. The airport's historic tower building (Building 4) has recently been renovated, as have two historic hangar structures (Building 110 and Building 111). In addition, the airport's wash rack is being repaired.

Funding. A major $10.6 million renovation program is currently underway at Kalaeloa Airport and includes runway and taxiway improvements, the installation of new lights, new signs and other repairs. These funds have been provided to DOT-Airports by the FAA and are subject to grant assurances that require DOT-Airports to continue to operate Kalaeloa as an active airfield.

Funding for staffing, maintenance, improvements and capital investment projects at Kalaeloa that are not eligible for FAA funding are financed solely by Hawaii's airport system users rather than by general tax payers or by the State's general fund.

General Aviation. There is currently a shortage of hangar space for GA aircraft on Oahu. The 84 hangar spaces available at Honolulu International Airport (HNL) for the 263 GA aircraft based there are fully occupied and there is a waiting list. At Kalaeloa, the two existing hangar structures (Buildings 110 and 111) are also occupied.

The lack of fuel service has deterred pilots from basing their aircraft at Kalaeloa instead of HNL; however, with the forthcoming addition of fuel service, an increase of based aircraft at Kalaeloa is anticipated.

In order to support the development of fixed base operator (FBO) facilities at Kalaeloa, DOT-Airports has configured three one-acre FBO parcels as well as seven 10,000 sf parcels for other aviation tenants (businesses, support services).

Flight School. Flight training is a major activity at Kalaeloa; even students and instructors who are based at HNL use the runways at Kalaeloa for landings, takeoffs and touch-and-go training. Training activity is anticipated to further expand when Kalaeloa's ILS system is installed.

The Pacific Aerospace Training Center (jointly-operated by Honolulu Community College and the University of North Dakota) is an FAA-Approved School (Part 141) program that provides students with a career path into the field of professional aviation. The program curriculum meets the training requirements for commercial air carriers. Graduates are prepared to continue in aviation academic fields to obtain baccalaureate training, to seek employment as flight instructors, or to obtain entry level pilot positions. Student pilots at the Pacific Aerospace Training Center receive part of their flight exercise training in a Frasca Model 142 Flight Simulator. The simulator replicates the performance characteristics of aircraft in both visual flight rules (VFR) and instrument flight rules (IFR) conditions.

Hawaii National Guard. The 29th Separate Infantry Brigade (SIB) is the largest unit in the Hawaii Army National Guard. Units of the SIB that occupy 150 acres at Kalaeloa include its Headquarters and Headquarters Company, the 229th Military Intelligence Company and the 29th Support Battalion. The Brigade is currently serving in Iraq as part of a ground troop rotation that transitioned into the country in March 2005 for a year of combat duty. The Hawaii Air National Guard also has a presence at Kalaeloa as the 297th Air Traffic Control Squadron operates the airport's air traffic control facility.

U.S. Coast Guard. The U.S. Coast Guard has had an air facility at Kalaeloa since 1949. Currently, the U.S. Coast Guard Air Station occupies 48 acres and its primary mission is search and rescue within the Pacific Maritime Region. In addition to Hawaii, the Coast Guard Air Station at Kalaeloa is responsible for the area that spans such island chains as the Marianas, Carolines, Marshalls. The Kalaeloa Coast Guard unit is also responsible for water pollution patrols in the Hawaiian Islands. In January 2005, one of the unit's C-130 transport planes and its crew were deployed to provide relief after the Indian Ocean tsunami. The crew flew 70 missions in less than one month and delivered 300,000 pounds of food and medical supplies to Indonesia, Thailand, Sri Lanka and Malaysia.

Noise Abatement Areas. DOT-Airports publishes a guide to Noise Abatement Areas for all of Hawaii's airports, including Kalaeloa Airport. The guide includes a map that shows noise sensitive areas surrounding Kalaeloa Airport and instructs pilots to avoid these areas and to fly using routes that go around populated areas. In addition, the guide recommends flying at or above 1,500 feet to reduce noise complaints. In addition, DOT-Airports has retained the crosswind runway at Kalaeloa (Runway 11-29) to maximize aircraft takeoffs and landings over water to reduce noise impacts on surrounding areas.

Lessons Learned from Other BRAC Cases

Conversion of former military airfields into new airports, air cargo facilities, and aviation-supporting uses has been one of the notable successes in base reuse. Most of the locations where this has been most successful have had existing passenger airports that were outmoded and undersized, constraints exist on air cargo capacity or ability to move cargo, or have been able to locate in strategic locations where they can benefit from the

trend of airline outsourcing of maintenance activities. An important factor for success has been the commitment of an existing or newly-formed airport authority to reuse and expansion of airport facilities, including runway lengthening if needed.

New international passenger airports were created from former military airfields in Austin, TX (Bergstrom Air Force Base); Myrtle Beach, SC (Myrtle Beach Air Force Base); and Alexandria, LA (England Air Force Base). Conversion of El Toro Marine Corps Air Station in Orange County, CA, to a major international airport to relieve capacity constraints at Los Angeles International Airport, was proposed but defeated after extensive opposition by adjacent communities that led to a voter referendum. That base will now be redeveloped into a new residential community, along with other uses. The nearby Tustin Marine Corps Air Station, a former helicopter facility, will also be redeveloped into a new residential community.

England Air Force Base has been successful in attracting a range of aircraft maintenance facilities. The A.B. Won Pat International Airport in Guam (former Agana Naval Air Station) now accommodates passenger air service, and has also attracted air cargo facilities, including a new DHL warehouse. Pease Air Force Base, in Portsmouth, NH, is now the Pease International Tradeport, and includes passenger facilities, a Foreign Trade Zone, and industrial and office development that has attracted over 1,300 new jobs to date.

McClellan Air Force Base in Sacramento, CA is being redeveloped into a mixed-use facility that includes an aviation/industrial district, business park, housing, recreation and park areas, a University of California, Davis, research facility, and family services such as a child-care center. Over the next 10 years, McClellan Park is projected to lease 12 to 13 million square feet of commercial/industrial space, with ultimate build out of up to 16 million square feet. The former Cecil Field Naval Air Station in Jacksonville, FL, is a non-passenger airport that includes four runways; eight hangars, which total over 750,000 square feet of space; 537,000 square yards of ramp space; and aviation fueling systems. In addition to these facilities, the station features aviation maintenance and training facilities, which include flight simulators, jet engine test cells, avionics repair facilities, and classrooms. With easy access to air and rail connections and a deep water port, Cecil Field's facilities offer aircraft maintenance, repair and overhaul (MRO) operations and a variety of aviation-related services.

Opportunities for Kalaeloa

Both general aviation and cargo operations can be developed at Kalaeloa. Other activities (e.g., depot-level maintenance) are unlikely because of the size of the Hawaii market and global competition. Also, the DOT has offered assurances to members of the surrounding community that it would not have regularly scheduled operations at Kalaeloa.[8]

Future General Aviation Expansion at Kalaeloa. The term “general aviation” describes a wide range of aviation activities excluding commercial air carriers, regional commuter airlines and military. GA activities include flight training, pleasure flying,

business/corporate flying and emergency medical services. GA aircraft range from one-seat single-engine piston aircraft to long-range corporate jets, and also include gliders, ultra-light aircraft, and kit-built aircraft.

The *Hawaii Aviation Demand Forecasts* (2004) shows an increase in based aircraft at Kalaeloa Airport from nine aircraft in 2002 to 156 aircraft in 2025. The forecast also shows a decrease in GA based aircraft at HNL from 182 in 2002 to 92 in 2025.

The forecast shows that Kalaeloa could serve approximately 60 percent of the GA aircraft and aircraft operations at HNL by 2015 (excluding commuter/air taxi aircraft). DOT-Airports will not permit scheduled flights (such as commuter and air taxi services) to operate at Kalaeloa Airport; therefore, these businesses will remain as tenants at HNL.

In addition to drawing GA users from HNL, based on the distribution of aircraft owner addresses, Kalaeloa could attract approximately 50 percent of the GA aircraft and operations at Dillingham Airfield by 2025 (excluding gliders, tow planes and skydiving aircraft).

The Airport Layout Plan for Kalaeloa calls for new T-hangars on the west concrete apron. The plan calls for a total of 140 T-hangars to be developed in phases as the actual need is demonstrated by market demand. In addition, the Airport Layout Plan includes 60 tiedowns for based aircraft, and 60 tiedowns for transient visitors.

At general aviation airfields, services such as fuel, maintenance, aircraft sales, private charter service, aircraft rental and flight instruction are supplied by fixed base operators (FBO). To avoid allowing a single FBO to exercise a monopoly over services available on an airfield, public airport owners typically lease premises to two or more FBOs under a long-term agreement. As GA pilots relocate from HNL to Kalaeloa Airport, FBOs at HNL are also expected to either relocate to Kalaeloa, or to open an additional facility to provide FBO services to Kalaeloa pilots.

Future Air Cargo Service at Kalaeloa. Because of Hawaii's distance from the U.S. mainland, many cargo customers must rely on air service as the only way to transport their goods in a timely fashion. In addition, most finished goods must be imported from other regions. While most of the U.S. can rely on highway, rail, sea and air transport, Hawaii is primarily dependent on sea and air cargo service. Most goods for which the speed of delivery is not critical can move by sea, both among the islands and between Hawaii and other regions. However, some goods — especially mail, time-sensitive documents, and perishable produce — require air cargo service.

Since September 11th, directives from the FAA and the TSA to strengthen security standards for transporting air cargo have had the effect of diverting some portion of freight cargo to all-cargo carriers. According to the *FAA Aerospace Forecasts 2005-2016* (2005), most of the growth in the demand for cargo services is forecast to occur among all-cargo carriers due to the inherent advantages of the integrated carriers (e.g., FedEx, UPS).

In 2003 (latest data available), Honolulu International Airport ranked 17th in the U.S. in air cargo landed weight. The majority of air cargo facilities at HNL are located on approximately 28 acres of land west of the main terminal. The *Hawaii Aviation Demand*

Forecasts (2004) shows an increase in non-mail cargo at HNL from 473,100 tons in 2005 to 695,100 tons in 2025, an average annual increase of 1.7 percent.

While DOT-Airports anticipates that several of the major cargo operators with significant facility investments will remain at HNL (such as United Airlines Cargo, FedEx, UPS), some interisland air cargo operators could relocate to Kalaeloa. With much lower rents at Kalaeloa, these operators could move quickly, and come to occupy about eight acres of ramp space within a few years. (One exception to this is the interisland air cargo operated by Aloha Airlines; the quick-change passenger/cargo aircraft operated by Aloha will continue to be based at HNL.)

The preceding discussion assumes that overseas cargo operators would not be willing to move to Kalaeloa. The issue of runway length is crucial. Operators would like runways as long as possible, giving them ample space for planes with full loads and full fuel tanks to take off. HNL has longer runways than Kalaeloa; with the current fleet of aircraft hauling freight overseas to and from Hawaii, it is unlikely that operators would be willing to move to Kalaeloa. (Benjamin Schlapak, DOT Airports District Manager, suggests that overseas cargo operations could be successful using an 8,000-foot runway, but recognizes that operators are unlikely to agree [Personal communication, May 2005.])

4.5.4 Mass Transit

After many years of debate, Honolulu leaders are actively planning for a new mass transit system. Mayor Mufi Hannemann has identified the route between Kapolei and downtown Honolulu, extending to the University of Hawaii at Manoa, as the major route. Both the State Legislature and the Honolulu City Council have voted measures to provide a dedicated tax base for the project. The City Department of Transportation Services is contracting for for planning and engineering studies of alternatives. While much work remains to be done, earlier plans may be reused with little change in many cases, so construction could occur within a few years.

Mayor Hannemann has said in speeches that rail system development would begin in Kapolei and move east, so the project would benefit Leeward Oahu first.

A rail transit system is not expected to lessen congestion on Oahu's roadways, so much as help to slow this growing problem. It is often seen as a potential impetus for economic development, since transit stations usually serve as local hubs, attracting commercial development.

Opportunities for Kalaeloa

Kalaeloa can potentially serve several distinct functions with regard to light rail development on Oahu:

- Space can be made for the project developer on the site, if much of the project's materials reach Oahu by way of Kalaeloa Harbor. The district's industrial area could provide a combination base yard and assembly/construction site.

  Former warehouse facilities may have the potential to be used for assembly and testing of rail cars and new equipments. Under the Federal Transit

Administration's Buy America requirements for rolling stock (bus or light rail), 60 percent of all components, by cost, must be of U.S. origin, and final assembly must take place in the United States. A number of jurisdictions have leveraged this requirement to generate local manufacturing and related employment in conjunction with the purchase of transit vehicles.

- Use of a site within the Kalaeloa district would be especially appropriate if the permanent base yard for the rail transit system were to be located there. Such a base yard will surely be needed, and Kalaeloa offers industrial land that could be developed to this purpose, either at the northeast or northwest corner of the district.

- With the base yard located in Kalaeloa, the final station of the rail line could appropriately be located there as well. At Kalaeloa, there would be ample space for parking lots as well as a terminus. It could hence serve as the transfer point for commuters from the Waianae Coast as well as the western Ewa plain.

In sum, Kalaeloa has much to offer for mass transit development, and mass transit could be central to both interim and permanent redevelopment at Kalaeloa.

4.6 ADDITIONAL DEVELOPMENT CONCEPTS CONSIDERED FOR THIS STUDY

Several additional concepts have seemed worth considering at Kalaeloa, largely because of the relatively isolated and undeveloped character of the site. Long term development will demand the creation of urban densities, at least in part of the District. These may be incompatible, in the long term, with the development concepts noted here.

4.6.1 Homeland Security Training Center

Members of the planning team have noted that one of Kalaeloa's key characteristics – the inaccessibility of parts of the site, notably on the west side – could be an advantage for tenants seeking exclusive use of a large area. With the Coast Guard already on-site, and concerned to limit access to areas west of the their site, use of parts of the site by the Department of Homeland Security seems appropriate. Areas to the north and west of the airport could be used for training for emergency and anti-terror operations.

During the base closure process, the concept of a training center for Fire Department and emergency response personnel, serving Hawaii and the Pacific region, was advanced. The City and County of Honolulu has not acted to implement this concept.

HCDA has not received an expression of interest from the agencies in question. Hence there is no current basis for considering this as an economically viable use of land at Kalaeloa.

4.6.2 Correctional Facility

Hawaii has a serious shortage of correctional space, and much of its existing facilities is old and in disrepair. The State has sent felons to the US Mainland in order to limit overcrowding in its facilities. Currently, 30% of the inmates for which the State's correctional system is responsible are outside Hawaii or in Federal keeping.

The current Department of Public Safety master plan calls for construction of two new prisons in Hawaii by 2013, and for extensive renovations and expansion of older facilities. Hawaii's prisoner population is projected to grow by nearly 2,700 persons between 2003 and 2013, not counting the prisoners in Mainland US facilities.

The need for additional prison space has long been recognized, but Hawaii communities have been unwilling to see new correctional facilities nearby. A prison was identified as a potential use at Kalaeloa in the redevelopment planning process. Local community stakeholders were deeply opposed to the idea, and the Department of Public Safety at the time was interested above all in a facility taking up considerable land area, more than could be accommodated in the relatively isolated area west of the runways.

The only prison facility built in recent years, the Federal Detention Center, is located beside the Honolulu Airport.

39. STATE PUBLIC SAFETY HEAD COUNT, APRIL 30, 2005

	Number	Share
Oahu Prisons	1,538	27%
Oahu Jails	1,397	24%
Oahu, Federal Center	108	2%
Neighbor Island Facilities	1,057	18%
Out of State	1,616	28%
Total	5,716	

Correctional facilities have been established at a number of former military bases. Fort Devens in Ayer, MA, is home to a 245 acre U.S. Bureau of Prisons medical facility, as is the former Carswell Air Force Base in Fort Worth, TX. One of the uses at the former Memphis Naval Air Station is a federal prison.

Opportunities for Kalaeloa

The example of the Federal Detention Center indicates that the constraints of land area and adjacency to an airport can be overcome if need for a correctional facility on Oahu is strong.

If Oahu had a continuing unemployment problem, a prison might be attractive as a source of jobs. However, unemployment is low, so this is not a strong incentive for locating a controversial public land use at Kalaeloa.

REFERENCES

Aries Consulting. *Hawaii Aviation Demand Forecasts.* Prepared for Hawaii State Department of Transportation. Santa Monica, CA: 2004.

Battelle Memorial Institute and State Science and Technology Institute. *State Government Initiatives in Biotechnology 2001*. Prepared for Biotechnology Industry Organization. Washington, DC, 2001

Carter Goble Associates, Inc. *10-Year Corrections Master Plan Update: Final Report.* Prepared for Hawaii State Departments of Accounting and General Services, and of Public Safety. Honolulu, HI: 2003. Available on the Internet at http://www.hawaii.gov/psd/documents/10yrrpt/2003%20Master%20Plan%20Update%20Final%20Report.pdf

Colliers International. *Colliers International Industrial Report: Honolulu, Year End 2004.* Honolulu, HI: 2005.

FAA Aerospace Forecasts 2005-2016 (2005)

Gomes, A. "492 Affordable Homes to be Built in Kapolei." *Honolulu Advertiser*, June 18, 2005.

Hawaii State Department of Business, Economic Development and Tourism. *The State of Hawaii Data Book 2003.* Honolulu, HI: 2004a.

Hawaii State Department of Business, Economic Development and Tourism. *Population and Economic Projections for the State of Hawaii to 2030: DBEDT 2030 Series.* Honolulu, HI: 2004b.

Honolulu, City and County of, Department of Planning and Permitting. *Annual Report on the Status of Land Use on Oahu: Fiscal Year 2003.* Honolulu, HI: 2004.

Lum, C. "HECO to Build Plant at Campbell." *Honolulu Advertiser*, June 18, 2005.

Milken Institute. *America's High-Tech Economy: Growth Development, and Risks for Metropolitan Areas.* Los Angeles, CA, 1999.

SMS Research & Marketing Services, Inc. *Market Study: Kakaako Makai Redevelopment Concept Plan.* Prepared for Hawaii Community Development Authority. Honolulu, HI: 2002.

SMS Research & Marketing Services, Inc. *Hawaii Housing Policy Study: 2003 Update*. Prepared for a consortium of public and private agencies. Honolulu, HI: 2003.

Townscape, Inc. *Kalaeloa Technology Park: Phase 2 Feasibility Study.* Prepared for Department of Hawaiian Home Lands, State of Hawaii. Honolulu, HI: 2003.

University of Arizona Science and Technology Park. *Expansion Plan.* Tucson, AZ, 2001. (www.uatechpark.org/expansion_plan.pdf).

Appendix B

Engineering and Infrastructure

Opinion of Probable Road Construction Cost

.	Line	Lot	Length	Unit Cost	Total
Phase 1	Franklin D Roosevelt Road	1L	1,100	$ 300	$ 330,000
Phase 1	Franklin D Roosevelt Road	1J	680	$ 300	$ 204,000
Phase 1	Franklin D Roosevelt Road	1I	910	$ 300	$ 273,000
Phase 1	Franklin D Roosevelt Road	1C	700	$ 300	$ 210,000
Phase 1	Franklin D Roosevelt Road	1B	1,460	$ 300	$ 438,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Offsite	1,850	$ 600	$ 1,110,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1N	740	$ 600	$ 444,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1Q	2,460	$ 600	$ 1,476,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	2E	850	$ 600	$ 510,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	2G	1,040	$ 600	$ 624,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1F	850	$ 600	$ 510,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1E	2,110	$ 600	$ 1,266,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1B	2,190	$ 600	$ 1,314,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1A	2,800	$ 600	$ 1,680,000
Phase 1	Realigned Saratoga Rd Bridge		1	$ 6,000,000	$ 6,000,000
Phase 1	Realigned Saratoga Rd/Kalaeloa Blvd Intersection		1	$ 2,000,000	$ 2,000,000
Phase 1	Malakole Street	1O	2,640	$ 600	$ 1,584,000
Phase 1	Malakole Street	1P	2,350	$ 600	$ 1,410,000
Phase 1	Malakole Street	1Q	690	$ 600	$ 414,000
Phase 1	Wakea Street	1I	1,520	$ 450	$ 684,000
Phase 1	Improved Malakole St Bridge		1	$ 3,000,000	$ 3,000,000
Phase 1	Kamokila Boulevard	1L	1,320	$ 450	$ 594,000
Phase 1	Kamokila Boulevard	1Q	820	$ 450	$ 369,000
Phase 1	Kamokila Boulevard	1P	1,850	$ 450	$ 832,500
Phase 1	Road A	1R	750	$ 300	$ 225,000
Phase 1	Road B	1R	960	$ 300	$ 288,000
Phase 1	Road F	1C	1,360	$ 300	$ 408,000
Phase 1	Road F	1G	3,650	$ 300	$ 1,095,000
Phase 1	North South Road	1B	1,490	$ 600	$ 894,000
Phase 1	North South Road	1G	2,640	$ 600	$ 1,584,000
Phase 1	North South Road	1H	1,070	$ 600	$ 642,000
Phase 1 Total					$ 32,412,500
Phase 2	Franklin D Roosevelt Road	2E	710	$ 300	$ 213,000
Phase 2	Franklin D Roosevelt Road	2F	380	$ 300	$ 114,000
Phase 2	Franklin D Roosevelt Road	4C	410	$ 300	$ 123,000
Phase 2	Franklin D Roosevelt Road	2H	940	$ 300	$ 282,000
Phase 2	Franklin D Roosevelt Road	OS-11	560	$ 300	$ 168,000
Phase 2	Franklin D Roosevelt Road	2D	550	$ 300	$ 165,000
Phase 2	Franklin D Roosevelt Road	OS-10	1,240	$ 300	$ 372,000
Phase 2	Franklin D Roosevelt Road	4B	1,400	$ 300	$ 420,000
Phase 2	Franklin D Roosevelt Road	4A	2,080	$ 300	$ 624,000
Phase 2	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	3E	920	$ 600	$ 552,000
Phase 2	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	3D-2D	2,280	$ 600	$ 1,368,000
Phase 2	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	2C	1,090	$ 600	$ 654,000
Phase 2	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	2B	600	$ 600	$ 360,000
Phase 2	Road C	2M	1,550	$ 300	$ 465,000
Phase 2	Ft. Barrette Road	2D	1,740	$ 450	$ 783,000
Phase 2	Road D	4B	680	$ 300	$ 204,000
Phase 2	Road D	2B	890	$ 300	$ 267,000
Phase 2	North-South Road	OS-3	3,400	$ 600	$ 2,040,000
Phase 2 Total					$ 9,174,000
Phase 3	Road E	4B	360	$ 300	$ 108,000
Phase 3	Road E	1F	1,140	$ 300	$ 342,000
Phase 3	Road E	4D (HNG)	1,480	$ 300	$ 444,000
Phase 3	Essex Road	Navy GC/3A	8,570	$ 300	$ 2,571,000
Phase 3	Road G	3B	1,900	$ 300	$ 570,000
Phase 3 Total					$ 4,035,000
Road Total					**$ 45,621,500**

Parcelization and Land Use based on Master Plan dated September 22, 2005

Opinion of Probable Drainage System Construction Cost

Phase	Line	Road Category Type	Lot	Length	Dry Wells	Unit Cost	Total
Drain	Roosevelt Crossing		OS-10	1		$ 400,000	$ 400,000
Total Drainage Crossing							**$ 400,000**
Phase 1	Franklin D Roosevelt Road	Tertiary Roads	1L	1,100	3	$ 4,000	$ 12,000
Phase 1	Franklin D Roosevelt Road	Tertiary Roads	1J	680	2	$ 4,000	$ 8,000
Phase 1	Franklin D Roosevelt Road	Tertiary Roads	1I	910	3	$ 4,000	$ 12,000
Phase 1	Franklin D Roosevelt Road	Tertiary Roads	1C	700	2	$ 4,000	$ 8,000
Phase 1	Franklin D Roosevelt Road	Tertiary Roads	1B	1,460	4	$ 4,000	$ 16,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Primary Roads	1N	740	4	$ 4,000	$ 16,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Primary Roads	1Q	2,460	14	$ 4,000	$ 56,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Primary Roads	2E	850	5	$ 4,000	$ 20,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Primary Roads	2G	1,040	6	$ 4,000	$ 24,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Primary Roads	1F	850	5	$ 4,000	$ 20,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Primary Roads	1E	2,110	12	$ 4,000	$ 48,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Primary Roads	1B	2,190	13	$ 4,000	$ 52,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Primary Roads	1A	2,800	16	$ 4,000	$ 64,000
Phase 1	Malakole Street	Secondary Roads	1O	2,640	15	$ 4,000	$ 60,000
Phase 1	Malakole Street	Secondary Roads	1P	2,350	13	$ 4,000	$ 52,000
Phase 1	Malakole Street	Secondary Roads	1Q	690	4	$ 4,000	$ 16,000
Phase 1	Wakea Street	Secondary Roads	1I	1,520	9	$ 4,000	$ 36,000
Phase 1	Kamokila Boulevard	Secondary Roads	1L	1,320	8	$ 4,000	$ 32,000
Phase 1	Kamokila Boulevard	Secondary Roads	1Q	820	5	$ 4,000	$ 20,000
Phase 1	Kamokila Boulevard	Secondary Roads	1P	1,850	11	$ 4,000	$ 44,000
Phase 1	Road A	Tertiary Roads	1R	750	2	$ 4,000	$ 8,000
Phase 1	Road B	Tertiary Roads	1R	960	3	$ 4,000	$ 12,000
Phase 1	Road F	Tertiary Roads	1C	1,360	4	$ 4,000	$ 16,000
Phase 1	Road F	Tertiary Roads	1G	3,650	10	$ 4,000	$ 40,000
Phase 1	North South Road	Primary Roads	1B	1,490	9	$ 4,000	$ 36,000
Phase 1	North South Road	Primary Roads	1G	2,640	15	$ 4,000	$ 60,000
Phase 1	North South Road	Primary Roads	1H	1,070	6	$ 4,000	$ 24,000
Phase 1 Total							$ 812,000
Phase 2	Franklin D Roosevelt Road	Tertiary Roads	2E	710	2	$ 4,000	$ 8,000
Phase 2	Franklin D Roosevelt Road	Tertiary Roads	2F	380	1	$ 4,000	$ 4,000
Phase 2	Franklin D Roosevelt Road	Tertiary Roads	4C	410	1	$ 4,000	$ 4,000
Phase 2	Franklin D Roosevelt Road	Tertiary Roads	2H	940	3	$ 4,000	$ 12,000
Phase 2	Franklin D Roosevelt Road	Tertiary Roads	OS-11	560	2	$ 4,000	$ 8,000
Phase 2	Franklin D Roosevelt Road	Tertiary Roads	2D	550	2	$ 4,000	$ 8,000
Phase 2	Franklin D Roosevelt Road	Tertiary Roads	OS-10	1,240	4	$ 4,000	$ 16,000
Phase 2	Franklin D Roosevelt Road	Tertiary Roads	4B	1,400	4	$ 4,000	$ 16,000
Phase 2	Franklin D Roosevelt Road	Tertiary Roads	4A	2,080	6	$ 4,000	$ 24,000
Phase 2	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Primary Roads	3E	920	5	$ 4,000	$ 20,000
Phase 2	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Primary Roads	3D-2D	2,280	13	$ 4,000	$ 52,000
Phase 2	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Primary Roads	2C	1,090	6	$ 4,000	$ 24,000
Phase 2	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Primary Roads	2B	600	3	$ 4,000	$ 12,000
Phase 2	Road C	Tertiary Roads	2M	1,550	4	$ 4,000	$ 16,000
Phase 2	Ft. Barrette Road	Secondary Roads	2D	1,740	10	$ 4,000	$ 40,000
Phase 2	Road D	Tertiary Roads	4B	680	2	$ 4,000	$ 8,000
Phase 2	Road D	Tertiary Roads	2B	890	3	$ 4,000	$ 12,000
Phase 2	North-South Road	Primary Roads	OS-3	3,400	19	$ 4,000	$ 76,000
Phase 2 Total							$ 360,000
Phase 3	Road E	Tertiary Roads	4B	360	1	$ 4,000	$ 4,000
Phase 3	Road E	Tertiary Roads	1F	1,140	3	$ 4,000	$ 12,000
Phase 3	Road E	Tertiary Roads	4D (HNG)	1,480	4	$ 4,000	$ 16,000
Phase 3	Essex Road	Tertiary Roads	Navy GC/3A	8,570	24	$ 4,000	$ 96,000
Phase 3	Road G	Tertiary Roads	3B	1,900	5	$ 4,000	$ 20,000
Phase 3 Total							$ 148,000
Dry Well Total							**$ 1,320,000**
Drainage Total							**$ 1,720,000**

Note: Parcelization and Land Use based on Master Plan dated September 22, 2005
Primary and Secondary Roads every 175 feet per dry well.
Tertiary Roads every 350 feet per dry well.

Opinion of Probable Sewer System Construction Cost

Phase	Line		Lot	Length	Size	Unit Cost	Total
Phase 1	Kamokila Boulevard	Line H	1N	820	10	$ 80	$ 65,600
Phase 1	Kamokila Boulevard	Line H	1O	1,850	12	$ 100	$ 185,000
Phase 1	Malakole Street	Line H	1P	2,350	27	$ 300	$ 705,000
Phase 1	Realigned Saratoga Road	Line G	1J	210	10	$ 80	$ 16,800
Phase 1	Realigned Saratoga Road	Line G	1K	432	10	$ 80	$ 34,560
Phase 1	Realigned Saratoga Road	Line G	1I	890	10	$ 80	$ 71,200
Phase 1	Malakole Street	Line G	1Q	690	12	$ 100	$ 69,000
Phase 1	Road A	Line F	1R	750	15	$ 150	$ 112,500
Phase 1	Road B	Line E	1R	960	8	$ 60	$ 57,600
Phase 1	Backlot	Line A	1R	750	30	$ 350	$ 262,500
Phase 1	Backlot	Line A	1R	1,090	36	$ 400	$ 436,000
Phase 1	Backlot	Line A	2M	750	36	$ 400	$ 300,000
Phase 1	Backlot	Line A	2M	850	36	$ 400	$ 340,000
Phase 1	Backlot	Line A	3F	2,670	42	$ 450	$ 1,201,500
Phase 1	Backlot	Line A	4D	3,380	48	$ 500	$ 1,690,000
Phase 1	Backlot	Line A	2A	1,880	48	$ 500	$ 940,000
Phase 1	Realigned Saratoga Road	Line C1	1E	2,110	18	$ 200	$ 422,000
Phase 1	Road F	Line C2	1B	270	12	$ 100	$ 27,000
Phase 1	Road F	Line C2	2A	1,880	18	$ 200	$ 376,000
Phase 1	Road F	Line A	1H	1,760	48	$ 500	$ 880,000
Phase 1	North-South Road	Line B	1G	2,640	15	$ 150	$ 396,000
Phase 1	North-South Road	Line A	1H	1,070	48	$ 500	$ 535,000
Phase 1	North-South Road	Line A	OS-6	1,250	48	$ 500	$ 625,000
Phase 1	East Pump Station		Navy GC			$ 50,000,000	$ 50,000,000
Phase 1 FM	North-South Road	SFM	OS-6	1,250	36	$ 300	$ 375,000
Phase 1 FM	North-South Road	SFM	1H	1,070	36	$ 300	$ 321,000
Phase 1 FM	North-South Road	SFM	1G	2,640	36	$ 300	$ 792,000
Phase 1 FM	Realigned Saratoga Road	SFM	1A	2,800	36	$ 300	$ 840,000
Phase 1 FM	Geiger - Treatment Plant	SFM		1,340	36	$ 300	$ 402,000
Phase 1 Total							$ 62,478,260
Phase 2	Road A	Line F1	4C	880	8	$ 60	$ 52,800
Phase 2	Road A	Line F1	2G	710	10	$ 80	$ 56,800
Phase 2	Road A	Line F2	2I	420	8	$ 60	$ 25,200
Phase 2	Road A	Line F2	4C	520	8	$ 60	$ 31,200
Phase 2	Realigned Saratoga Road	Line D	2C	1,090	8	$ 60	$ 65,400
Phase 2	Realigned Saratoga Road	Line D	2D	700	10	$ 80	$ 56,000
Phase 2	Realigned Saratoga Road	Line D	3D	1,580	15	$ 150	$ 237,000
Phase 2	Road C	Line D	2M	1,550	18	$ 200	$ 310,000
Phase 2	North-South Road	Line I	3A	1,520	24	$ 250	$ 380,000
Phase 2	East Pump Station Upgrade		Navy GC			$ 10,000,000	$ 10,000,000
Phase 2 Total							$ 11,214,400
Phase 3	Road E	Line C1	4A	760	10	$ 80	$ 60,800
Phase 3	Road E	Line C1	1E	380	12	$ 100	$ 38,000
Phase 3	Road G	Line I	3B	1,070	24	$ 250	$ 267,500
Phase 3	East Pump Station Upgrade		Navy GC			$ 10,000,000	$ 10,000,000
Phase 3 Total							$ 10,366,300
Project Total							**$ 84,058,960**

Parcelization based on Master Plan dated September 22, 2005
Land Use based on Yields dated February 6, 2006

Opinion of Probable Water System Construction Cost

Phase	Line	Lot	Length	Size	Unit Cost	Total
Offsite	North-South Road		4,066	30	$ 500	$ 2,033,000
Offsite	North-South Road		3,144	36	$ 650	$ 2,043,600
Offsite	North-South Road		3,457	42	$ 800	$ 2,765,600
Offsite	5.0 MG Reservoir				$ 5,000,000	$ 5,000,000
Offsite Total						$ 11,842,200
Phase 1	Franklin D Roosevelt Road	1L	1,100	30	$ 500	$ 550,000
Phase 1	Franklin D Roosevelt Road	1J	680	30	$ 500	$ 340,000
Phase 1	Franklin D Roosevelt Road	1I	910	30	$ 500	$ 455,000
Phase 1	Franklin D Roosevelt Road	2E	710	30	$ 500	$ 355,000
Phase 1	Franklin D Roosevelt Road	2F	380	30	$ 500	$ 190,000
Phase 1	Franklin D Roosevelt Road	4C	410	30	$ 500	$ 205,000
Phase 1	Franklin D Roosevelt Road	2H	940	30	$ 500	$ 470,000
Phase 1	Franklin D Roosevelt Road	OS-11	560	30	$ 500	$ 280,000
Phase 1	Franklin D Roosevelt Road	2D	550	30	$ 500	$ 275,000
Phase 1	Franklin D Roosevelt Road	OS-10	1,240	30	$ 500	$ 620,000
Phase 1	Franklin D Roosevelt Road	4B	1,400	30	$ 500	$ 700,000
Phase 1	Franklin D Roosevelt Road	4A	2,080	30	$ 500	$ 1,040,000
Phase 1	Franklin D Roosevelt Road	1C	700	30	$ 500	$ 350,000
Phase 1	Franklin D Roosevelt Road	1B	1,460	30	$ 500	$ 730,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Offsite	1,850	16	$ 180	$ 333,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Offsite	1,850	16	$ 180	$ 333,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1N	740	16	$ 180	$ 133,200
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1Q	2,460	30	$ 500	$ 1,230,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	2E	850	30	$ 500	$ 425,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	2G	1,040	30	$ 500	$ 520,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	3E	920	30	$ 500	$ 460,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	3D	1,580	30	$ 500	$ 790,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	2D	700	30	$ 500	$ 350,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	2C	1,090	30	$ 500	$ 545,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	2B	600	30	$ 500	$ 300,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1F	850	30	$ 500	$ 425,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1E	2,110	30	$ 500	$ 1,055,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1B	2,190	30	$ 500	$ 1,095,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1A	2,800	16	$ 180	$ 504,000
Phase 1	Malakole Street	1O	2,640	16	$ 180	$ 475,200
Phase 1	Malakole Street	1P	2,350	16	$ 180	$ 423,000
Phase 1	Malakole Street	1Q	690	16	$ 180	$ 124,200
Phase 1	Wakea Street	1I	1,520	16	$ 180	$ 273,600
Phase 1	Kamokila Boulevard	1L	1,320	30	$ 500	$ 660,000
Phase 1	Kamokila Boulevard	1Q	820	16	$ 180	$ 147,600
Phase 1	Kamokila Boulevard	1P	1,850	16	$ 180	$ 333,000
Phase 1	Road A	1R	750	16	$ 180	$ 135,000
Phase 1	Road B	1R	960	16	$ 180	$ 172,800
Phase 1	Road E	4B	360	16	$ 180	$ 64,800
Phase 1	Road E	1F	1,140	16	$ 180	$ 205,200
Phase 1	Road F	1C	1,090	16	$ 180	$ 196,200
Phase 1	Road F	1B	270	16	$ 180	$ 48,600
Phase 1	Road F	1G	3,650	16	$ 180	$ 657,000
Phase 1	North South Road	1B	1,490	30	$ 500	$ 745,000
Phase 1	North South Road	1G	2,640	16	$ 180	$ 475,200
Phase 1	North South Road	1H	1,070	16	$ 180	$ 192,600
Phase 1 Total						$ 20,054,200
Phase 2	Road C	2M	1,550	16	$ 180	$ 279,000
Phase 2	Ft. Barrette Road	2D	1,740	16	$ 180	$ 313,200
Phase 2	Road D	4B	680	16	$ 180	$ 122,400
Phase 2	Road D	2B	890	16	$ 180	$ 160,200
Phase 2	North South Road	OS-3	3,400	16	$ 180	$ 612,000
Phase 2 Total						$ 1,486,800
Phase 3	Road E	4D	1,480	16	$ 180	$ 266,400
Phase 3	Road G	3B	1,900	16	$ 180	$ 342,000
Phase 3	Essex Road	Navy GC	7,810	16	$ 180	$ 1,405,800
Phase 3	Essex Road	3A	760	16	$ 180	$ 136,800
Phase 3 Total						$ 2,151,000
On-Site Total						$ 23,692,000
Project Total						**$ 35,534,200**

Parcelization based on Master Plan dated September 22, 2005
Land Use based on Yields dated February 6, 2006

Opinion of Probable Irrigation System Construction Cost

Phase	Line	Lot	Length	Size	Unit Cost	Total
Phase 1	Franklin D Roosevelt Road	1L	1,100	8	$ 60	$ 66,000
Phase 1	Franklin D Roosevelt Road	1J	680	8	$ 60	$ 40,800
Phase 1	Franklin D Roosevelt Road	1I	910	8	$ 60	$ 54,600
Phase 1	Franklin D Roosevelt Road	2E	710	8	$ 60	$ 42,600
Phase 1	Franklin D Roosevelt Road	2F	380	8	$ 60	$ 22,800
Phase 1	Franklin D Roosevelt Road	4C	410	8	$ 60	$ 24,600
Phase 1	Franklin D Roosevelt Road	2H	940	8	$ 60	$ 56,400
Phase 1	Franklin D Roosevelt Road	OS-11	560	8	$ 60	$ 33,600
Phase 1	Franklin D Roosevelt Road	2D	550	8	$ 60	$ 33,000
Phase 1	Franklin D Roosevelt Road	OS-10	1,240	8	$ 60	$ 74,400
Phase 1	Franklin D Roosevelt Road	4B	1,400	8	$ 60	$ 84,000
Phase 1	Franklin D Roosevelt Road	4A	2,080	8	$ 60	$ 124,800
Phase 1	Franklin D Roosevelt Road	1C	700	8	$ 60	$ 42,000
Phase 1	Franklin D Roosevelt Road	1B	1,460	8	$ 60	$ 87,600
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	Offsite	1,850	8	$ 60	$ 111,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1N	740	8	$ 60	$ 44,400
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1Q	2,460	8	$ 60	$ 147,600
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	2E	850	8	$ 60	$ 51,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	2G	1,040	8	$ 60	$ 62,400
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	3E	920	8	$ 60	$ 55,200
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	3D	1,580	8	$ 60	$ 94,800
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	2D	700	8	$ 60	$ 42,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	2C	1,090	8	$ 60	$ 65,400
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	2B	600	8	$ 60	$ 36,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1F	850	8	$ 60	$ 51,000
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1E	2,110	8	$ 60	$ 126,600
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1B	2,190	8	$ 60	$ 131,400
Phase 1	Realigned Saratoga Rd (Kalaeloa - Essex Rd)	1A	2,800	8	$ 60	$ 168,000
Phase 1	Malakole Street	1O	2,640	8	$ 60	$ 158,400
Phase 1	Malakole Street	1P	2,350	8	$ 60	$ 141,000
Phase 1	Malakole Street	1Q	690	8	$ 60	$ 41,400
Phase 1	Wakea Street	1I	1,520	8	$ 60	$ 91,200
Phase 1	Kamokila Boulevard	1L	1,320	8	$ 60	$ 79,200
Phase 1	Kamokila Boulevard	1Q	820	8	$ 60	$ 49,200
Phase 1	Kamokila Boulevard	1P	1,850	8	$ 60	$ 111,000
Phase 1	Road A	1R	750	8	$ 60	$ 45,000
Phase 1	Road B	1R	960	8	$ 60	$ 57,600
Phase 1	Road E	4B	360	8	$ 60	$ 21,600
Phase 1	Road E	1F	1,140	8	$ 60	$ 68,400
Phase 1	Road F	1C	1,090	8	$ 60	$ 65,400
Phase 1	Road F	1B	270	8	$ 60	$ 16,200
Phase 1	Road F	1G	3,650	8	$ 60	$ 219,000
Phase 1	North South Road	1B	1,490	8	$ 60	$ 89,400
Phase 1	North South Road	1G	2,640	8	$ 60	$ 158,400
Phase 1	North South Road	1H	1,070	8	$ 60	$ 64,200
Phase 1 Total						$ 3,450,600
Phase 2	Road C	2M	1,550	8	$ 60	$ 93,000
Phase 2	Ft. Barrette Road	2D	1,740	8	$ 60	$ 104,400
Phase 2	Road D	4B	680	8	$ 60	$ 40,800
Phase 2	Road D	2B	890	8	$ 60	$ 53,400
Phase 2	North South Road	OS-3	3,400	8	$ 60	$ 204,000
Phase 2 Total						$ 495,600
Phase 3	Road E	4D	1,480	8	$ 60	$ 88,800
Phase 3	Road G	3B	1,900	8	$ 60	$ 114,000
Phase 3	Essex Road	Navy GC	7,810	8	$ 60	$ 468,600
Phase 3	Essex Road	3A	760	8	$ 60	$ 45,600
Phase 3 Total						$ 717,000
Project Total						**$ 4,663,200**

Parcelization and Land Use based on Master Plan dated September 22, 2005

Opinion of Probable Impact Fees - Summary

	Phase 1	Phase 2	Phase 3	Phase 4	Total
Mixed Use Residential	$ 5,342,800	$ 3,263,400	$ -	$ -	$ 8,606,200
Mixed Use Town House	$ 3,230,320	$ 3,582,620	$ 3,902,400	$ -	$ 10,715,340
Mixed Use Multifamily	$ 3,230,320	$ 3,582,620	$ 4,292,640	$ -	$ 11,105,580
Mixed Use	$ -	$ -	$ -	$ 8,168,160	$ 8,168,160
Industrial	$ 23,256,000	$ 18,411,000	$ 5,457,000	$ 6,834,000	$ 53,958,000
Commercial	$ 259,243	$ 216,718	$ 148,701	$ 196,891	$ 821,552
School	$ 1,683,000	$ 1,275,000	$ -	$ -	$ 2,958,000
Water Impact Fees	$ 37,001,683	$ 30,331,358	$ 13,800,741	$ 15,199,051	$ 96,332,832
Mixed Use Residential	$ 6,902,320	$ 4,215,960	$ -	$ -	$ 11,118,280
Mixed Use Town House	$ 2,848,880	$ 3,159,580	$ 3,441,600	$ -	$ 9,450,060
Mixed Use Multifamily	$ 2,848,880	$ 3,159,580	$ 3,785,760	$ -	$ 9,794,220
Mixed Use	$ -	$ -	$ -	$ 9,569,560	$ 9,569,560
Industrial	$ 21,796,800	$ 17,255,800	$ 5,114,600	$ 6,405,200	$ 50,572,400
Commercial	$ 242,977	$ 203,120	$ 139,371	$ 184,537	$ 770,004
School	$ 1,577,400	$ 1,195,000	$ -	$ -	$ 2,772,400
Sewer Impact Fees	$ 36,217,257	$ 29,189,040	$ 12,481,331	$ 16,159,297	$ 94,046,924
Mixed Use Residential	$ 1,797,780	$ 1,098,090	$ -	$ -	$ 2,895,870
Mixed Use Town House	$ 742,020	$ 822,945	$ 896,400	$ -	$ 2,461,365
Mixed Use Multifamily	$ 742,020	$ 822,945	$ 986,040	$ -	$ 2,551,005
Mixed Use	$ -	$ -	$ -	$ 2,492,490	$ 2,492,490
Industrial	$ 10,026,031	$ 7,937,275	$ 2,352,599	$ 2,946,246	$ 23,262,151
Commercial	$ 642,604	$ 537,194	$ 368,595	$ 488,048	$ 2,036,441
School	$ 725,568	$ 549,673	$ -	$ -	$ 1,275,241
Traffic Impact Fees	$ 14,676,023	$ 11,768,121	$ 4,603,635	$ 5,926,784	$ 36,974,562
Water Impact Fees	$ 37,001,683	$ 30,331,358	$ 13,800,741	$ 15,199,051	$ 96,332,832
Sewer Impact Fees	$ 36,217,257	$ 29,189,040	$ 12,481,331	$ 16,159,297	$ 94,046,924
Traffic Impact Fees	$ 14,676,023	$ 11,768,121	$ 4,603,635	$ 5,926,784	$ 36,974,562
Impact Fee Total	**$ 87,894,963**	**$ 71,288,518**	**$ 30,885,706**	**$ 37,285,131**	**$ 227,354,319**

Opinion of Probable Impact Fees

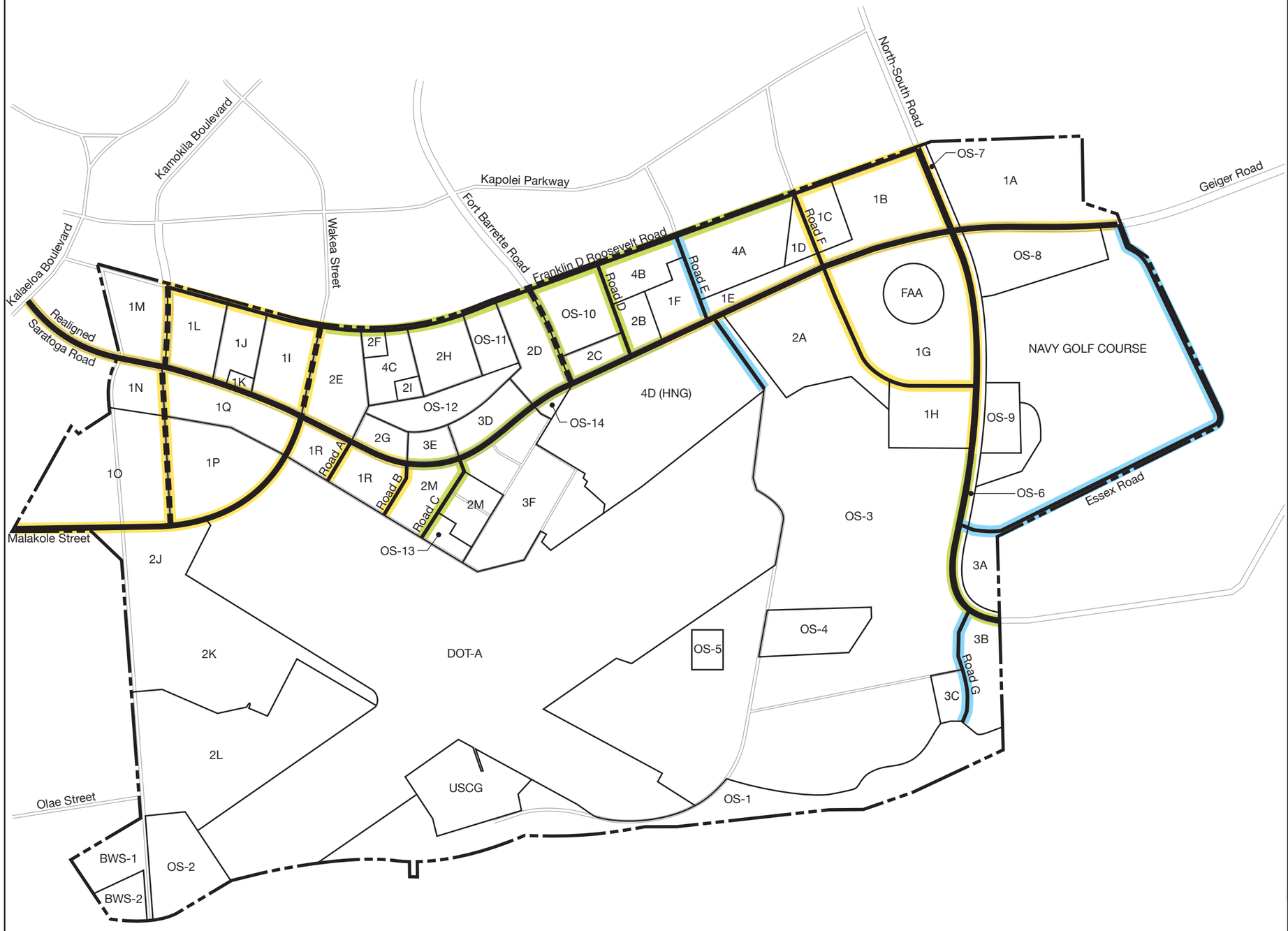
	Description	Units	Water Fee	Water Impact Total	Sewer Fee	Sewer Impact Total	Traffic Fee	Traffic Impact Total
Parcel 1B	Mixed Use Residential Unit	526	$ 3,700	$ 1,946,200	$ 4,780	$ 2,514,280	$ 1,245	$ 654,870
Parcel 1D	Mixed Use Residential Unit	76	$ 3,700	$ 281,200	$ 4,780	$ 363,280	$ 1,245	$ 94,620
Parcel 1E	Mixed Use Residential Unit	132	$ 3,700	$ 488,400	$ 4,780	$ 630,960	$ 1,245	$ 164,340
Parcel 1F	Mixed Use Residential Unit	176	$ 3,700	$ 651,200	$ 4,780	$ 841,280	$ 1,245	$ 219,120
Parcel 1I	Mixed Use Residential Unit	370	$ 3,700	$ 1,369,000	$ 4,780	$ 1,768,600	$ 1,245	$ 460,650
Parcel 1L	Mixed Use Residential Unit	164	$ 3,700	$ 606,800	$ 4,780	$ 783,920	$ 1,245	$ 204,180
Phase 1 Mixed Use Residential Unit		1,444		$ 5,342,800		$ 6,902,320		$ 1,797,780
Parcel 1B	Mixed Use Townhouse	217	$ 5,420	$ 1,176,140	$ 4,780	$ 1,037,260	$ 1,245	$ 270,165
Parcel 1D	Mixed Use Townhouse	32	$ 5,420	$ 173,440	$ 4,780	$ 152,960	$ 1,245	$ 39,840
Parcel 1E	Mixed Use Townhouse	54	$ 5,420	$ 292,680	$ 4,780	$ 258,120	$ 1,245	$ 67,230
Parcel 1F	Mixed Use Townhouse	72	$ 5,420	$ 390,240	$ 4,780	$ 344,160	$ 1,245	$ 89,640
Parcel 1I	Mixed Use Townhouse	153	$ 5,420	$ 829,260	$ 4,780	$ 731,340	$ 1,245	$ 190,485
Parcel 1L	Mixed Use Townhouse	68	$ 5,420	$ 368,560	$ 4,780	$ 325,040	$ 1,245	$ 84,660
Phase 1 Mixed Use Townhouse		596		$ 3,230,320		$ 2,848,880		$ 742,020
Parcel 1B	Mixed Use Multifamily (Condo)	217	$ 5,420	$ 1,176,140	$ 4,780	$ 1,037,260	$ 1,245	$ 270,165
Parcel 1D	Mixed Use Multifamily (Condo)	32	$ 5,420	$ 173,440	$ 4,780	$ 152,960	$ 1,245	$ 39,840
Parcel 1E	Mixed Use Multifamily (Condo)	54	$ 5,420	$ 292,680	$ 4,780	$ 258,120	$ 1,245	$ 67,230
Parcel 1F	Mixed Use Multifamily (Condo)	72	$ 5,420	$ 390,240	$ 4,780	$ 344,160	$ 1,245	$ 89,640
Parcel 1I	Mixed Use Multifamily (Condo)	153	$ 5,420	$ 829,260	$ 4,780	$ 731,340	$ 1,245	$ 190,485
Parcel 1L	Mixed Use Multifamily (Condo)	68	$ 5,420	$ 368,560	$ 4,780	$ 325,040	$ 1,245	$ 84,660
Phase 1 Mixed Use Multifamily (Condo)		596		$ 3,230,320		$ 2,848,880		$ 742,020
Parcel 2B	Mixed Use Residential Unit	82	$ 3,700	$ 303,400	$ 4,780	$ 391,960	$ 1,245	$ 102,090
Parcel 2C	Mixed Use Residential Unit	92	$ 3,700	$ 340,400	$ 4,780	$ 439,760	$ 1,245	$ 114,540
Parcel 2D	Mixed Use Residential Unit	260	$ 3,700	$ 962,000	$ 4,780	$ 1,242,800	$ 1,245	$ 323,700
Parcel 2E	Mixed Use Residential Unit	274	$ 3,700	$ 1,013,800	$ 4,780	$ 1,309,720	$ 1,245	$ 341,130
Parcel 2F	Mixed Use Residential Unit	28	$ 3,700	$ 103,600	$ 4,780	$ 133,840	$ 1,245	$ 34,860
Parcel 2G	Mixed Use Residential Unit	104	$ 3,700	$ 384,800	$ 4,780	$ 497,120	$ 1,245	$ 129,480
Parcel 2I	Mixed Use Residential Unit	42	$ 3,700	$ 155,400	$ 4,780	$ 200,760	$ 1,245	$ 52,290
Phase 2 Mixed Use Residential Unit		882		$ 3,263,400		$ 4,215,960		$ 1,098,090
Parcel 2B	Mixed Use Townhouse	62	$ 5,420	$ 336,040	$ 4,780	$ 296,360	$ 1,245	$ 77,190
Parcel 2C	Mixed Use Townhouse	69	$ 5,420	$ 373,980	$ 4,780	$ 329,820	$ 1,245	$ 85,905
Parcel 2D	Mixed Use Townhouse	195	$ 5,420	$ 1,056,900	$ 4,780	$ 932,100	$ 1,245	$ 242,775
Parcel 2E	Mixed Use Townhouse	205	$ 5,420	$ 1,111,100	$ 4,780	$ 979,900	$ 1,245	$ 255,225
Parcel 2F	Mixed Use Townhouse	21	$ 5,420	$ 113,820	$ 4,780	$ 100,380	$ 1,245	$ 26,145
Parcel 2G	Mixed Use Townhouse	78	$ 5,420	$ 422,760	$ 4,780	$ 372,840	$ 1,245	$ 97,110
Parcel 2I	Mixed Use Townhouse	31	$ 5,420	$ 168,020	$ 4,780	$ 148,180	$ 1,245	$ 38,595
Phase 2 Mixed Use Townhouse		661		$ 3,582,620		$ 3,159,580		$ 822,945
Parcel 2B	Mixed Use Multifamily (Condo)	62	$ 5,420	$ 336,040	$ 4,780	$ 296,360	$ 1,245	$ 77,190
Parcel 2C	Mixed Use Multifamily (Condo)	69	$ 5,420	$ 373,980	$ 4,780	$ 329,820	$ 1,245	$ 85,905
Parcel 2D	Mixed Use Multifamily (Condo)	195	$ 5,420	$ 1,056,900	$ 4,780	$ 932,100	$ 1,245	$ 242,775
Parcel 2E	Mixed Use Multifamily (Condo)	205	$ 5,420	$ 1,111,100	$ 4,780	$ 979,900	$ 1,245	$ 255,225
Parcel 2F	Mixed Use Multifamily (Condo)	21	$ 5,420	$ 113,820	$ 4,780	$ 100,380	$ 1,245	$ 26,145
Parcel 2G	Mixed Use Multifamily (Condo)	78	$ 5,420	$ 422,760	$ 4,780	$ 372,840	$ 1,245	$ 97,110
Parcel 2I	Mixed Use Multifamily (Condo)	31	$ 5,420	$ 168,020	$ 4,780	$ 148,180	$ 1,245	$ 38,595
Phase 2 Mixed Use Multifamily (Condo)		661		$ 3,582,620		$ 3,159,580		$ 822,945
Parcel 3A	Mixed Use Townhouse	244	$ 5,420	$ 1,322,480	$ 4,780	$ 1,166,320	$ 1,245	$ 303,780
Parcel 3D	Mixed Use Townhouse	286	$ 5,420	$ 1,550,120	$ 4,780	$ 1,367,080	$ 1,245	$ 356,070
Parcel 3E	Mixed Use Townhouse	190	$ 5,420	$ 1,029,800	$ 4,780	$ 908,200	$ 1,245	$ 236,550
Phase 3 Mixed Use Townhouse		720		$ 3,902,400		$ 3,441,600		$ 896,400
Parcel 3A	Mixed Use Multifamily (Condo)	268	$ 5,420	$ 1,452,560	$ 4,780	$ 1,281,040	$ 1,245	$ 333,660
Parcel 3D	Mixed Use Multifamily (Condo)	314	$ 5,420	$ 1,701,880	$ 4,780	$ 1,500,920	$ 1,245	$ 390,930
Parcel 3E	Mixed Use Multifamily (Condo)	210	$ 5,420	$ 1,138,200	$ 4,780	$ 1,003,800	$ 1,245	$ 261,450
Phase 3 Mixed Use Multifamily (Condo)		792		$ 4,292,640		$ 3,785,760		$ 986,040
Parcel 4A	Mixed Use Moderate Intensity	1,092	$ 4,080	$ 4,455,360	$ 4,780	$ 5,219,760	$ 1,245	$ 1,359,540
Parcel 4B	Mixed Use Moderate Intensity	520	$ 4,080	$ 2,121,600	$ 4,780	$ 2,485,600	$ 1,245	$ 647,400
Parcel 4C	Mixed Use Moderate Intensity	390	$ 4,080	$ 1,591,200	$ 4,780	$ 1,864,200	$ 1,245	$ 485,550
Phase 4 Mixed Use		2,002		$ 8,168,160		$ 9,569,560		$ 2,492,490
Total Mixed Use		8,354		$ 38,595,280		$ 39,932,120		$ 10,400,730

	Description	Acres	Water Fee	Water Impact Total	Sewer Fee	Sewer Impact Total	Traffic Fee	Traffic Impact Total
Parcel 1A	Light Industry	79	$ 51,000	$ 4,029,000	$ 47,800	$ 3,776,200	$ 2,019	$ 1,736,966
Parcel 1G	Eco-Industrial Open Space	84	$ 51,000	$ 4,284,000	$ 47,800	$ 4,015,200	$ 2,019	$ 1,846,900
Parcel 1H	Eco-Industrial Open Space	32	$ 51,000	$ 1,632,000	$ 47,800	$ 1,529,600	$ 2,019	$ 703,581
Parcel 1L	Light Industry/Mixed Use	25	$ 51,000	$ 1,275,000	$ 47,800	$ 1,195,000	$ 2,019	$ 549,673
Parcel 1M	Light Industry	26	$ 51,000	$ 1,326,000	$ 47,800	$ 1,242,800	$ 2,019	$ 571,660
Parcel 1N	Eco-Industrial	15	$ 51,000	$ 765,000	$ 47,800	$ 717,000	$ 2,019	$ 329,804
Parcel 1O	Eco-Industrial	80	$ 51,000	$ 4,080,000	$ 47,800	$ 3,824,000	$ 2,019	$ 1,758,953
Parcel 1P	Eco-Industrial	50	$ 51,000	$ 2,550,000	$ 47,800	$ 2,390,000	$ 2,019	$ 1,099,346
Parcel 1Q	Eco-Industrial	35	$ 51,000	$ 1,785,000	$ 47,800	$ 1,673,000	$ 2,019	$ 769,542
Parcel 1R	Airport Related Mixed Use	30	$ 51,000	$ 1,530,000	$ 47,800	$ 1,434,000	$ 2,019	$ 659,607
Phase 1 Industrial		456		$ 23,256,000		$ 21,796,800		$ 10,026,031
Parcel 2A	Eco-Industry Open Space	66	$ 51,000	$ 3,366,000	$ 47,800	$ 3,154,800	$ 2,019	$ 1,451,136
Parcel 2J	Eco-Industry	30	$ 51,000	$ 1,530,000	$ 47,800	$ 1,434,000	$ 2,019	$ 659,607
Parcel 2K	Military	104	$ 51,000	$ 5,304,000	$ 47,800	$ 4,971,200	$ 2,019	$ 2,286,639
Parcel 2L	Recreation/Eco-Industrial	127	$ 51,000	$ 6,477,000	$ 47,800	$ 6,070,600	$ 2,019	$ 2,792,338
Parcel 2M	Airport Related/Mixed Use	34	$ 51,000	$ 1,734,000	$ 47,800	$ 1,625,200	$ 2,019	$ 747,555
Phase 2 Industrial		361		$ 18,411,000		$ 17,255,800		$ 7,937,275
Parcel 3B	Cultural Center	27	$ 51,000	$ 1,377,000	$ 47,800	$ 1,290,600	$ 2,019	$ 593,647
Parcel 3C	Cultural Center	9	$ 51,000	$ 459,000	$ 47,800	$ 430,200	$ 2,019	$ 197,882
Parcel 3F	Airport Related	71	$ 51,000	$ 3,621,000	$ 47,800	$ 3,393,800	$ 2,019	$ 1,561,071
Phase 3 Industrial		107		$ 5,457,000		$ 5,114,600		$ 2,352,599
Parcel 4D	Military	134	$ 51,000	$ 6,834,000	$ 47,800	$ 6,405,200	$ 2,019	$ 2,946,246
Phase 4 Industrial		134		$ 6,834,000		$ 6,405,200		$ 2,946,246
Total Industrial		1,058		$ 53,958,000		$ 50,572,400		$ 23,262,151

	Description	GSF	Water Fee	Water Impact Total	Sewer Fee	Sewer Impact Total	Traffic Fee	Traffic Impact Total
Parcel 1B	Commercial	57,600	$ 25,500	$ 94,413	$ 23,900	$ 88,489	$ 4,063	$ 234,029
Parcel 1D	Commercial	8,400	$ 25,500	$ 13,769	$ 23,900	$ 12,905	$ 4,063	$ 34,129
Parcel 1E	Commercial	14,400	$ 25,500	$ 23,603	$ 23,900	$ 22,122	$ 4,063	$ 58,507
Parcel 1F	Commercial	19,200	$ 25,500	$ 31,471	$ 23,900	$ 29,496	$ 4,063	$ 78,010
Parcel 1I	Commercial	40,560	$ 25,500	$ 66,483	$ 23,900	$ 62,311	$ 4,063	$ 164,795
Parcel 1L	Commercial	18,000	$ 25,500	$ 29,504	$ 23,900	$ 27,653	$ 4,063	$ 73,134
Phase 1 Commercial		158,160		$ 259,243		$ 242,977		$ 642,604
Parcel 2B	Commercial	12,384	$ 25,500	$ 20,299	$ 23,900	$ 19,025	$ 4,063	$ 50,316
Parcel 2C	Commercial	13,824	$ 25,500	$ 22,659	$ 23,900	$ 21,237	$ 4,063	$ 56,167
Parcel 2D	Commercial	39,000	$ 25,500	$ 63,926	$ 23,900	$ 59,915	$ 4,063	$ 158,457
Parcel 2E	Commercial	41,040	$ 25,500	$ 67,269	$ 23,900	$ 63,049	$ 4,063	$ 166,746
Parcel 2F	Commercial	4,128	$ 25,500	$ 6,766	$ 23,900	$ 6,342	$ 4,063	$ 16,772
Parcel 2G	Commercial	15,600	$ 25,500	$ 25,570	$ 23,900	$ 23,966	$ 4,063	$ 63,383
Parcel 2I	Commercial	6,240	$ 25,500	$ 10,228	$ 23,900	$ 9,586	$ 4,063	$ 25,353
Phase 2 Commercial		132,216		$ 216,718		$ 203,120		$ 537,194
Parcel 3A	Commercial	30,720	$ 25,500	$ 50,354	$ 23,900	$ 47,194	$ 4,063	$ 124,815
Parcel 3D	Commercial	36,000	$ 25,500	$ 59,008	$ 23,900	$ 55,306	$ 4,063	$ 146,268
Parcel 3E	Commercial	24,000	$ 25,500	$ 39,339	$ 23,900	$ 36,871	$ 4,063	$ 97,512
Phase 3 Commercial		90,720		$ 148,701		$ 139,371		$ 368,595
Parcel 4A	Commercial	65,520	$ 25,500	$ 107,395	$ 23,900	$ 100,657	$ 4,063	$ 266,208
Parcel 4B	Commercial	31,200	$ 25,500	$ 51,140	$ 23,900	$ 47,932	$ 4,063	$ 126,766
Parcel 4C	Commercial	23,400	$ 25,500	$ 38,355	$ 23,900	$ 35,949	$ 4,063	$ 95,074
Phase 4 Commercial		120,120		$ 196,891		$ 184,537		$ 488,048
Total Commercial		501,216		$ 821,552		$ 770,004		$ 2,036,441

	Description	Acres	Water Fee	Water Impact Total	Sewer Fee	Sewer Impact Total	Traffic Fee	Traffic Impact Total
Parcel 1C	School	13	$ 51,000	$ 663,000	$ 47,800	$ 621,400	$ 2,019	$ 285,830
Parcel 1J	School	17	$ 51,000	$ 867,000	$ 47,800	$ 812,600	$ 2,019	$ 373,777
Parcel 1K	School	3	$ 51,000	$ 153,000	$ 47,800	$ 143,400	$ 2,019	$ 65,961
Phase 1 School		33		$ 1,683,000		$ 1,577,400		$ 725,568
Parcel 2H	School	25	$ 51,000	$ 1,275,000	$ 47,800	$ 1,195,000	$ 2,019	$ 549,673
Phase 2 School		25		$ 1,275,000		$ 1,195,000		$ 549,673
Total School		58		$ 2,958,000		$ 2,772,400		$ 1,275,241
Impact Fee Total				**$ 96,332,832**		**$ 94,046,924**		**$ 36,974,562**

Parcelization based on Master Plan dated September 22, 2005
Land Use based on Yields dated February 6, 2006



LEGEND

- Primary Road
- Secondary Road
- Tertiary Road
- Phase 1
- Phase 2
- Phase 3

Note: Parcelization and Land Use based on Draft Kalaeloa Master Plan, September 22, 2005.

BeltCollins

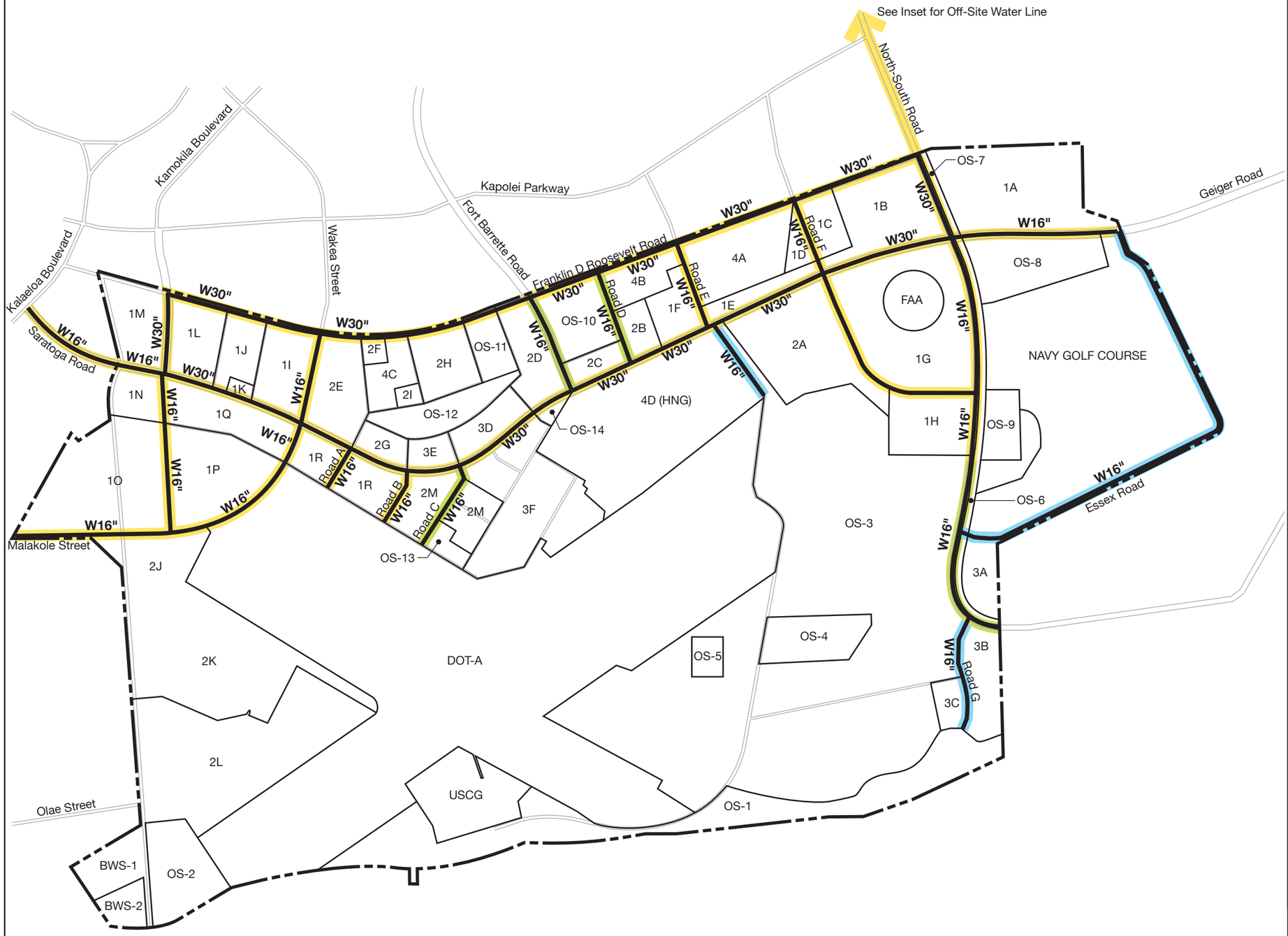
NORTH

0 .25 .5

SCALE IN MILES

Figure 1
CONCEPTUAL ROAD SYSTEM

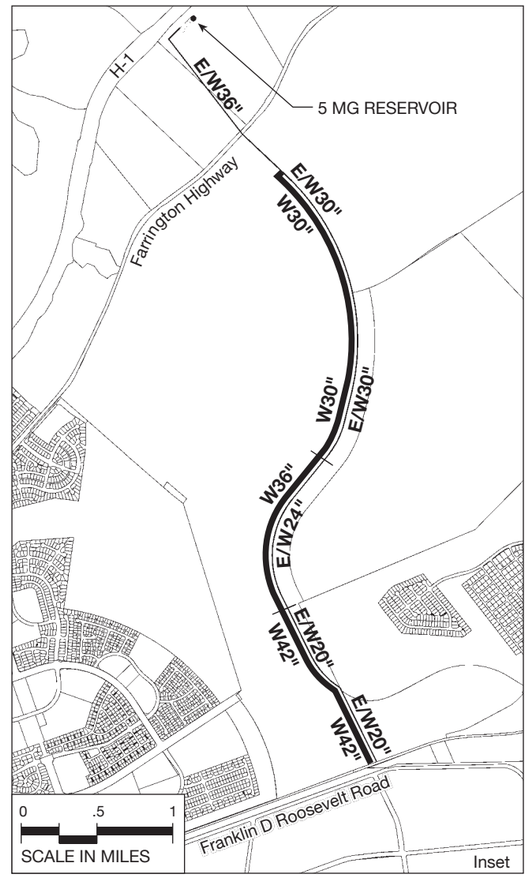
HCDA Kalaeloa Master Plan
January 2006



LEGEND

- Water Line
- Phase 1
- Phase 2
- Phase 3

Note: Parcelization based on Draft Kalaeloa Master Plan, September 22, 2005. Land Use based on Yields dated February 6, 2006.



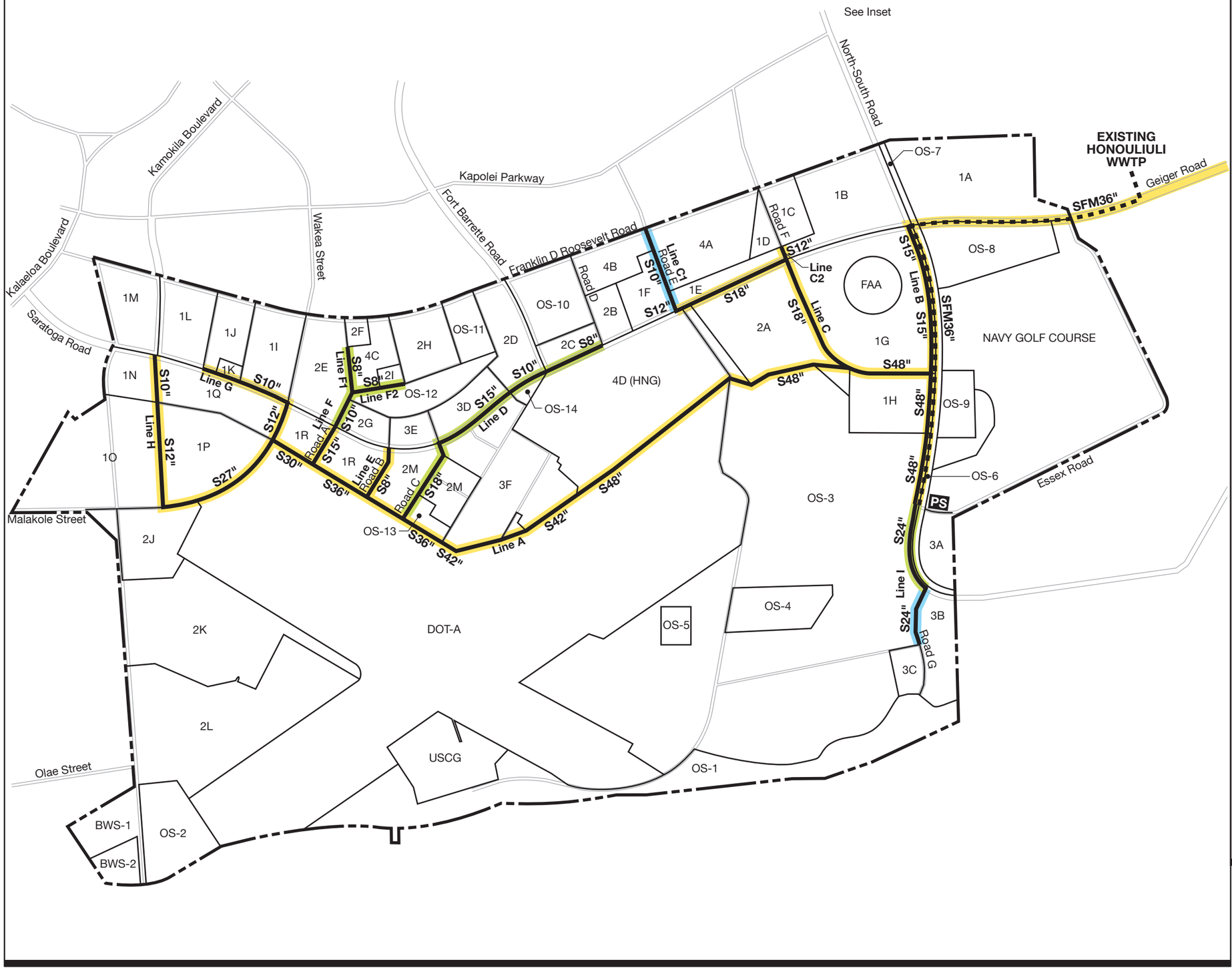
BeltCollins

NORTH

0 .25 .5
SCALE IN MILES

Figure 2
CONCEPTUAL WATER SYSTEM

HCDA Kalaeloa Master Plan
February 2006



LEGEND

- Sewer Force Main
- Gravity Sewer Line
- Phase 1
- Phase 2
- Phase 3

Note: Parcelization based on Draft Kalaeloa Master Plan, September 22, 2005. Land Use based on Yields dated February 6, 2006.

BeltCollins

NORTH

0 .25 .5

SCALE IN MILES

Figure 3
CONCEPTUAL SEWER SYSTEM

HCDA Kalaeloa Master Plan
February 2006

Potable Water Demand Estimate

Description		Area (ac)	No. of Units or Sq. Ft.	Flow Rate							
				Per Unit (gpd)	Average (gpd)	Peak Factor	Peak Hour (gph)	Peak Hour (gpm)	Max. Daily (gpd)	Fire Flow Req (gpm)	Max. Daily + Fire (gpm)
Kalaeloa Phase 1											
Parcel 1A	Light Industry	79.0	240,886	0.1	24,089	3	3,011	50	36,133	4,000	4,025
Parcel 1B	Mixed Use Residential Unit	32.2	526	500.0	263,000	3	32,875	548	394,500	1,000	1,274
Parcel 1B	Mixed Use Town House	8.0	217	400.0	86,800	3	10,850	181	130,200	1,500	1,590
Parcel 1B	Mixed Use Multifamily (Condo)	4.2	217	300.0	65,100	3	8,138	136	97,650	2,000	2,068
Parcel 1B	Commercial	3.7		3,000.0	11,100	3	1,388	23	16,650	4,000	4,012
Parcel 1C	School	13.0		4,000.0	52,000	3	6,500	108	78,000	2,000	2,054
Parcel 1D	Mixed Use Residential Unit	4.7	76	500.0	38,000	3	4,750	79	57,000	1,000	1,040
Parcel 1D	Mixed Use Town House	1.2	32	400.0	12,800	3	1,600	27	19,200	1,500	1,513
Parcel 1D	Mixed Use Multifamily (Condo)	0.6	32	300.0	9,600	3	1,200	20	14,400	2,000	2,010
Parcel 1D	Commercial	0.5		3,000.0	1,500	3	188	3	2,250	4,000	4,002
Parcel 1E	Mixed Use Residential Unit	8.1	132	500.0	66,000	3	8,250	138	99,000	1,000	1,069
Parcel 1E	Mixed Use Town House	2.0	54	400.0	21,600	3	2,700	45	32,400	1,500	1,523
Parcel 1E	Mixed Use Multifamily (Condo)	1.0	54	300.0	16,200	3	2,025	34	24,300	2,000	2,017
Parcel 1E	Commercial	0.9		3,000.0	2,700	3	338	6	4,050	4,000	4,003
Parcel 1F	Mixed Use Residential Unit	13.0	176	500.0	88,000	3	11,000	183	132,000	1,000	1,092
Parcel 1F	Mixed Use Town House	3.2	72	400.0	28,800	3	3,600	60	43,200	1,500	1,530
Parcel 1F	Mixed Use Multifamily (Condo)	1.7	72	300.0	21,600	3	2,700	45	32,400	2,000	2,023
Parcel 1F	Commercial	1.2		3,000.0	3,600	3	450	8	5,400	4,000	4,004
Parcel 1G	Eco-Industrial Open Space	84.0	128,066	0.1	12,807	3	1,601	27	19,210	4,000	4,013
Parcel 1H	Eco-Industrial Open Space	32.0	48,787	0.1	4,879	3	610	10	7,318	4,000	4,005
Parcel 1I	Mixed Use Residential Unit	17.0	370	500.0	185,000	3	23,125	385	277,500	1,000	1,193
Parcel 1I	Mixed Use Town House	4.2	153	400.0	61,200	3	7,650	128	91,800	1,500	1,564
Parcel 1I	Mixed Use Multifamily (Condo)	2.2	153	300.0	45,900	3	5,738	96	68,850	2,000	2,048
Parcel 1I	Commercial	2.6		3,000.0	7,800	3	975	16	11,700	4,000	4,008
Parcel 1J	School	17.0		4,000.0	68,000	3	8,500	142	102,000	2,000	2,071
Parcel 1K	School	3.0		4,000.0	12,000	3	1,500	25	18,000	2,000	2,013
Parcel 1L	Mixed Use Residential Unit	17.3	164	500.0	82,000	3	10,250	171	123,000	1,000	1,085
Parcel 1L	Mixed Use Town House	4.3	68	400.0	27,200	3	3,400	57	40,800	1,500	1,528
Parcel 1L	Mixed Use Multifamily (Condo)	2.2	68	300.0	20,400	3	2,550	43	30,600	2,000	2,021
Parcel 1L	Commercial	1.2		3,000.0	3,600	3	450	8	5,400	4,000	4,004
Parcel 1M	Light Industry	23.4	118,919	0.1	11,892	3	1,486	25	17,838	4,000	4,012
Parcel 1N	Eco-Industrial	15.0	22,869	0.1	2,287	3	286	5	3,430	4,000	4,002
Parcel 1O	Eco-Industrial	80.0	121,968	0.1	12,197	3	1,525	25	18,295	4,000	4,013
Parcel 1P	Eco-Industrial	50.0	76,230	0.1	7,623	3	953	16	11,435	4,000	4,008
Parcel 1Q	Eco-Industrial	35.0	106,722	0.1	10,672	3	1,334	22	16,008	4,000	4,011
Parcel 1R	Airport Related Mixed Use	30.0	91,476	0.1	9,148	3	1,143	19	13,721	4,000	4,010
Total Kalaeloa Phase 1		598.4	958,559		1,397,092	3	174,637	2,911	2,095,638	4,000	5,455
Kalaeloa Phase 2											
Parcel 2A	Eco-Industry Open Space	66.0	160,998	0.1	16,100	3	2,012	34	24,150	4,000	4,017
Parcel 2B	Mixed Use Residential Unit	4.9	82	500.0	41,000	3	5,125	85	61,500	1,000	1,043
Parcel 2B	Mixed Use Town House	2.2	62	400.0	24,800	3	3,100	52	37,200	1,500	1,526
Parcel 2B	Mixed Use Multifamily (Condo)	1.2	62	300.0	18,600	3	2,325	39	27,900	2,000	2,019
Parcel 2B	Commercial	0.8		3,000.0	2,400	3	300	5	3,600	4,000	4,003
Parcel 2C	Mixed Use Residential Unit	4.2	92	500.0	46,000	3	5,750	96	69,000	1,000	1,048
Parcel 2C	Mixed Use Town House	1.9	69	400.0	27,600	3	3,450	58	41,400	1,500	1,529
Parcel 2C	Mixed Use Multifamily (Condo)	1.0	69	300.0	20,700	3	2,588	43	31,050	2,000	2,022
Parcel 2C	Commercial	0.9		3,000.0	2,700	3	338	6	4,050	4,000	4,003
Parcel 2D	Mixed Use Residential Unit	13.4	260	500.0	130,000	3	16,250	271	195,000	1,000	1,135
Parcel 2D	Mixed Use Town House	6.0	195	400.0	78,000	3	9,750	163	117,000	1,500	1,581
Parcel 2D	Mixed Use Multifamily (Condo)	3.1	195	300.0	58,500	3	7,313	122	87,750	2,000	2,061
Parcel 2D	Commercial	2.5		3,000.0	7,500	3	938	16	11,250	4,000	4,008
Parcel 2E	Mixed Use Residential Unit	16.3	274	500.0	137,000	3	17,125	285	205,500	1,000	1,143
Parcel 2E	Mixed Use Town House	7.3	205	400.0	82,000	3	10,250	171	123,000	1,500	1,585
Parcel 2E	Mixed Use Multifamily (Condo)	3.8	205	300.0	61,500	3	7,688	128	92,250	2,000	2,064
Parcel 2E	Commercial	2.6		3,000.0	7,800	3	975	16	11,700	4,000	4,008
Parcel 2F	Mixed Use Residential Unit	2.2	28	500.0	14,000	3	1,750	29	21,000	1,000	1,015
Parcel 2F	Mixed Use Town House	1.0	21	400.0	8,400	3	1,050	18	12,600	1,500	1,509
Parcel 2F	Mixed Use Multifamily (Condo)	0.5	21	300.0	6,300	3	788	13	9,450	2,000	2,007
Parcel 2F	Commercial	0.3		3,000.0	900	3	113	2	1,350	4,000	4,001
Parcel 2G	Mixed Use Residential Unit	5.3	104	500.0	52,000	3	6,500	108	78,000	1,000	1,054
Parcel 2G	Mixed Use Town House	2.4	78	400.0	31,200	3	3,900	65	46,800	1,500	1,533
Parcel 2G	Mixed Use Multifamily (Condo)	1.3	78	300.0	23,400	3	2,925	49	35,100	2,000	2,024
Parcel 2G	Commercial	1.0		3,000.0	3,000	3	375	6	4,500	4,000	4,003
Parcel 2H	School	25.0		4,000.0	100,000	3	12,500	208	150,000	2,000	2,104
Parcel 2I	Mixed Use Residential Unit	2.2	42	500.0	21,000	3	2,625	44	31,500	1,000	1,022
Parcel 2I	Mixed Use Town House	1.0	31	400.0	12,400	3	1,550	26	18,600	1,500	1,513
Parcel 2I	Mixed Use Multifamily (Condo)	0.5	31	300.0	9,300	3	1,163	19	13,950	2,000	2,010
Parcel 2I	Commercial	0.4		3,000.0	1,200	3	150	3	1,800	4,000	4,001
Parcel 2J	Eco-Industry	30.0	73,181	0.1	7,318	3	915	15	10,977	4,000	4,008
Parcel 2K	Military	104.0	253,694	0.1	25,369	3	3,171	53	38,054	4,000	4,026
Parcel 2L	Recreation/Eco-Industrial	127.0		0.1	0	3	0	0	0	4,000	4,000
Parcel 2M	Airport Related/Mixed Use	34.0	761,080	0.1	76,108	3	9,514	159	114,162	4,000	4,079
Total Kalaeloa Phase 2		476.0	1,251,157		1,154,095	3	144,262	2,404	1,731,143	4,000	5,202
Kalaeloa Phase 3											
Parcel 3A	Mixed Use Town House	8.9	244	400.0	97,600	3	12,200	203	146,400	1,500	1,602
Parcel 3A	Mixed Use Multifamily (Condo)	5.1	268	300.0	80,400	3	10,050	168	120,600	2,000	2,084
Parcel 3A	Commercial	2.0		3,000.0	6,000	3	750	13	9,000	4,000	4,006
Parcel 3B	Cultural Center	27.0		3,000.0	81,000	3	10,125	169	121,500	4,000	4,084
Parcel 3C	Cultural Center	9.0		3,000.0	27,000	3	3,375	56	40,500	4,000	4,028
Parcel 3D	Mixed Use Town House	8.1	286	400.0	114,400	3	14,300	238	171,600	1,500	1,619
Parcel 3D	Mixed Use Multifamily (Condo)	4.6	314	300.0	94,200	3	11,775	196	141,300	2,000	2,098
Parcel 3D	Commercial	2.3		3,000.0	6,900	3	863	14	10,350	4,000	4,007
Parcel 3E	Mixed Use Town House	5.4	190	400.0	76,000	3	9,500	158	114,000	1,500	1,579
Parcel 3E	Mixed Use Multifamily (Condo)	3.1	210	300.0	63,000	3	7,875	131	94,500	2,000	2,066
Parcel 3E	Commercial	1.5		3,000.0	4,500	3	563	9	6,750	4,000	4,005
Parcel 3F	Airport Related	71.0	865,973	0.1	86,597	3	10,825	180	129,896	4,000	4,090
Total Kalaeloa Phase 3		148.0	867,485		737,597	3	92,200	1,537	1,106,396	4,000	4,768
Kalaeloa Phase 4											
Parcel 4A	Mixed Use Moderate Intensity	37.8	1,092	400.0	436,800	3	54,600	910	655,200	1,500	1,955
Parcel 4A	Commercial	4.2		3,000.0	12,600	3	1,575	26	18,900	4,000	4,013
Parcel 4B	Mixed Use Moderate Intensity	18.0	520	400.0	208,000	3	26,000	433	312,000	1,500	1,717
Parcel 4B	Commercial	2.0		3,000.0	6,000	3	750	13	9,000	4,000	4,006
Parcel 4C	Mixed Use Moderate Intensity	13.5	390	400.0	156,000	3	19,500	325	234,000	1,500	1,663
Parcel 4C	Commercial	1.5		3,000.0	4,500	3	563	9	6,750	4,000	4,005
Parcel 4D	Military	134.0	980,623	0.1	98,062	3	12,258	204	147,093	4,000	4,102
Total Kalaeloa Phase 4		211.0	982,625		921,962	3	115,245	1,921	1,382,943	4,000	4,960
Total Kalaeloa		1,433.4	4,059,826		4,210,747	3	526,343	8,772	6,316,121	4,000	8,386

Parcelization based on Master Plan dated September 22, 2005
Land Use based on Yields dated February 6, 2006

Wastewater Generation Estimate

DESIGN CRITERIA:

Densities:

Single-Family	4 cpu
Multi-Family	2.8 cpu
Central Business	300 cpa
Community Business	140 cpa
Neighborhood Business	40 cpa
Resort	400 cpa
Apartment HIgh Density	390 cpa
Apartment Med Density	250 cpa
Apartment Low Density	85 cpa
General Industry	100 cpa
Waterfront Industry	40 cpa

cpu = capita per unit
cpa = capita per acre
gpcd = gallon per capita per day

Average Per Capita Flow:

Single-Family	80.00 gpcd
Multi-Family	80.00 gpcd
Central Business	80.00 gpcd
Community Business	80.00 gpcd
Neighborhood Business	80.00 gpcd
Resort	80.00 gpcd
Apartment HIgh Density	80.00 gpcd
Apartment Med Density	80.00 gpcd
Apartment Low Density	80.00 gpcd
General Industry	80.00 gpcd
Waterfront Industry	80.00 gpcd
School	25.00 gpcd
Institution (Hospital, etc.)	200.00 gpcd

Dry Weather Infiltration/Inflow (I/I)	5.00
Wet Weather I/I	1,250.00

PARCEL	USE	# UNITS	TRIBUTARY AREA (ACRES)		ACRE ADJ. ECO INDUS		CAPITA PER UNIT / SCHOO	POPULATION		GAL PER CAPITA	AVERAGE FLOW (MGD)		DESIGN AVE FLOW (MGD)		DRY WEATHER I/I		WET WEATHER		BABBITT FACTOR	PEAK FLOW (MGD)
			INCR	TOTAL	INCR	TOTAL		INCR	TOTAL		INCR	TOTAL	INCR	TOTAL	INCR	TOTAL	INCR	TOTAL		
Line J																				
Parcel 2J	Eco-Industrial		36.0	36.0	18.0	18.0	25.0	900	900.0	80.0	0.0720	0.0720	0.0765	0.0765	0.0045	0.0045	0.0225	0.0225	5.0000	0.3870
Parcel 2K	Military		105.0	141.0	52.5	70.5	25.0	2,625	3,525.0	80.0	0.2100	0.2820	0.2231	0.2996	0.0131	0.0176	0.0656	0.0881	3.8863	1.2017
Parcel 2L	Recreation Eco-Industrial Open Space		128.0	269.0	64.0	134.5	25.0	3,200	6,725.0	80.0	0.2560	0.5380	0.2720	0.5716	0.0160	0.0336	0.0800	0.1681	3.4153	2.0392
Parcel BWS	Eco-Industrial		33.0	302.0	16.5	151.0	25.0	825	7,550.0	80.0	0.0660	0.6040	0.0701	0.6418	0.0041	0.0378	0.0206	0.1888	3.3372	2.2422
Line J Total			302.0	302.0	151.0	151.0		7,550	7,550.0		0.6040	0.6040	0.6418	0.6418		0.0378		0.1888	3.3372	2.2422
Line H																				
Parcel 1M	Light Industry		26.0	26.0	26.0	26.0	100.0	2,600	2,600.0	80.0	0.2080	0.2080	0.2210	0.2210	0.0130	0.0130	0.0325	0.0325	4.1302	0.9046
Parcel 1N	Eco-Industrial		15.0	41.0	7.5	33.5	25.0	375	2,975.0	80.0	0.0300	0.2380	0.0319	0.2529	0.0019	0.0149	0.0094	0.0419	4.0204	1.0136
Parcel 1O	Eco-Industrial		80.0	121.0	40.0	73.5	25.0	2,000	4,975.0	80.0	0.1600	0.3980	0.1700	0.4229	0.0100	0.0249	0.0500	0.0919	3.6275	1.5605
Parcel 1P	Eco-Industrial		50.0	171.0	25.0	98.5	25.0	1,250	6,225.0	80.0	0.1000	0.4980	0.1063	0.5291	0.0063	0.0311	0.0313	0.1231	3.4685	1.8816
Line H Total			171.0	171.0	98.5	98.5		6,225	6,225.0		0.4980	0.4980	0.5291	0.5291		0.0311		0.1231	3.4685	1.8816
Line G																				
Parcel 1L	Mixed Use Residential Unit	164	17.3	17.3	17.3	17.3	4.0	656	656.0	80.0	0.0525	0.0525	0.0558	0.0558	0.0033	0.0033	0.0216	0.0216	5.0000	0.2873
Parcel 1L	Mixed Use Townhouse	68	4.3	21.6	4.3	21.6	2.8	190	846.4	80.0	0.0152	0.0677	0.0162	0.0719	0.0010	0.0042	0.0054	0.0270	5.0000	0.3697
Parcel 1L	Mixed Use Multifamily (Condo)	68	2.2	23.8	2.2	23.8	2.8	190	1,036.8	80.0	0.0152	0.0829	0.0162	0.0881	0.0010	0.0052	0.0028	0.0298	4.9640	0.4467
Parcel 1L	Neighborhood Business		1.2	25.0	1.2	25.0	40.0	48	1,084.8	80.0	0.0038	0.0868	0.0041	0.0922	0.0002	0.0054	0.0015	0.0313	4.9193	0.4636
Parcel 1J	School	1	17.0	42.0	17.0	42.0	850.0	850	1,934.8	25.0	0.0213	0.1080	0.0255	0.1177	0.0043	0.0097	0.0213	0.0525	4.3817	0.5355
Parcel 1K	School	1	3.0	45.0	3.0	45.0	150.0	150	2,084.8	25.0	0.0038	0.1118	0.0045	0.1222	0.0008	0.0104	0.0038	0.0563	4.3168	0.5492
Parcel 1I	Mixed Use Residential Unit	370	17.0	62.0	17.0	62.0	4.0	1,480	3,564.8	80.0	0.1184	0.2302	0.1258	0.2480	0.0074	0.0178	0.0212	0.0775	3.8776	0.9879
Parcel 1I	Mixed Use Townhouse	153	4.2	66.2	4.2	66.2	2.8	428	3,993.2	80.0	0.0343	0.2645	0.0364	0.2844	0.0021	0.0200	0.0053	0.0828	3.7906	1.1052
Parcel 1I	Mixed Use Multifamily (Condo)	153	2.2	68.4	2.2	68.4	2.8	428	4,421.6	80.0	0.0343	0.2987	0.0364	0.3208	0.0021	0.0221	0.0028	0.0855	3.7141	1.2171
Parcel 1I	Neighborhood Business		2.6	71.0	2.6	71.0	40.0	104	4,525.6	80.0	0.0083	0.3070	0.0088	0.3297	0.0005	0.0226	0.0033	0.0888	3.6969	1.2465
Parcel 1Q	Eco-Industrial		35.0	106.0	17.5	88.5	25.0	875	5,400.6	80.0	0.0700	0.3770	0.0744	0.4041	0.0044	0.0270	0.0219	0.1106	3.5685	1.4831
Line G Total			106.0	106.0	88.5	88.5		5,401	5,400.6		0.3770	0.3770	0.4041	0.4041		0.0270		0.1106	3.5685	1.4831
Line F1																				
Parcel 2F	Mixed Use Residential Unit	28	2.2	2.2	2.2	2.2	4.0	112	112.0	80.0	0.0090	0.0090	0.0095	0.0095	0.0006	0.0006	0.0028	0.0028	5.0000	0.0481
Parcel 2F	Mixed Use Townhouse	21	1.0	3.2	1.0	3.2	2.8	59	170.8	80.0	0.0047	0.0137	0.0050	0.0145	0.0003	0.0009	0.0012	0.0040	5.0000	0.0732
Parcel 2F	Mixed Use Multifamily (Condo)	21	0.5	3.7	0.5	3.7	2.8	59	229.6	80.0	0.0047	0.0184	0.0050	0.0195	0.0003	0.0011	0.0006	0.0046	5.0000	0.0976
Parcel 2F	Neighborhood Business		0.3	4.0	0.3	4.0	40.0	12	241.6	80.0	0.0010	0.0193	0.0010	0.0205	0.0001	0.0012	0.0004	0.0050	5.0000	0.1028
Parcel 4C	Mixed Use Moderate Intensity	390	13.5	17.5	13.5	17.5	2.8	1,092	1,333.6	80.0	0.0874	0.1067	0.0928	0.1134	0.0055	0.0067	0.0169	0.0219	4.7202	0.5321
Parcel 4C	Neighborhood Business		1.5	19.0	1.5	19.0	40.0	60	1,393.6	80.0	0.0048	0.1115	0.0051	0.1185	0.0003	0.0070	0.0019	0.0238	4.6789	0.5524
Line F1 Total			19.0	19.0	19.0	19.0		1,394	1,393.6		0.1115	0.1115	0.1185	0.1185		0.0070		0.0238	4.6789	0.5524
Line F2																				
Parcel 2H	School	1	25.0	25.0	25.0	25.0	1,000.0	1,000	1,000.0	25.0	0.0250	0.0250	0.0300	0.0300	0.0050	0.0050	0.0313	0.0313	5.0000	0.1613
Parcel 2I	Mixed Use Residential Unit	42	2.2	27.2	2.2	27.2	4.0	168	1,168.0	80.0	0.0134	0.0384	0.0143	0.0443	0.0008	0.0058	0.0027	0.0339	4.8471	0.2261
Parcel 2I	Mixed Use Townhouse	31	1.0	28.1	1.0	28.1	2.8	87	1,254.8	80.0	0.0069	0.0454	0.0074	0.0517	0.0004	0.0063	0.0012	0.0351	4.7781	0.2582
Parcel 2I	Mixed Use Multifamily (Condo)	31	0.5	28.6	0.5	28.6	2.8	87	1,341.6	80.0	0.0069	0.0523	0.0074	0.0590	0.0004	0.0067	0.0006	0.0358	4.7146	0.2892
Parcel 2I	Neighborhood Business		0.4	29.0	0.4	29.0	40.0	16	1,357.6	80.0	0.0013	0.0536	0.0014	0.0604	0.0001	0.0068	0.0005	0.0363	4.7034	0.2952
Line F2 Total			29.0	29.0	29.0	29.0		1,358	1,357.6		0.0536	0.0536	0.0604	0.0604		0.0068		0.0363	4.7034	0.2952
Line F																				
Line F2			29.0	29.0	29.0	29.0		1,357.6	1,357.6		0.0536	0.0536	0.0604	0.0604	0.0068	0.0068	0.0363	0.0363	4.7034	0.2952
Line F1			19.0	48.0	19.0	48.0		1,393.6	2,751.2		0.1115	0.1651	0.1185	0.1789	0.0070	0.0138	0.0238	0.0600	4.0838	0.7480
Parcel 2E	Mixed Use Residential Unit	274	16.3	64.3	16.3	64.3	4.0	1,096	3,847.2	80.0	0.0877	0.2528	0.0932	0.2720	0.0055	0.0192	0.0204	0.0804	3.8189	1.0649
Parcel 2E	Mixed Use Townhouse	205	7.3	71.6	7.3	71.6	2.8	574	4,421.2	80.0	0.0459	0.2987	0.0488	0.3208	0.0029	0.0221	0.0091	0.0895	3.7142	1.2210
Parcel 2E	Mixed Use Multifamily (Condo)	205	3.8	75.4	3.8	75.4	2.8	574	4,995.2	80.0	0.0459	0.3446	0.0488	0.3696	0.0029	0.0250	0.0048	0.0943	3.6246	1.3683
Parcel 2E	Neighborhood Business		2.6	78.0	2.6	78.0	40.0	104	5,099.2	80.0	0.0083	0.3529	0.0088	0.3784	0.0005	0.0255	0.0033	0.0975	3.6097	1.3970
Parcel 1R	Airport Related Mixed Use		2.0	80.0	2.0	80.0	100.0	200	5,299.2	80.0	0.0160	0.3689	0.0170	0.3954	0.0010	0.0265	0.0025	0.1000	3.5820	1.4480
Parcel 1R	Airport Related		9.0	89.0	9.0	89.0	100.0	900	6,199.2	80.0	0.0720	0.4409	0.0765	0.4719	0.0045	0.0310	0.0113	0.1113	3.4714	1.6729
Line F Total			89.0	89.0	89.0	89.0		6,199	6,199.2		0.4409	0.4409	0.4719	0.4719		0.0310		0.1113	3.4714	1.6729
Line E																				
Parcel 2G	Mixed Use Residential Unit	104	5.3	5.3	5.3	5.3	4.0	416	416.0	80.0	0.0333	0.0333	0.0354	0.0354	0.0021	0.0021	0.0067	0.0067	5.0000	0.1752
Parcel 2G	Mixed Use Townhouse	78	2.4	7.7	2.4	7.7	2.8	218	634.4	80.0	0.0175	0.0508	0.0186	0.0539	0.0011	0.0032	0.0030	0.0097	5.0000	0.2666
Parcel 2G	Mixed Use Multifamily (Condo)	78	1.3	9.0	1.3	9.0	2.8	218	852.8	80.0	0.0175	0.0682	0.0186	0.0725	0.0011	0.0043	0.0016	0.0112	5.0000	0.3566
Parcel 2G	Neighborhood Business		1.0	10.0	1.0	10.0	40.0	40	892.8	80.0	0.0032	0.0714	0.0034	0.0759	0.0002	0.0045	0.0013	0.0125	5.0000	0.3741
Parcel 1R	Airport Related Mixed Use		5.0	15.0	5.0	15.0	100.0	500	1,392.8	80.0	0.0400	0.1114	0.0425	0.1184	0.0025	0.0070	0.0063	0.0187	4.6794	0.5471
Parcel 1R	Airport Related		14.0	29.0	14.0	29.0	100.0	1,400	2,792.8	80.0	0.1120	0.2234	0.1190	0.2374	0.0070	0.0140	0.0175	0.0362	4.0716	0.9599
Line E Total			29.0	29.0	29.0	29.0		2,793	2,792.8		0.2234	0.2234	0.2374	0.2374		0.0140		0.0362	4.0716	0.9599
Line D																				
Parcel 2B	Mixed Use Residential Unit	82	4.9	4.9	4.9	4.9	4.0	328	328.0	80.0	0.0262	0.0262	0.0279	0.0279	0.0016	0.0016	0.0061	0.0061	5.0000	0.1389
Parcel 2B	Mixed Use Townhouse	62	2.2	7.1	2.2	7.1	2.8	174	501.6	80.0	0.0139	0.0401	0.0148	0.0426	0.0009	0.0025	0.0028	0.0088	5.0000	0.2120
Parcel 2B	Mixed Use Multifamily (Condo)	62	1.2	8.2	1.2	8.2	2.8	174	675.2	80.0	0.0139	0.0540	0.0148	0.0574	0.0009	0.0034	0.0014	0.0103	5.0000	0.2837
Parcel 2B	Neighborhood Business		0.8	9.0	0.8	9.0	40.0	32	707.2	80.0	0.0026	0.0566	0.0027	0.0601	0.0002	0.0035	0.0010	0.0113	5.0000	0.2977
Parcel 2C	Mixed Use Residential Unit	92	4.2	13.2	4.2	13.2	4.0	368	1,075.2	80.0	0.0294	0.0860	0.0313	0.0914	0.0018	0.0054	0.0053	0.0165	4.9280	0.4458
Parcel 2C	Mixed Use Townhouse	69	1.9	15.1	1.9	15.1	2.8	193	1,268.4	80.0	0.0155	0.1015	0.0164	0.1078	0.0010	0.0063	0.0024	0.0189	4.7678	0.5090
Parcel 2C	Mixed Use Multifamily (Condo)	69	1.0	16.1	1.0	16.1	2.8	193	1,461.6	80.0	0.0155	0.1169	0.0164	0.1242	0.0010	0.0073	0.0012	0.0201	4.6345	0.5694
Parcel 2C	Neighborhood Business		0.9	17.0	0.9	17.0	40.0	36	1,497.6	80.0	0.0029	0.1198	0.0031	0.1273	0.0002	0.0075	0.0011	0.0213	4.6120	0.5813
Parcel 2D	Mixed Use Residential Unit	260	13.4	30.4	13.4	30.4	4.0	1,040	2,537.6	80.0	0.0832	0.2030	0.0884	0.2157	0.0052	0.0127	0.0167	0.0380	4.1504	0.8932
Parcel 2D	Mixed Use Townhouse	195	6.0	36.4	6.0	36.4	2.8	546	3,083.6	80.0	0.0437	0.2467	0.0464	0.2621	0.0027	0.0154	0.0075	0.0455	3.9917	1.0456
Parcel 2D	Mixed Use Multifamily (Condo)	195	3.1	39.5	3.1	39.5	2.8	546	3,629.6	80.0	0.0437	0.2904	0.0464	0.3085	0.0027	0.0181	0.0039	0.0494	3.8637	1.1894
Parcel 2D	Neighborhood Business		2.5	42.0	2.5	42.0	40.0	100	3,729.6	80.0	0.0080	0.2984	0.0085	0.3170	0.0005	0.0186	0.0031	0.0525	3.8427	1.2177
Parcel 3D	Mixed Use Townhouse	286	8.1	50.1	8.1	50.1	2.8	801	4,530.4	80.0	0.0641	0.3624	0.0681	0.3851	0.0040	0.0227	0.0101	0.0626	3.6961	1.4248
Parcel 3D	Mixed Use Multifamily (Condo)	314	4.6	54.7	4.6	54.7	2.8	879	5,409.6	80.0	0.0703	0.4328	0.0747	0.4598	0.0044	0.0270	0.0058	0.0684	3.5673	1.6392
Parcel 3D	Neighborhood Business		2.3	57.0	2.3	57.0	40.0	92	5,501.6	80.0	0.0074	0.4401	0.0078	0.4676	0.0005	0.0275	0.0029	0.0713	3.5553	1.6635
Parcel 3E	Mixed Use Townhouse	190	5.4	62.4	5.4	62.4	2.8	532	6,033.6	80.0	0.0426	0.4827	0.0452	0.5129	0.0027	0.0302	0.0067	0.0780	3.4902	1.7929
Parcel 3E	Mixed Use Multifamily (Condo)	210	3.1	65.5	3.1	65.5	2.8	588	6,621.6	80.0	0.0470	0.5297	0.0500	0.5628	0.0029	0.0331	0.0039	0.0819	3.4259	1.9298
Parcel 3E	Neighborhood Business		1.5	67.0	1.5	67.0	40.0	60	6,681.6	80.0	0.0048	0.5345	0.0051	0.5679	0.0003	0.0334	0.0019	0.0838	3.4197	1.9451
Parcel 2M	Airport Related		9.0	76.0	9.0	76.0	100.0	900	7,581.6	80.0	0.0720	0.6065	0.0765	0.6444	0.0045	0.0379	0.0113	0.0950	3.3344	2.1553
Parcel 2M	Airport Related Mixed Use		8.0	84.0	8.0	84.0	100.0	800	8,381.6	80.0	0.0640	0.6705	0.0680	0.7124	0.0040	0.0419	0.0100	0.1050	3.2682	2.3383
Parcel 2M	Airport Related		17.0	101.0	17.0	101.0	100.0	1,700	10,081.6	80.0	0.1360	0.8065	0.1445	0.8569	0.0085	0.0504	0.0213	0.1263	3.1497	2.7170
Line D Total			101.0	101.0	101.0	101.0		10,082	10,081.6		0.8065	0.8065	0.8569	0.8569		0.0504		0.1263	3.1497	2.7170
Line C1																				
Parcel 4B	Mixed Use Moderate Intensity	520	18.0	18.0	18.0	18.0	2.8	1,456	1,456.0	80.0	0.1165	0.1165	0.1238	0.1238	0.0073	0.0073	0.0225	0.0225	4.6381	0.5700
Parcel 4B	Neighborhood Business		2.0	20.0	2.0	20.0	40.0	80	1,536.0	80.0	0.0064	0.1229	0.0068	0.1306	0.0004	0.0077	0.0025	0.0250	4.5887	0.5965
Parcel 4A	Mixed Use Moderate Intensity	1092	37.8	57.8	37.8	57.8	2.8	3,058	4,593.6	80.0	0.2446	0.3675	0.2599	0.3905	0.0153	0.0230	0.0473	0.0723	3.6859	1.4497
Parcel 4A	Neighborhood Business		4.2	62.0	4.2	62.0	40.0	168	4,761.6	80.0	0.0134	0.3809	0.0143	0.4047	0.0008	0.0238	0.0053	0.0775	3.6595	1.4953
Parcel 1F	Mixed Use Residential Unit	176	13.0	75.0	13.0	75.0	4.0	704	5,465.6	80.0	0.0563	0.4372	0.0598	0.4646	0.0035	0.0273	0.0162	0.0937	3.5599	1.6776
Parcel 1F	Mixed Use Townhouse	72	3.2	78.1	3.2	78.1	2.8	202	5,667.2	80.0	0.0161	0.4534	0.0171	0.4817	0.0010	0.0283	0.0040	0.0977	3.5342	1.7284
Parcel 1F	Mixed Use Multifamily (Condo)	72	1.7	79.8	1.7	79.8	2.8	202	5,868.8	80.0	0.0161	0.4695	0.0171	0.4988	0.0010	0.0293	0.0021	0.0998	3.5096	1.7769
Parcel 1F	Neighborhood Business		1.2	81.0	1.2	81.0	40.0	48	5,916.8	80.0	0.0038	0.4733	0.0041	0.5029	0.0002	0.0296	0.0015	0.1013	3.5039	1.7894
Line C1 Total			81.0	81.0	81.0	81.0		5,916.8	5,916.8		0.4733	0.4733	0.5029	0.5029		0.0296		0.1013	3.5039	1.7894
Line C2																				
Parcel 1D	Mixed Use Residential Unit	76	4.7	4.7	4.7	4.7	4.0	304	304.0	80.0	0.0243	0.0243	0.0258	0.0258	0.0015	0.0015	0.0059	0.0059	5.0000	0.1290
Parcel 1D	Mixed Use Townhouse	32	1.2	5.9	1.2	5.9	2.8	90	393.6	80.0	0.0072	0.0315	0.0076	0.0335	0.0004	0.0020	0.0015	0.0074	5.0000	0.1668
Parcel 1D	Mixed Use Multifamily (Condo)	32	0.6	6.5	0.6	6.5	2.8	90	483.2	80.0	0.0072	0.0387	0.0076	0.0411	0.0004	0.0024	0.0008	0.0081	5.0000	0.2038
Parcel 1D	Neighborhood Business		0.5	7.0	0.5	7.0	40.0	20	503.2	80.0	0.0016	0.0403	0.0017	0.0428	0.0001	0.0025	0.0006	0.0088	5.0000	0.2125
Parcel 1C	School	1	13.0	20.0	13.0	20.0	1,000.0	1,000	1,503.2	25.0	0.0250	0.0653	0.0300	0.0728	0.0050	0.0075	0.0163	0.0250	4.6086	0.3333
Parcel 1E	Mixed Use Residential Unit	132	8.1	28.1	8.1	28.1	4.0	528	2,031.2	80.0	0.0422	0.1075	0.0449	0.1177	0.0026	0.0102	0.0101	0.0351	4.3393	0.5117
Parcel 1E	Mixed Use Townhouse	54	2.0	30.1	2.0	30.1	2.8	151	2,182.4	80.0	0.0121	0.1196	0.0129	0.1305	0.0008	0.0109	0.0025	0.0376	4.2774	0.5600
Parcel 1E	Mixed Use Multifamily (Condo)	54	1.0	31.1	1.0	31.1	2.8	151	2,333.6	80.0	0.0121	0.1317	0.0129	0.1434	0.0008	0.0117	0.0013	0.0389	4.2205	0.6063
Parcel 1E	Neighborhood Business		0.9	32.0	0.9	32.0	40.0	36	2,369.6	80.0	0.0029	0.1346	0.0031	0.1464	0.0002	0.0118	0.0011	0.0400	4.2076	0.6181
Parcel 1B	Mixed Use Residential Unit	526	32.2	64.2	32.2	64.2	4.0	2,104	4,473.6	80.0	0.1683	0.3029	0.1788	0.3253	0.0105	0.0224	0.0402	0.0802	3.7054	1.2249
Parcel 1B	Mixed Use Townhouse	217	8.0	72.2	8.0	72.2	2.8	608	5,081.2	80.0	0.0486	0.3515	0.0516	0.3769	0.0030	0.0254	0.0100	0.0902	3.6122	1.3853
Parcel 1B	Mixed Use Multifamily (Condo)	217	4.2	76.3	4.2	76.3	2.8	608	5,688.8	80.0	0.0486	0.4001	0.0516	0.4285	0.0030	0.0284	0.0052	0.0954	3.5316	1.5368
Parcel 1B	Neighborhood Business		3.7	80.0	3.7	80.0	40.0	148	5,836.8	80.0	0.0118	0.4119	0.0126	0.4411	0.0007	0.0292	0.0046	0.1000	3.5135	1.5765
Line C2 Total			80.0	80.0	80.0	80.0		5,837	5,836.8		0.4119	0.4119	0.4411	0.4411		0.0292		0.1000	3.5135	1.5765
Line C																				
Line C2			80.0	80.0	80.0	80.0		5,836.8	5,836.8		0.4119	0.4119	0.4411	0.4411	0.0292	0.0292	0.1000	0.1000	3.5135	1.5765
Line C1			81.0	161.0	81.0	161.0		5,916.8	11,753.6		0.4733	0.8853	0.5029	0.9441	0.0296	0.0588	0.1013	0.2013	3.0545	2.9641
			0.0	0.0	0.0	0.0		0.0	11,753.6		0.0000	0.8853	0.0000	0.9441	0.0000	0.0588	0.0000	0.0000	3.0545	2.7629
			0.0	0.0	0.0	0.0		0.0	11,753.6		0.0000	0.8853	0.0000	0.9441	0.0000	0.0588	0.0000	0.0000	3.0545	2.7629
Line C Total			161.0	0.0	161.0	0.0		11,754	11,753.6		0.8853	0.8853	0.9441	0.9441		0.0588		0.0000	3.0545	2.7629
Line B																				
Parcel 1A	Light Industry		79.0	79.0	79.0	79.0	100.0	7,900	7,900.0	80.0	0.6320	0.6320	0.6715	0.6715	0.0395	0.0395	0.0988	0.0988	3.3071	2.2283
Parcel 1G	Eco-Industrial Open Space		84.0	163.0	42.0	121.0	25.0	2,100	10,000.0	80.0	0.1680	0.8000	0.1785	0.8500	0.0105	0.0500	0.0525	0.1513	3.1548	2.7251
Line B Total			163.0	163.0	121.0	121.0		10,000	10,000.0		0.8000	0.8000	0.8500	0.8500		0.0500		0.1513	3.1548	2.7251

Wastewater Generation Estimate

DESIGN CRITERIA:

Densities:

Single-Family	4 cpu
Multi-Family	2.8 cpu
Central Business	300 cpa
Community Business	140 cpa
Neighborhood Business	40 cpa
Resort	400 cpa
Apartment HIgh Density	390 cpa
Apartment Med Density	250 cpa
Apartment Low Density	85 cpa
General Industry	100 cpa
Waterfront Industry	40 cpa

cpu = capita per unit
cpa = capita per acre
gpcd = gallon per capita per day

Average Per Capita Flow:

Single-Family	80.00 gpcd
Multi-Family	80.00 gpcd
Central Business	80.00 gpcd
Community Business	80.00 gpcd
Neighborhood Business	80.00 gpcd
Resort	80.00 gpcd
Apartment HIgh Density	80.00 gpcd
Apartment Med Density	80.00 gpcd
Apartment Low Density	80.00 gpcd
General Industry	80.00 gpcd
Waterfront Industry	80.00 gpcd
School	25.00 gpcd
Institution (Hospital, etc.)	200.00 gpcd

Dry Weather Infiltration/Inflow (I/I)	5.00
Wet Weather I/I	1,250.00

PARCEL	USE	# UNITS	TRIBUTARY AREA (ACRES)		ACRE ADJ. ECO INDUS		CAPITA PER UNIT /	POPULATION		GAL PER CAPITA	AVERAGE FLOW (MGD)		DESIGN AVE FLOW (MGD)		DRY WEATHER I/I		WET WEATHER		BABBITT FACTOR	PEAK FLOW (MGD)
			INCR	TOTAL	INCR	TOTAL	SCHOO	INCR	TOTAL		INCR	TOTAL	INCR	TOTAL	INCR	TOTAL	INCR	TOTAL		
Line I																				
Parcel 3C	Cultural Center		9.0	9.0	9.0	9.0	100.0	900	900.0	80.0	0.0720	0.0720	0.0765	0.0765	0.0045	0.0045	0.0113	0.0113	5.0000	0.3758
Parcel 3B	Cultural Center		27.0	36.0	27.0	36.0	100.0	2,700	3,600.0	80.0	0.2160	0.2880	0.2295	0.3060	0.0135	0.0180	0.0338	0.0450	3.8700	1.1776
Parcel 3A	Mixed Use Townhouse	244	8.9	44.9	8.9	44.9	2.8	683	4,283.2	80.0	0.0547	0.3427	0.0581	0.3641	0.0034	0.0214	0.0111	0.0561	3.7378	1.3583
Parcel 3A	Mixed Use Multifamily (Condo)	268	5.1	50.0	5.1	50.0	2.8	750	5,033.6	80.0	0.0600	0.4027	0.0638	0.4279	0.0038	0.0252	0.0064	0.0625	3.6190	1.5450
Parcel 3A	Neighborhood Business		2.0	52.0	2.0	52.0	40.0	80	5,113.6	80.0	0.0064	0.4091	0.0068	0.4347	0.0004	0.0256	0.0025	0.0650	3.6077	1.5664
Line I Total			52.0	52.0	52.0	52.0		5,114	5,113.6		0.4091	0.4091	0.4347	0.4347		0.0256		0.0650	3.6077	1.5664
Line A																				
Line J			302.0	302.0	151.0	151.0		7,550.0	7,550.0		0.6040	0.6040	0.6418	0.6418	0.0378	0.0378	0.1888	0.1888	3.3372	2.2422
Line H			171.0	473.0	98.5	249.5		6,225.0	13,775.0		0.4980	1.1020	0.5291	1.1709	0.0311	0.0689	0.1231	0.3119	2.9590	3.6416
Line G			106.0	579.0	88.5	338.0		5,400.6	19,175.6		0.3770	1.4790	0.4041	1.5749	0.0270	0.0959	0.1106	0.4225	2.7696	4.6148
Line F			89.0	668.0	89.0	427.0		6,199.2	25,374.8		0.4409	1.9200	0.4719	2.0469	0.0310	0.1269	0.1113	0.5338	2.6187	5.6885
Line E			29.0	697.0	29.0	456.0		2,792.8	28,167.6		0.2234	2.1434	0.2374	2.2842	0.0140	0.1408	0.0362	0.5700	2.5646	6.2078
Line D			101.0	798.0	101.0	557.0		10,081.6	38,249.2		0.8065	2.9499	0.8569	3.1412	0.0504	0.1912	0.1263	0.6963	2.4124	8.0039
Parcel DOT	Airport		1.0	799.0	1.0	558.0	100.0	100	38,349.2	80.0	0.0080	2.9579	0.0085	3.1497	0.0005	0.1917	0.0013	0.6975	2.4111	8.0212
Parcel 3F	Airport Related Mixed Use		6.0	805.0	6.0	564.0	100.0	600	38,949.2	80.0	0.0480	3.0059	0.0510	3.2007	0.0030	0.1947	0.0075	0.7050	2.4036	8.1249
Parcel 3F	Military		48.0	853.0	48.0	612.0	100.0	4,800	43,749.2	80.0	0.3840	3.3899	0.4080	3.6087	0.0240	0.2187	0.0600	0.7650	2.3484	8.9447
Parcel 3F	Airport Related		17.0	870.0	17.0	629.0	100.0	1,700	45,449.2	80.0	0.1360	3.5259	0.1445	3.7532	0.0085	0.2272	0.0213	0.7863	2.3306	9.2310
Parcel 4D	Military		134.0	1,004.0	134.0	763.0	100.0	13,400	58,849.2	80.0	1.0720	4.5979	1.1390	4.8922	0.0670	0.2942	0.1675	0.9538	2.2132	11.4242
Parcel 2A	Eco-Industrial Open Space		66.0	1,070.0	33.0	796.0	25.0	1,650	60,499.2	80.0	0.1320	4.7299	0.1403	5.0324	0.0083	0.3025	0.0413	0.9950	2.2010	11.7081
Line C			161.0	1,231.0	161.0	957.0		11,753.6	72,252.8		0.8853	5.6152	0.9441	5.9765	0.0588	0.3613	0.2013	1.1963	2.1242	13.4855
Line B			163.0	1,394.0	121.0	1,078.0		10,000.0	82,252.8		0.8000	6.4152	0.8500	6.8265	0.0500	0.4113	0.1513	1.3475	2.0699	15.0373
Parcel 1H	Eco-Industrial Open Space		32.0	1,426.0	16.0	1,094.0	25.0	800	83,052.8	80.0	0.0640	6.4792	0.0680	6.8945	0.0040	0.4153	0.0200	1.3675	2.0659	15.1679
Line A Total		8358	1,426.0	1,426.0	1,094.0	1,094.0		83,053	83,052.8		6.4792	6.4792	6.8945	6.8945		0.4153		1.3675	2.0659	15.1679
Line I			52.0	52.0	52.0	52.0		5,113.6	5,113.6		0.4091	0.4091	0.4347	0.4347	0.0256	0.0256	0.0650	0.0650	3.6077	1.5664
Total		8358	1,478.0	1,478.0	1,146.0	1,146.0		88,166	88,166		6.8883	6.8883	7.3291	7.3291		0.4408		1.4325	2.0413	15.9345

Parcelization based on Master Plan dated September 22, 2005
Land Use based on Yields dated February 6, 2006

Appendix C

Development ProForma Summary

Table 1: Summary of Kalaeloa Master Plan Development Revenues, Costs, Feasibility Gap

	Phase 1	Phase 2	Phase 3	Total
REVENUES FROM DEVELOPMENT				
Net Sale Proceeds ("Value")				
Residential	$ 1,100,359,950	$ 855,884,727	$ 465,945,207	**$ 2,422,189,883**
Commercial	76,510,042	52,295,120	60,935,319	**189,740,481**
Industrial	92,323,009	148,852,483	96,951,932	**338,127,424**
Net Sale Proceeds	$ 1,269,193,000	$ 1,057,032,330	$ 623,832,457	**$ 2,950,057,788**
Lease Revenues	$ 61,392,269	$ 70,791,004	$ 48,615,466	**$ 180,798,739**
Total Revenues	**$ 1,330,585,269**	**$ 1,127,823,334**	**$ 672,447,924**	**$ 3,130,856,527**
EXPENSES OF DEVELOPMENT				
Development Costs (a)	$ 1,348,301,041	$ 1,082,497,338	$ 703,235,931	**$ 3,134,034,310**
Return to Investors (b)	74,637,613	104,676,787	38,359,905	**217,674,305**
Total Costs	**$ 1,422,938,654**	**$ 1,187,174,124**	**$ 741,595,836**	**$ 3,351,708,614**
"FEASIBILITY GAP" (c) (Revenues - Expenses)	**$ (92,353,385)**	**$ (59,350,790)**	**$ (69,147,912)**	**$ (220,852,088)**

(a) Includes land, all construction, and all infrastructure.
(b) Return on equity needed to attract private investment.
Based on current market rates of return for real estate investment.
(c) Represents the revenue shortfall needed to achieve feasibility,
without public / other support in this amount development will not happen.

Source: BAE, 2006.

Table 2: Summary of Kalaeloa Master Plan Proposed Public Financing Sources

	Phase 1	Phase 2	Phase 3	Total
FEASIBILITY GAP (a)	**($92,353,385)**	**($59,350,790)**	**($69,147,912)**	**($220,852,088)**
PROPOSED FINANCING SOURCES				
State Obtained Sources				
Grant Funds (b)	$15,000,000	$0	$0	$15,000,000
State Gen'l Obligation Bonds (c)	86,250,000	69,000,000	80,500,000	235,750,000
Total Funds	**$101,250,000**	**$69,000,000**	**$80,500,000**	**$250,750,000**

Note: Financing sources show larger amount than feasibility gap because of bond underwriting costs and reserve requirements.

(a) Amount by which total costs of development exceed revenues from completed projects.
Negative number means costs exceed revenue, without public / other support project will not be built.
Use of bond financing to close gap increases costs due to underwriting, bond reserve requirements.
(b) Projected U.S. EDA, FAA bonds for infrastructure projects.
(c) Requires approval by Legislature.

Source: BAE, 2006.

Table 3: Kalaeloa Master Plan --
Summary Cash Flow Projection (a)

	Total	2008	2009	2010	2011	2012	2013	2014	2015
Summary of Development Activity and Return -- All Phases									
Inflows									
Lease Revenues	$181,650,826	$0	$2,180,988	$4,361,976	$6,542,964	$8,723,952	$10,904,940	$13,085,928	$15,266,916
Sale Proceeds	2,950,057,788	0	131,998,483	131,998,483	131,998,483	131,998,483	131,998,483	131,998,483	300,831,534
Grant Funding (b)	15,000,000	15,000,000	0	0	0	0	0	0	0
Construction Financing	2,452,705,924	373,541,421	110,958,987	110,958,987	110,958,987	110,958,987	110,958,987	265,750,244	162,498,868
State-Issued Bonds Net Proceeds	205,000,000	75,000,000	0	0	0	0	0	60,000,000	0
Total Inflows	**$5,804,414,538**	$463,541,421	$245,138,458	$247,319,446	$249,500,434	$251,681,422	$253,862,410	$470,834,655	$478,597,318
Outflows									
Land Acquisition	$67,953,600	$32,844,240	$0	$0	$0	$0	$0	$17,075,520	$0
Construction (excluding Parking)	2,372,786,341	128,131,749	128,236,673	128,236,673	128,236,673	128,236,673	128,236,673	149,448,126	195,008,148
Garages, Parking (Residential & Commercial)	143,626,009	9,486,181	9,486,181	9,486,181	9,486,181	9,486,181	9,486,181	8,946,330	7,433,472
Site-Specific Infrastructure	351,000,000	141,257,444	0	0	0	0	0	126,506,049	0
Project-Wide Infrastructure	198,668,360	150,605,741	0	0	0	0	0	24,549,264	0
Repayment of Construction Funding	2,452,705,924	0	124,642,648	124,642,648	124,642,648	124,642,648	124,642,648	124,642,648	179,832,534
Total Outflows	**$5,586,740,233**	$462,325,355	$262,365,503	$262,365,503	$262,365,503	$262,365,503	$262,365,503	$451,167,937	$382,274,155
Net Development Inflows/Outflows	**$217,674,305**	**$1,216,066**	**($17,227,045)**	**($15,046,057)**	**($12,865,069)**	**($10,684,081)**	**($8,503,093)**	**$19,666,718**	**$96,323,163**
Equity Contributions and Returns									
Equity Added by Developers	($280,674,590)	$0	($17,227,045)	($15,046,057)	($12,865,069)	($10,684,081)	($8,503,093)	($811,872)	($32,937,873)
Distributions to Equity	498,348,895	1,216,066	0	0	0	0	0	20,478,590	129,261,036
Net Return on Equity	**$217,674,305**	$1,216,066	($17,227,045)	($15,046,057)	($12,865,069)	($10,684,081)	($8,503,093)	$19,666,718	$96,323,163

Unleveraged Internal Rate of Return	**19.2%**
Return on Cost	**-0.1%**
Land Sale Revenue (b)	**$67,953,600**
Average per FAR (built) sf	**$2**

Developer and Land Returns by Phase

	Internal Rate of Return	Return on Cost	Land Price per Site sf (b)
Phase 1	18.9%	-1.1%	$2
Phase 2	19.8%	4.1%	$2
Phase 3	20.8%	-4.5%	$2

Public Investment

Public Investment	
Grant Sources	$ 15,000,000
Debt Sources - State Bonds	235,750,000
	$ 250,750,000

Source: BAE, 2006.

Table 3: Kalaeloa Master Plan --
Summary Cash Flow Projection (a)

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Summary of Development Activity and Retur									
Inflows									
Lease Revenues	$5,183,054	$5,010,128	$7,515,192	$10,020,256	$12,525,320	$15,030,384	$19,809,895	$4,548,893	$6,823,340
Sale Proceeds	293,485,745	117,115,179	117,115,179	117,115,179	117,115,179	117,115,179	427,871,630	73,530,376	73,530,376
Grant Funding (b)	0	0	0	0	0	0	0	0	0
Construction Financing	99,454,947	99,454,947	99,454,947	99,454,947	212,890,674	140,832,324	73,817,592	73,817,592	73,817,592
State-Issued Bonds Net Proceeds	0	0	0	0	70,000,000	0	0	0	0
Total Inflows	$398,123,745	$221,580,254	$224,085,318	$226,590,382	$412,531,173	$272,977,888	$521,499,117	$151,896,861	$154,171,308
Outflows									
Land Acquisition	$0	$0	$0	$0	$18,033,840	$0	$0	$0	$0
Construction (excluding Parking)	124,959,347	124,959,347	124,959,347	124,959,347	146,553,660	176,901,140	93,451,908	93,451,908	93,451,908
Garages, Parking (Residential & Commercial)	7,433,472	7,433,472	7,433,472	7,433,472	8,646,896	10,092,385	4,613,874	4,613,874	4,613,874
Site-Specific Infrastructure	0	0	0	0	83,236,507	0	0	0	0
Project-Wide Infrastructure	0	0	0	0	23,513,355	0	0	0	0
Repayment of Construction Funding	275,397,323	105,646,496	105,646,496	105,646,496	105,646,496	105,646,496	265,026,478	75,469,774	75,469,774
Total Outflows	$407,790,143	$238,039,316	$238,039,316	$238,039,316	$385,630,754	$292,640,021	$363,092,261	$173,535,556	$173,535,556
Net Development Inflows/Outflows	**($9,666,398)**	**($16,459,061)**	**($13,953,997)**	**($11,448,933)**	**$26,900,420**	**($19,662,133)**	**$158,406,856**	**($21,638,695)**	**($19,364,248)**
Equity Contributions and Returns									
Equity Added by Developers	($18,964,125)	($16,459,061)	($13,953,997)	($11,448,933)	($8,943,869)	($24,248,190)	($23,913,141)	($21,638,695)	($19,364,248)
Distributions to Equity	9,297,728	0	0	0	35,844,289	4,586,058	182,319,998	0	0
Net Return on Equity	($9,666,398)	($16,459,061)	($13,953,997)	($11,448,933)	$26,900,420	($19,662,133)	$158,406,856	($21,638,695)	($19,364,248)

Source: BAE, 2006.

Table 3: Kalaeloa Master Plan --
Summary Cash Flow Projection (a)

	2025	2026	2027	2028
Summary of Development Activity and Retur				
Inflows				
Lease Revenues	$9,097,786	$11,372,233	$13,646,680	$0
Sale Proceeds	73,530,376	73,530,376	256,180,577	0
Grant Funding (b)	0	0	0	0
Construction Financing	73,817,592	49,307,305	0	0
State-Issued Bonds Net Proceeds	0	0	0	0
Total Inflows	$156,445,755	$134,209,914	$269,827,257	$0
Outflows				
Land Acquisition	$0	$0	$0	$0
Construction (excluding Parking)	93,451,908	61,915,129	0	0
Garages, Parking (Residential & Commercial)	4,613,874	3,400,451	0	0
Site-Specific Infrastructure	0	0	0	0
Project-Wide Infrastructure	0	0	0	0
Repayment of Construction Funding	75,469,774	75,469,774	154,482,125	0
Total Outflows	$173,535,556	$140,785,354	$154,482,125	$0
Net Development Inflows/Outflows	**($17,089,801)**	**($6,575,439)**	**$115,345,131**	**$0**
Equity Contributions and Returns				
Equity Added by Developers	($17,089,801)	($6,575,439)	$0	$0
Distributions to Equity	0	0	115,345,131	0
Net Return on Equity	($17,089,801)	($6,575,439)	$115,345,131	$0

Source: BAE, 2006.

Table 3: Kalaeloa Master Plan --
Summary Cash Flow Projection (a)

	Total	2008	2009	2010	2011	2012	2013	2014	2015
Total Absorption									
Residential (Dwelling Units)									
Apartments - Rental	635	0	33	33	33	33	33	33	33
Condominium - 2 BR 2 BA	465	0	14	14	14	14	14	14	14
Condominium - 3 BR 2 BA	949	0	28	28	28	28	28	28	28
Townhouse - 2 BR 2 BA	651	0	25	25	25	25	25	25	25
Townhouse - 3 BR 2 BA	1,326	0	50	50	50	50	50	50	50
3 BR 2 BA (c)	767	0	60	60	60	60	60	60	60
4 BR 2.5 BA (c)	1,559	0	121	121	121	121	121	121	121
	6,352	0	330	330	330	330	330	330	330
Commercial (Gross Square Feet)									
Office - Rental	725,028	0	27,886	27,886	27,886	27,886	27,886	27,886	27,886
1st Floor Mixed Use Commercial	116,583	0	16,655	16,655	16,655	16,655	16,655	16,655	16,655
Light Industrial	1,819,388	0	97,602	97,602	97,602	97,602	97,602	97,602	97,602
Flex/R&D Industrial	470,436	0	0	0	0	0	0	0	0
	3,131,435	0	142,142	142,142	142,142	142,142	142,142	142,142	142,142
Parking (Spaces)									
Off-Street Surface Parking	8,134	0	359	359	359	359	359	359	359
Tuck Under / Garage Parking	9,036	0	612	612	612	612	612	612	612
	17,170	0	971	971	971	971	971	971	971

Notes

(a) This table summarizes cash flow model analysis by phase and product type of proposed development, development assumptions, and proposed public investment.

(b) Federal EDA and FAA grant sources typically available for base reuse. Does not include other federal funding sources, such as transportation improvements that may become available at a future date.

(c) Refers to a higher-density, small-lot residential product type that achieves approximately 15 du/ac. and may include cluster homes, semi-detached homes, row homes or other similar product types.

Source: BAE, 2006.

Table 3: Kalaeloa Master Plan --
Summary Cash Flow Projection (a)

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total Absorption									
Residential (Dwelling Units)									
Apartments - Rental	64	31	31	31	31	31	57	25	25
Condominium - 2 BR 2 BA	34	21	21	21	21	21	56	35	35
Condominium - 3 BR 2 BA	70	42	42	42	42	42	114	72	72
Townhouse - 2 BR 2 BA	56	31	31	31	31	31	71	40	40
Townhouse - 3 BR 2 BA	113	63	63	63	63	63	144	81	81
3 BR 2 BA (c)	101	42	42	42	42	42	42	0	0
4 BR 2.5 BA (c)	205	84	84	84	84	84	84	0	0
	644	315	315	315	315	315	567	252	252
Commercial (Gross Square Feet)									
Office - Rental	34,957	34,957	34,957	34,957	34,957	34,957	82,478	47,521	47,521
1st Floor Mixed Use Commercial	0	0	0	0	0	0	0	0	0
Light Industrial	104,056	104,056	104,056	104,056	104,056	104,056	172,020	67,964	67,964
Flex/R&D Industrial	36,726	36,726	36,726	36,726	36,726	36,726	72,285	35,559	35,559
	175,739	175,739	175,739	175,739	175,739	175,739	326,783	151,044	151,044
Parking (Spaces)									
Off-Street Surface Parking	392	392	392	392	392	392	871	479	479
Tuck Under / Garage Parking	463	463	463	463	463	463	715	252	252
	855	855	855	855	855	855	1,586	731	731

Source: BAE, 2006.

Table 3: Kalaeloa Master Plan --
Summary Cash Flow Projection (a)

	2025	2026	2027	2028
Total Absorption				
Residential (Dwelling Units)				
Apartments - Rental	25	25	25	0
Condominium - 2 BR 2 BA	35	35	35	0
Condominium - 3 BR 2 BA	72	72	72	0
Townhouse - 2 BR 2 BA	40	40	40	0
Townhouse - 3 BR 2 BA	81	81	81	0
3 BR 2 BA (c)	0	0	0	0
4 BR 2.5 BA (c)	0	0	0	0
	252	252	252	0
Commercial (Gross Square Feet)				
Office - Rental	47,521	47,521	47,521	0
1st Floor Mixed Use Commercial	0	0	0	0
Light Industrial	67,964	67,964	67,964	0
Flex/R&D Industrial	35,559	35,559	35,559	0
	151,044	151,044	151,044	0
Parking (Spaces)				
Off-Street Surface Parking	479	479	479	0
Tuck Under / Garage Parking	252	252	252	0
	731	731	731	0

Source: BAE, 2006.

Table 4: Kalaeloa Master Plan --
Development Assumptions (a)

Development Program by Phase, Units		Unit (b)	Average / Total Size in sf	Hard Construction Cost / sf (c)		Total (n)	Phase 1 2009	Phase 2 2016		Phase 3 2022
Gross Sq. Ft. / Acres			12,432,553			780	377	196	Years to	207
							Units	Units	Absorb (l)	Units
Residential										
Apartments - Rental		du	850	$120		635	264	220		151
Condominium - 2 BR 2 BA		du	1,000	$130		465	109	145		211
Condominium - 3 BR 2 BA		du	1,300	$130		949	223	296		430
Townhouse - 2 BR 2 BA		du	1,200	$126		651	196	218		237
Townhouse - 3 BR 2 BA		du	1,500	$117		1,326	400	443		483
3 BR 2 BA (m)		du	1,500	$144		767	476	291		-
4 BR 2.5 BA (m)		du	1,800	$138		1,559	968	591		-
Multi-Family Circulation - add to sf			15%			6,352	2,636	2,204		1,512
Commercial										
Office - Rental		sf		$135		725,028	195,203	244,698		285,127
1st Floor Mixed Use Commercial		sf		$120		116,583	116,583	-		-
Light Industrial		sf		$90		1,819,388	683,211	728,394		407,783
Flex/R&D Industrial		sf		$110		470,436	-	257,080		213,356
Comm'l Non-Rentable - deduct from sf			5%			3,131,435	994,997	1,230,172		906,266
						-	-	-		-
Parking (including replacement)										
Off-Street Surface Parking		space		$1,500		8,134	2,513	2,747		2,874
Tuck Under / Garage Parking		space		$10,000		9,036	4,284	3,240		1,512
						17,170	6,797	5,987		4,386
Site-Specific Infrastructure (e)										
Streets, Utilities, Streetscape, Other Costs		acre		$450,000						
Developer Share			100%	$450,000		351,000,000	$141,257,444	$126,506,049		$83,236,507
						$351,000,000	$141,257,444	$126,506,049		$83,236,507
Project Area Infrastructure (f)										
A&E at 5%	Allowance					8,979,893	6,972,488	1,136,540		870,865
Other Costs at 3%	Allowance					5,387,936	4,183,493	681,924		522,519
Site Work	Included in Site-Specific Above					-	-	-		-
Site Utilities	Included in Site-Specific Above					-	-	-		-
Electrical Distribution (HECO)	BC estimate					8,000,000	8,000,000	-		-
Domestic Water	BC estimate					35,534,200	31,896,400	1,486,800		2,151,000
Sewer	BC estimate					84,058,960	62,478,260	11,214,400		10,366,300
Drainage	BC estimate					1,720,000	1,212,000	360,000		148,000
Roads	BC estimate					45,621,500	32,412,500	9,174,000		4,035,000
Irrigation	BC estimate					4,663,200	3,450,600	495,600		717,000
Contingency at: (g)	0%					-	-	-		-
						$193,965,689	$150,605,741	$24,549,264		$18,810,684

		Total Price by Phase						
Residential - Market Rate		1	2	3				
Apartments - Rental	mo. rent	$1,301	$1,301	$1,301	Unit (h)	$1.53	$1.53	$1.53
Condominium - 2 BR 2 BA		$270,000	$270,000	$270,000	$/sf	$270	$270	$270
Condominium - 3 BR 2 BA		$340,000	$340,000	$340,000	$/sf	$262	$262	$262
Townhouse - 2 BR 2 BA		$320,000	$320,000	$320,000	$/sf	$267	$267	$267
Townhouse - 3 BR 2 BA		$390,000	$390,000	$390,000	$/sf	$260	$260	$260
3 BR 2 BA (m)		$490,000	$490,000	$490,000	$/sf	$327	$327	$327
4 BR 2.5 BA (m)		$570,000	$570,000	$570,000	$/sf	$317	$317	$317
					$/sf			
Residential - Affordable (per City's Rules)		80% AMI	120% AMI					
2 BR 2 BA		$251,404	$402,917					
3 BR 2 BA		$282,311	$451,210					
4 BR 3 BA		$315,420	$501,840					
Commercial								
Office - Rental	$/sf/yr.		Full Service Gross			$30	$30	$30
1st Floor Mixed Use Commercial	$/sf/yr.		Full Service Gross			$30	$30	$30
Light Industrial	$/sf/yr.		NNN			$12.00	$12.00	$12.00
Flex/R&D Industrial	$/sf/yr.		NNN			$16.80	$16.80	$16.80
Parking								
Off-Street Surface Parking	space/mo.					$0.00	$0.00	$0.00
Tuck Under / Garage Parking	space/mo.					$0.00	$0.00	$0.00

Source: BAE, 2006.

Table 4: Kalaeloa Master Plan -- Development Assumptions (a)

Development Costs (i)

	Residential	Commercial	
Architecture & Engineering Fees	6.00%	6.00%	of Hard Costs
Building Permit Fees	2.00%	2.00%	of Hard Costs
Insurance, Legal, Accounting, Other	1.50%	0.75%	of Hard Costs
Construction Financing Costs:			
Loan to Cost Ratio	90.00%	90.00%	of Total Value
Construction Period	3	3	Year
Drawdown Factor	55.00%	55.00%	of Total Loan
Interest Rate	7.50%	7.00%	of Total Loan/Yr
Loan Fees	1.00%	1.00%	of Total Loan
Permanent Loan Commitment Fee	1.00%	1.00%	of Total Loan
Residential Marketing and Brokerage Fees	4.00%		of Gross Sales Price
Commercial Leasing Commissions		4.00%	of Gross Lease Revenues
Lease Length for Commission Calculation	5	5	of Gross Lease Revenues
Developer Fee	5.00%	5.00%	of Hard + Soft Costs
Contingency	10.00%	10.00%	of Hard + Soft Costs
Site Demolition Costs	$0	$0	per site sf
Site Preparation Costs	$4	$4	per site sf
Office Tenant Improvements Construction	$0	$0	per sf

Capitalization Rates (k)

Rental Residential	6.00%
Retail	7.50%
Office	7.75%
Industrial	7.25%
Income Property Costs of Sale	3.00%

Weighted Average Calculation for Site-Specific Infrastructure per Acre Cost (e)

Total Developed Area in Acres	**780.00**	
Site-Specific Infrastructure Cost / Acre	**$ 450,000**	(developer share)

Development Phase	Developed Sq. Ft.	Percent of Total	Allocated Acreage	Allocated Cost
1	5,003,392	40%	313.91	$141,257,444
2	4,480,892	36%	281.12	$126,506,049
3	2,948,269	24%	184.97	$83,236,507
Total Developed Sq. Ft.	12,432,553	100%	780.00	$351,000,000

Exactions / Impact Fee Calculations

Affordable Housing Calculation

Requirement at 30% total units:			1,906		
Credit factor per ordinance 2-7(c):			1.21		
Actual number affordable units:			1,571		
Condo units - 10% at 80% AMI			524		
SFR units - 20% at 120% AMI			0	(market rate units under 120% AMI limits)	
Revenue adjustment by phase					
Phase	1	2	3	Total	
Condos	176	175	175	526	
SFR	0	0	**0**	0	
Revenue loss - aff units	$ 7,859,808	$ 7,815,150	$ 7,815,150	$ 23,490,108	

		Impact Fee Components			
Total Impact Fees (d)	Total	Stewardship	'Ewa Traffic	Water	Sewer
Single-family residence/du	$ 17,316	$ 7,211	$ 1,245	4,080	4,780
Multi-family residence/du	$ 17,240	$ 5,795	$ 1,245	5,420	4,780
Retail/sf	$ 13.48	$ 4.61	$ 4.05	$ 2.34	$ 2.47
Office/sf	$ 12.83	$ 4.61	$ 3.40	$ 2.34	$ 2.47
Industrial/sf	$ 16.25	$ 4.61	$ 2.02	$ 4.68	$ 4.94
Schools, Dept. of Education per du		$ 5,000	allowance		

Total Impact Fees (All) $162,504,350

Operating Costs (j)

For-sale Residential - Sale Expenses	4.0%	of Sale Revenues
Rental Residential - Operating Expenses	30.0%	of Gross Revenues
Retail Space - Operating Expenses	$4.00	sf / yr.
Office Space - Operating Expenses	$10.00	sf / yr.
Industrial Space - Operating Expenses	$1.30	sf / yr.
Hotel - Operating Expenses	79.2%	of Gross Sales
Vacancy Factor - Rental Residential	5.0%	
Vacancy Factor - Retail	5.0%	
Vacancy Factor - Office	5.0%	
Occupancy Level - Hotel (Conversion Factor to RevPAR)	70.0%	

Bond Financing Assumptions

Debt Coverage Ratio	1.25	x Tax Lien Revenue
Interest, Other Reserve	10.00%	
Underwriting Costs	5.00%	
Interest Rate	6.00%	
Bond Term	20	Years

Notes

(a) This table provides common assumptions used in the cash flow model for analysis of development program, costs, and returns.
(b) du = dwelling unit; sf = square feet; space = parking space.
(c) Hard construction costs as estimated by BAE from R.S. Means Co. construction cost data for comparable projects in Honolulu area.
(d) Residential traffic, water, and sewer fees updated February 2006 per data from Belt Collins.
(e) Site-specific infrastructure costs, on a per-acre basis for new development, as estimated by Belt Collins. These costs are allocated by land area in each phase.
(f) Estimate and allocation by phase provided by Belt Collins.
(g) Contingency allowance reflecting conceptual nature of cost estimate.
(h) Residences priced on total cost per sq. ft.; parking spaces on total cost per space; and rental commercial space on cost per sq. ft. per year.
(i) "Soft" construction costs based on industry standard ratios, BAE experience.
(j) Operating costs based on data from Urban Land Institute, BAE experience.
(k) Based on current market conditions for sale of commercial investment real estate.
(l) Placeholder for years to fully sell/lease each product type in that phase.
(m) Refers to a higher-density, small-lot residential product type that achieves approximately 15 du/ac. and may include cluster homes, semi-detached homes, row homes or other similar product types.
(n) Represents the estimated impact area of new development. Excludes open space, site-wide infrastructure areas such as roads, and existing uses.

Source: BAE, 2006.

Appendix D

Design Guidelines

Kalaeloa Design Guidelines

TABLE OF CONTENTS

List of Figures

List of Figures (con't)

List of Tables

Appendix D: Kalaeloa Design Guidelines

1.0 Overview

This chapter describes in detail the design guidelines necessary to maintain consistent physical form and quality of open space throughout the Kalaeloa Master Plan.

1.1 The Purpose of Form Based Guidelines

Form based guidelines are designed to foster vibrant urban centers that are built upon a lively mix of uses—with shop-fronts, sidewalk cafes, and other commercial uses at street level, overlooked by canopy shade trees, upper story residences and offices. Redevelopment within Kalaeloa shall be guided by the Kalaeloa Design Guidelines contained here in order to achieve the vision set forth by the Kalaeloa Master Plan.

The Kalaeloa Design Guidelines provides the means to guide implementation of the vision for the development and redevelopment of properties in the Kalaeloa Master Plan area. The Kalaeloa Design Guidelines constitute a guidance document for HCDA in its continued collaboration and dialog with the City & County of Honolulu towards the promulgation of administrative rules to regulate development in Kalaeloa by setting careful and coherent controls on building form—while employing more flexible parameters relative to building use and density.

This greater emphasis on physical form is intended to produce safe, attractive and enjoyable public spaces (good streets, neighborhoods and parks) complemented with a healthy mix of uses. With proper urban form, a greater integration of building uses is natural and comfortable. The Design Guidelines uses simple and clear graphic prescriptions and parameters for height, site planning, and building elements to address the basic necessities for forming good public space.

1.2 Components of the Kalaeloa Design Guidelines

The Kalaeloa Design Guidelines are comprised of the following components: (1) Urban Design Framework, which consists of Street and Landscape Design Guidelines; and (2) Site Development Guidelines, which consists of Mixed-Use and Industrial Development Guidelines.

2.0 Urban Design Framework

The Urban Design Framework for the Kalaeloa Master Plan area is comprised of a set of design principles to: (1) enhance the quality of design and construction of all public areas; and (2) provide overall guidance in executing a consistent yet dynamic design of all public areas.

2.1 Street Design Guidelines

The Street Design Guidelines seek to create streets that are pedestrian and bicycle friendly, while also meeting the demands of motorists and emergency vehicles. Walkable districts are the basic building block for more livable and environmentally sustainable cities. Design plays a vital role in their creation. An arrangement of complementary land uses paired with inviting streets influence the extent to which workers and residents walk to local destinations and use transit. Pedestrian friendly streets are foundational to transit-oriented development and the creation of alternatives to driving for daily needs.

In deciding to walk or bike instead of drive, pedestrians and bicyclists must feel that an environment is safe and comfortable. Fast, unmitigated traffic presents a major deterrent. Major pedestrian and bicycle injuries are significantly reduced when vehicle speeds are about 25 miles per hour. The use of modest travel lane widths and traffic-calming devices slows traffic, while adding very little to motorist travel times.

Pedestrians also feel more comfortable when on-street parking and trees are placed between sidewalks, and when street crossing distances are reduced. Street trees reduce temperatures by as much as ten degrees – an important advantage on hot days. On-street parking is critical to attracting street-facing shops.

Pedestrian comfort and safety are influenced by the relationship between abutting uses and streets. Streets lined by rear yard fences, garage doors or parking lots are unwelcoming, and have been shown to attract more crime than streets lined by building entries and windows. Traffic must be kept to modest volumes yet encourage street-facing buildings in most settings. An interconnected street network plays a critical role in keeping traffic volumes to appropriate levels. Street connectivity also reduces pedestrian travel distances to local destinations, and integrates the many functions and activities of a city center.

Besides mobility, streets can also address other issues. Their design character – width, landscaping, lighting, and signage – can help establish an immediate sense of place, especially when joined with quality architecture. Streets also hold most public utilities. Paired with vegetated swales and other storm-water infiltration tools, streets can play an essential role in filtering pollutants from urban run-off and improve water quality. The design and arrangement of streets are at the intersection of many urban challenges.

Figure D-1. Major Street Network

2.1.1 Major Street Network

Major streets establish an interconnected network that is expected to improve circulation in Kapolei and distribute traffic within the larger Master Plan area. The major streets define "superblocks," the largest of which is roughly 2,000 feet by 4,000 feet. Most superblocks will need to be served by a network of minor streets. (Figure D-1)

2.1.2 Street Connectivity

The alignment of many streets has not been determined, as they depend on the requirements of future, still-to-be defined projects. In mixed-use and residential zones, adequate connectivity among streets must be assured. Adequate connectivity is critical for providing direct routes to local destinations, and for disbursing traffic such that all streets can be pedestrian friendly. To ensure adequate connectivity in all mixed-use and residential zones, continuous street connections shall be provided at least every 1,200 feet. Continuous street connections may be accompanied by offset intersections and traffic-calming features to discourage cut-through traffic.

Figure D-2. Block Size and Connectivity Encouraged

Figure D-3. Block Size and Connectivity Discouraged

2.1.3 Block Size

Smaller city "blocks" (bound by streets or publicly accessible open space) contribute to connectivity and human scale. Blocks shall be fully bound by streets, except for one side, which can be a publicly accessible path and open space. In mixed-use and residential zones, blocks shall not exceed three acres for residential uses (including residential uses over storefronts), and eight acres for commercial uses. Industrial and airport-related zones would have no block size requirements.(Figure D-2 & D-3)

2.1.4 Street Design

Streets in the Kalaeloa Master Plan area shall conform to the design guidelines described in the following sections. In recognition of each street's unique context and function, different street types are anticipated. All streets support pedestrian activity relating to abutting uses by protecting pedestrians, minimizing pedestrian crossing distances, and reducing vehicular speeds while accommodating reasonable vehicular travel times. Major streets indicated in the following sections are expected to carry nearly all of Kalaeloa's through traffic. Streets within the superblocks defined by major streets are not shown, as they depend on the requirements of future, still-to-be defined projects.

2.1.4.1 Boulevards

Boulevards have four (4) 11-foot travel lanes and accommodate the highest traffic volumes in the area. They include Saratoga, Fort Barrette, and North/South Roads. With boulevard traffic volumes, conflicts between traffic and parked car doors are more likely, and 7-foot parking lanes are necessary. Many features vary, however, as each of these roads must support distinct functions.

Saratoga Road includes a right-of-way for light rail transit and has on-street parking where it abuts mixed-use zones. A swale runs along its southern edge to manage and improve the quality of stormwater. (Figure D-4, 5, 6, 7 & 8)

Figure D-4
Saratoga Road

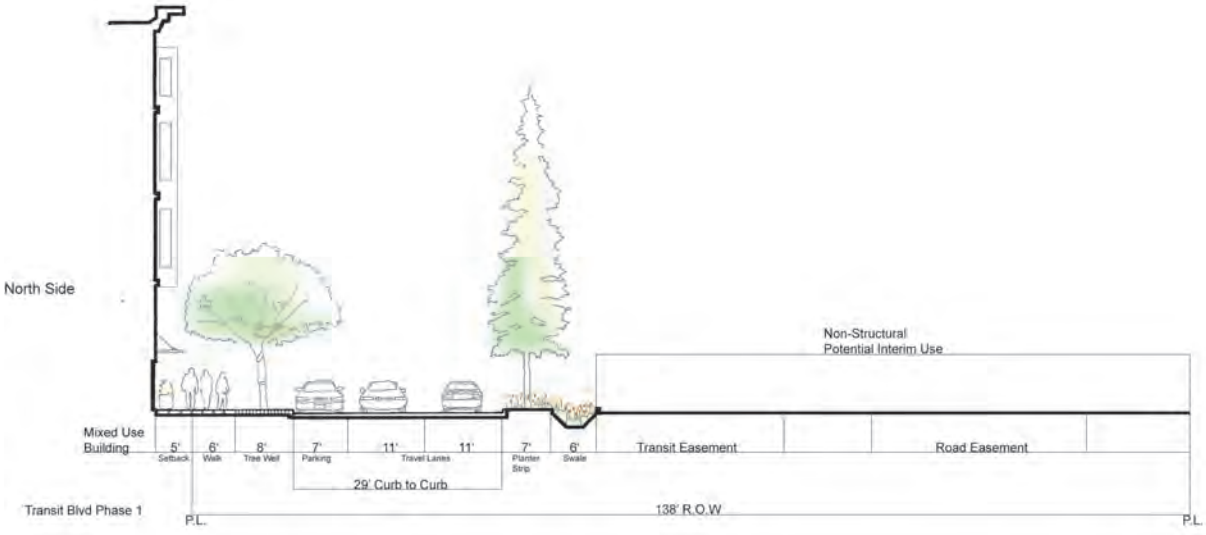


Figure D-5.Saratoga Road Street Section Phase 1

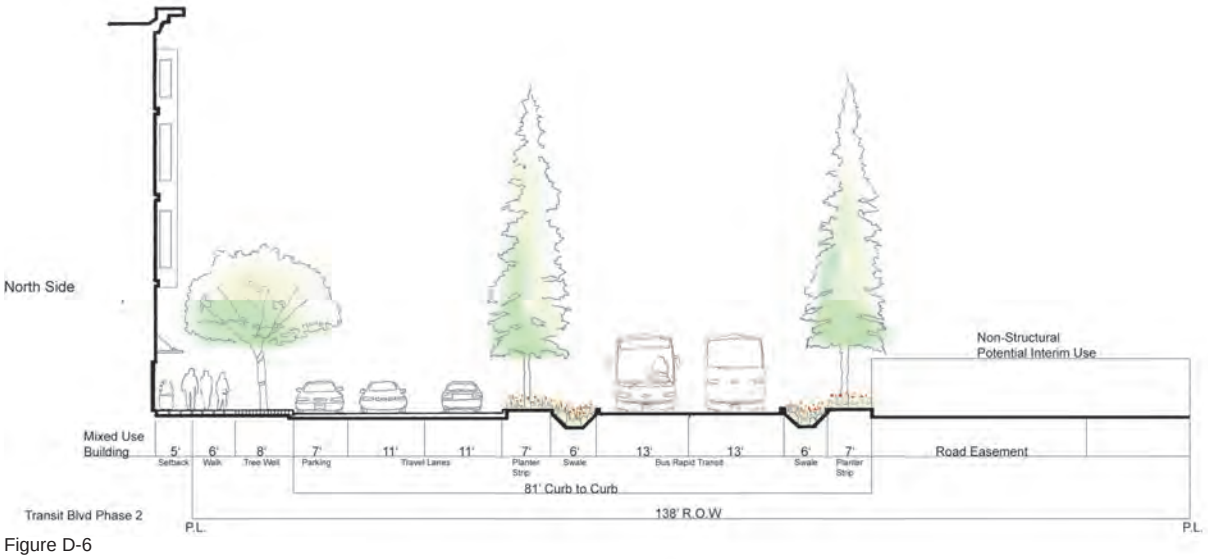


Figure D-6
Saratoga Road Street Section Phase 2

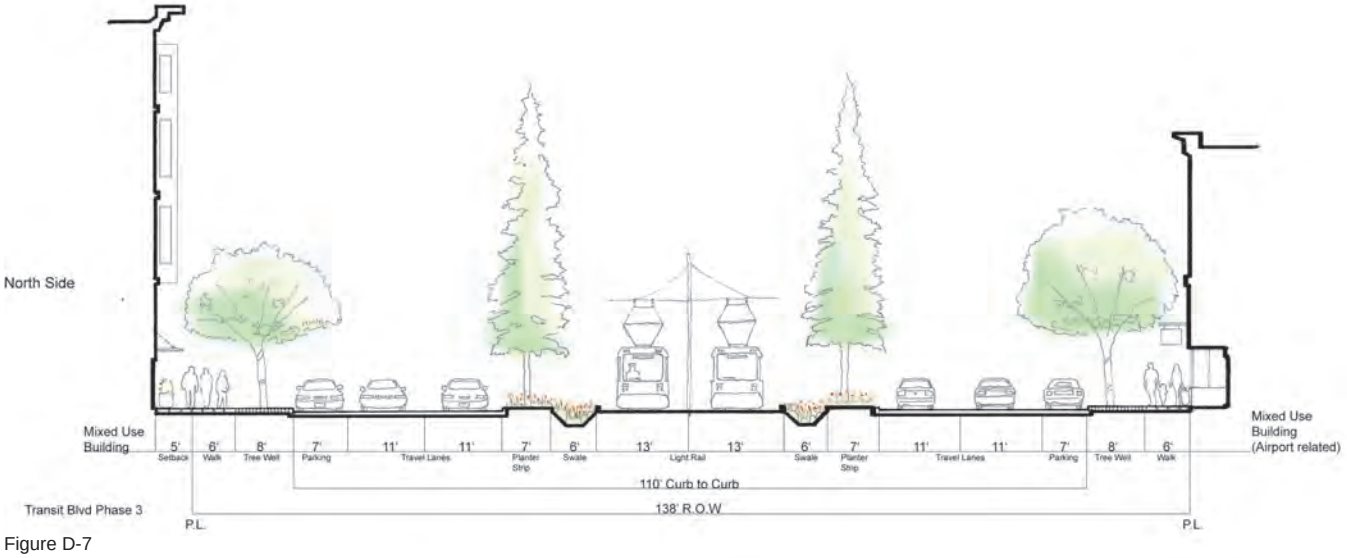


Figure D-7
Saratoga Road Street Section Phase 3

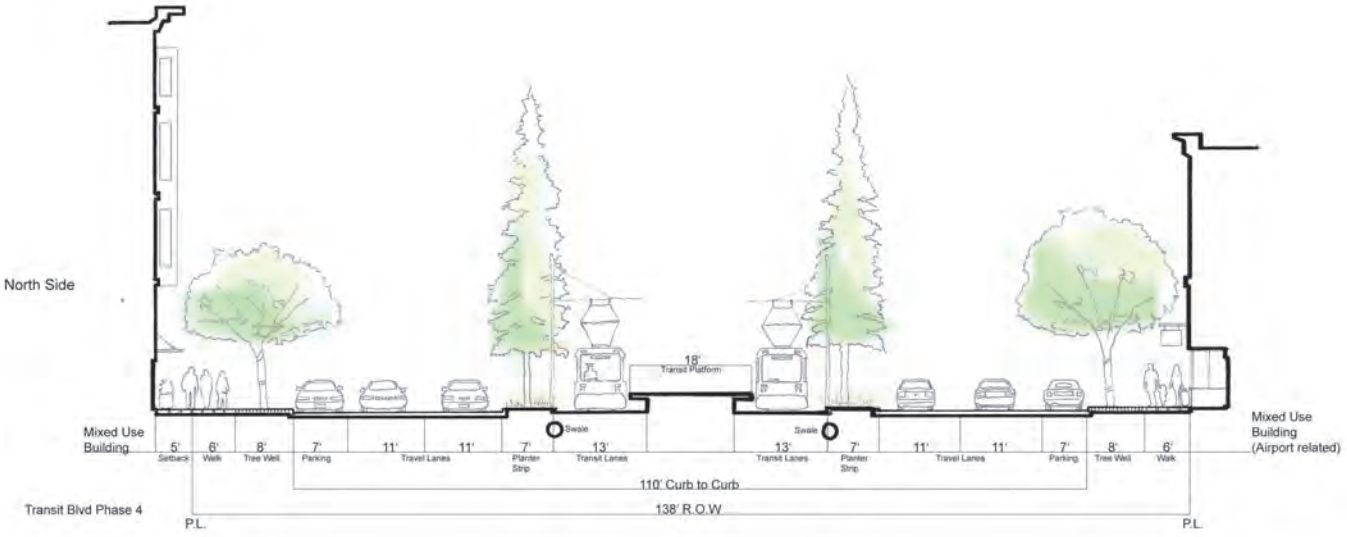


Figure D-8
Saratoga Road Street Section Phase 4

Fort Barrette Road is a primary entry point from the north and will support abutting mixed-use development and park activity with on-street parking. Fort Barrette Road is accompanied by generous landscaped setbacks at major intersections and where it approaches the Airport.(Figure D-9 & 10)

Figure D-9 Fort Barrette Road

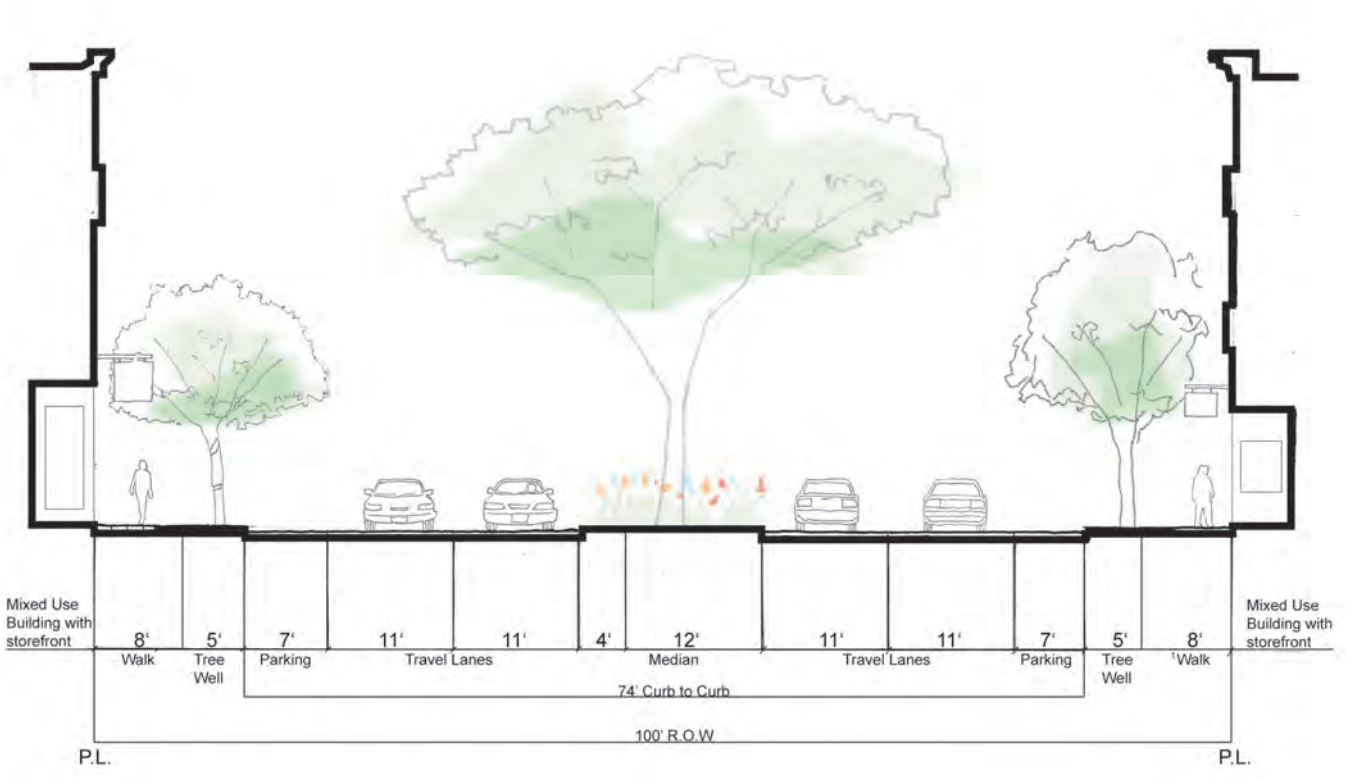


Figure D-10 Fort Barrette Road Street Section

Keoneula Connector Road incorporates bike lanes that can extend east through Ocean Pointe and north to the planned trail along the railroad and beyond. Buildings are not expected to front directly onto Keoneula Connector Road; so on-street parking is not provided. (Figure D-11 & 12)

Figure D-11 Keoneula Connector Road

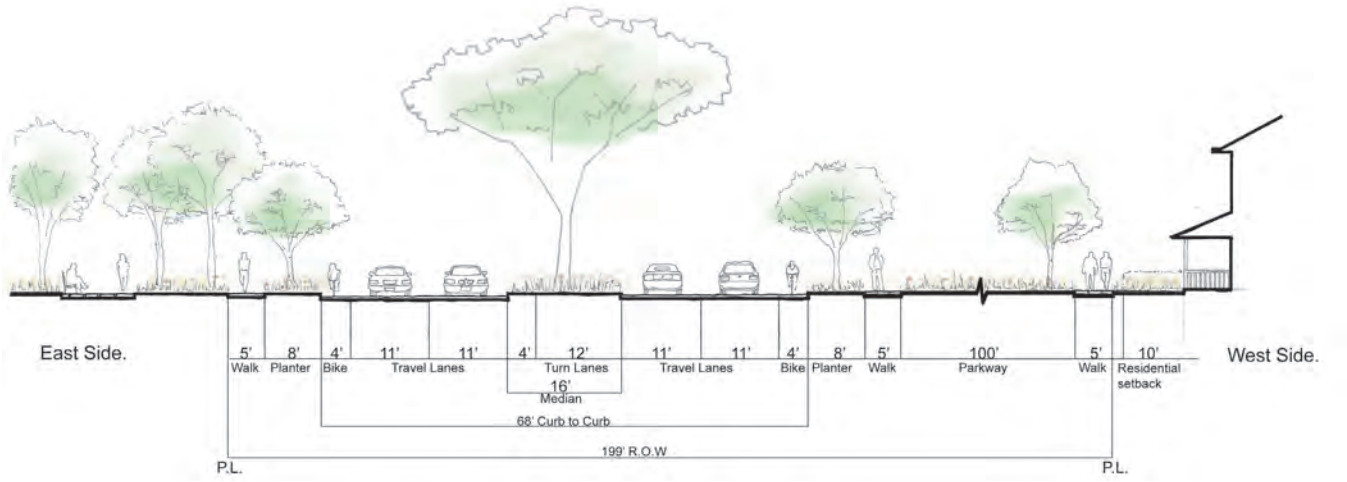


Figure D-12 Keoneula Connector Road Street Section

2.1.4.2 Avenues

Avenues have two 10-foot travel lanes and accommodate traffic volumes exceeding 7,000 average daily trips (ADT). With avenue traffic volumes, conflicts between traffic and parked-car doors are more likely, and 7-foot parking lanes are necessary.

Figure D-13 Standard Avenue Locations

Standard Avenues. All avenues have on-street parking and sidewalks to support street-facing entrances and uses on abutting parcels. Avenue travel lanes are wide enough to accommodate traffic volumes exceeding 8,000 ADT, but with pedestrian friendly speeds and crossing distances.(Figure D-13 & 14)

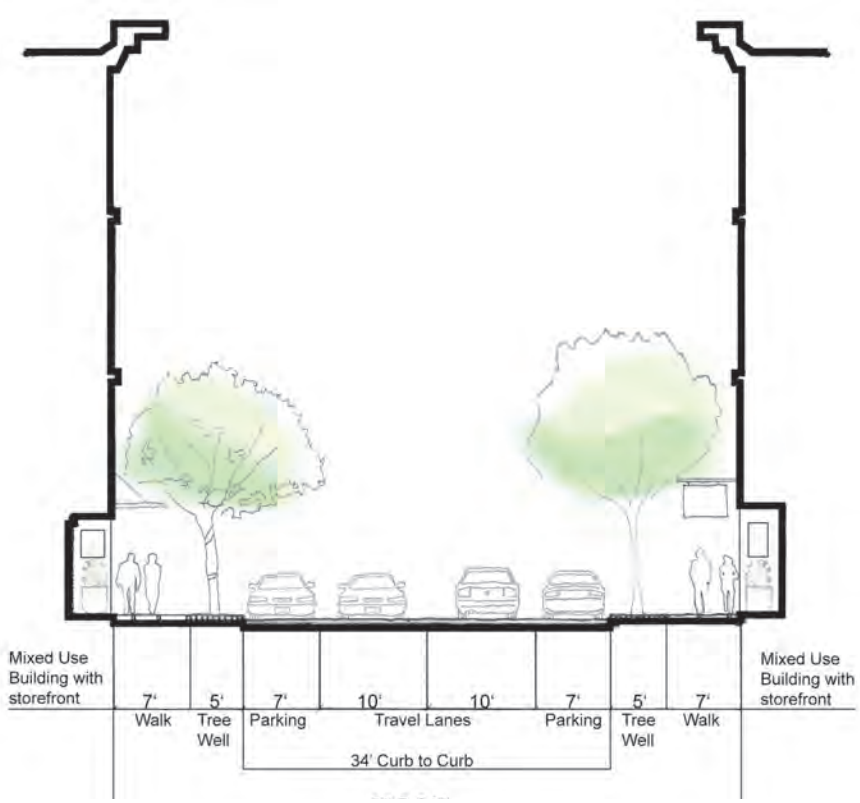


Figure D-14 Standard Avenue

Main Street. Because of excellent regional access (from H-1 and by transit), Main Street would provide the best opportunity for creating an intimate shopping street. With higher levels of pedestrian activity, sidewalks extend to the curb, and tree grates replace planting strips. (Figure D-15 & 16)

Figure D-15 Main Street

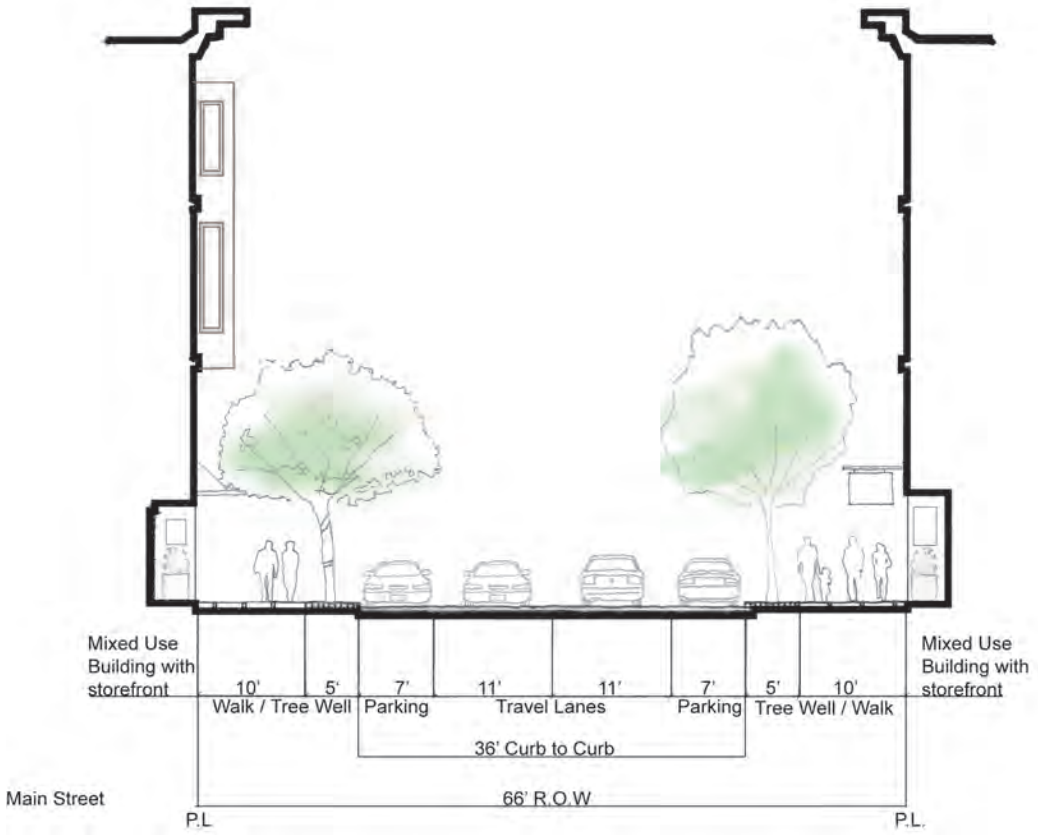


Figure D-16 Main Street

Avenue with Bike Lanes. The avenue just east of airport-related uses provides a convenient bicycle route between the future park and the planned trail along the railroad. (Figure D-17 & 18)

Figure D-17 Avenue with Bicycle Lanes

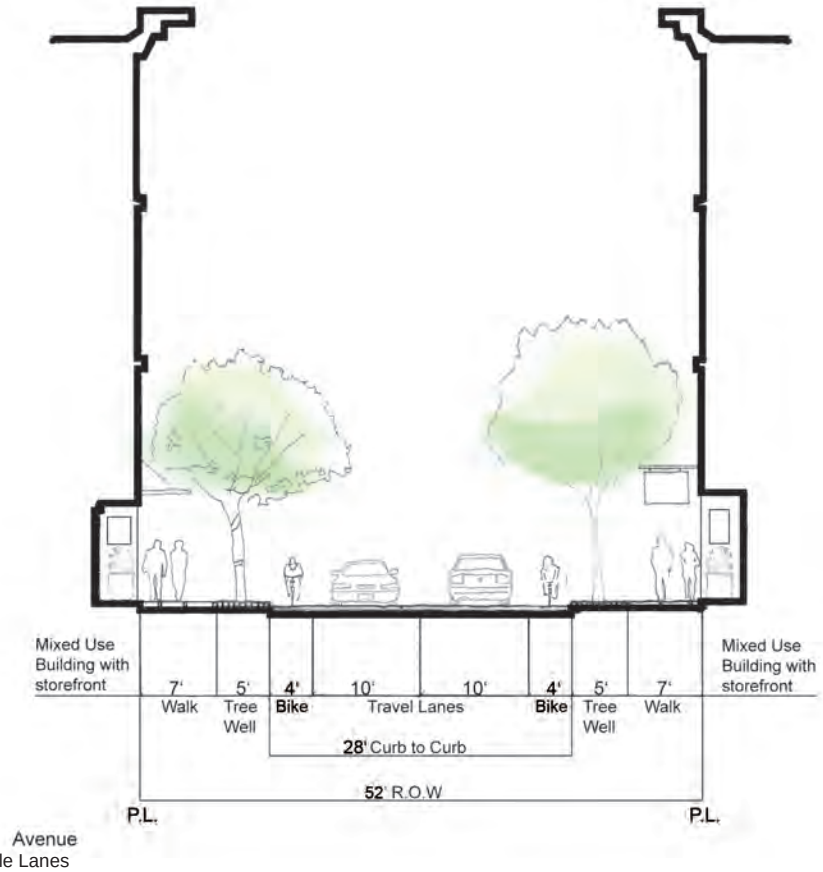
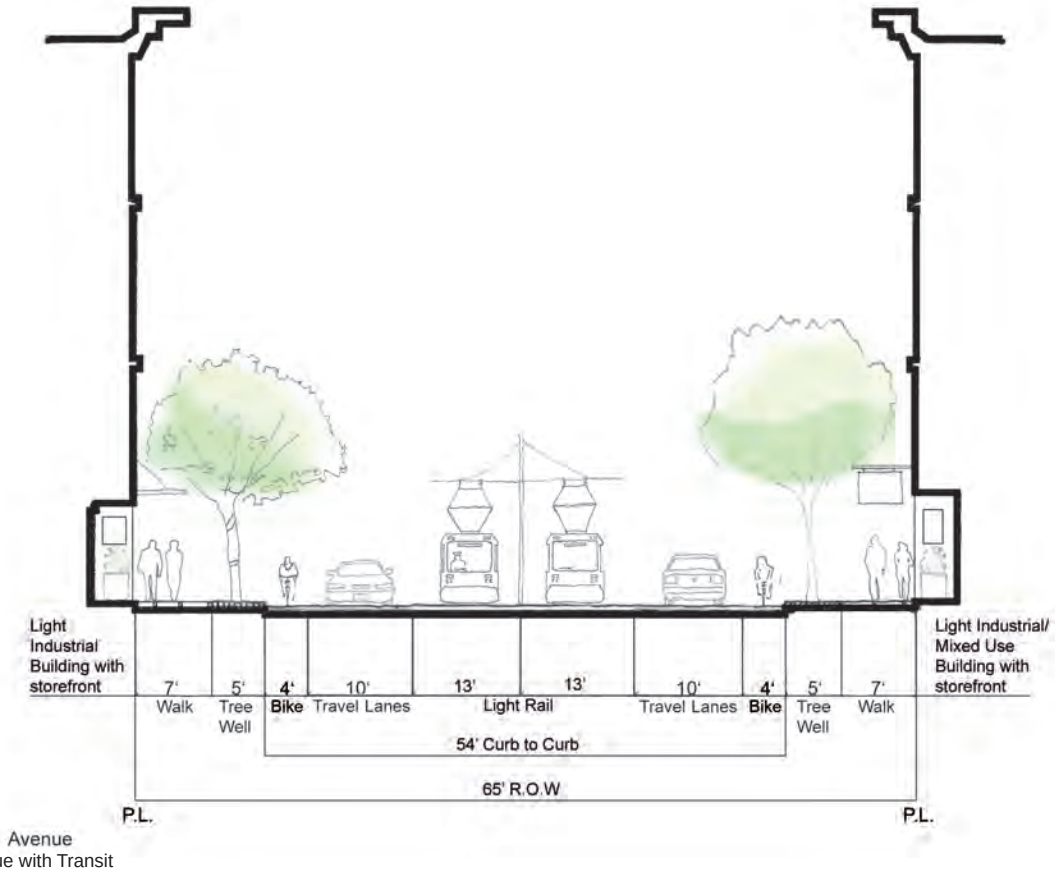


Figure D-18 Avenue with Bicycle Lanes

Avenue with Transit .The avenue linking Kalaeloa and Kapolei will provide an easement for future dedicated bus or light rail transit. (Figure D-19 & 20)

Figure D-19 Avenue with Transit



Avenue

Figure D-20 Avenue with Transit

Lanes. Lanes are local streets with traffic volumes less than 7,000 ADT, and have two (2) 9-foot travel lanes. Lanes emphasize pedestrians and livability over vehicular speed. With low traffic volumes, conflicts between traffic and parked car doors are rare, and 6-foot parking lanes are appropriate. When engineering curves, a maximum design speed of 25 miles per hour should be assumed. If interconnected and frequently spaced, a network of lanes would avoid concentrations of traffic that require wider travel lanes. Where concentrations of traffic exceeding 7,000 ADT are unavoidable, avenue standards shall apply.

2.1.4.3 Bus Stops

Transit is an integral vision of the Kalaeloa Master Plan. Bus stops will be integrated into the streets of Kalaeloa, and this will be achieved in a uniform manner through clearly articulated curb bulb-outs, no parking zones, and unified street furniture.

2.1.4.4 Alleys

Alleys provide access to mid-block garages and service areas, thereby avoiding negative impacts of accessing garages and service areas directly from a street. Alleys are encouraged in all areas to eliminate the visual impact of garage doors, parking structures, and service areas along streets. Alleys are required: (1) where traffic volumes on streets that abuts a lot exceeds 3,000 ADT (and curb cuts should be avoided), and (2) where development will front directly onto preserves, parks, and parkways (with no intervening street).(Figure D-21)

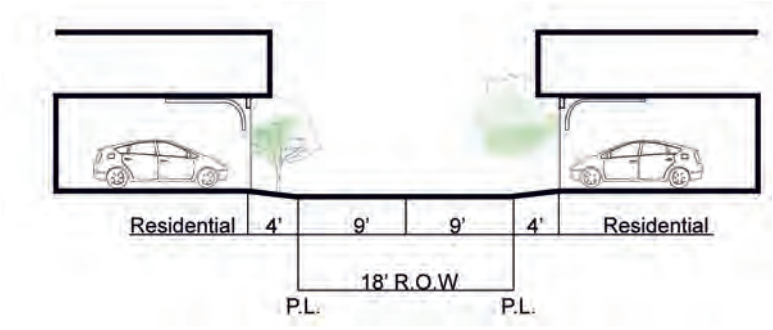


Figure D-21 Alley

2.1.4.5 Parking

Parking 2-Sides. Where abutting uses have a commercial, industrial, cultural or educational component, and where residential uses exceed a density of eight dwellings per net acre, parking shall be provided on both sides of the lane (except where elimination of a parking lane can help avoid disturbing significant natural or archeological resources).(Figure D-22)

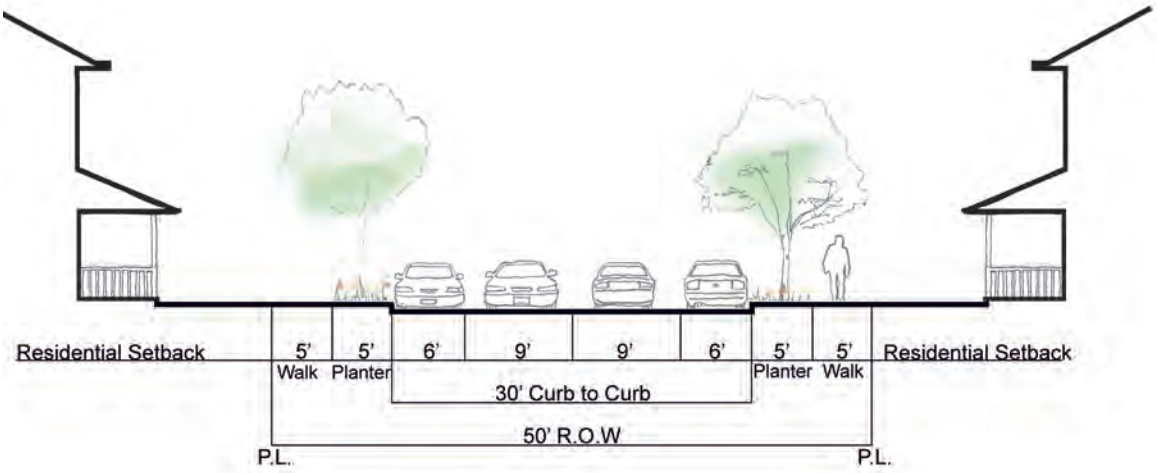


Figure D-22 Lane with Parking on 2 Sides

Parking 1-Side. Where abutting uses are residential with density less than eight dwellings per net acre, parking may be provided on only one side of the lane. (Figure D-23)

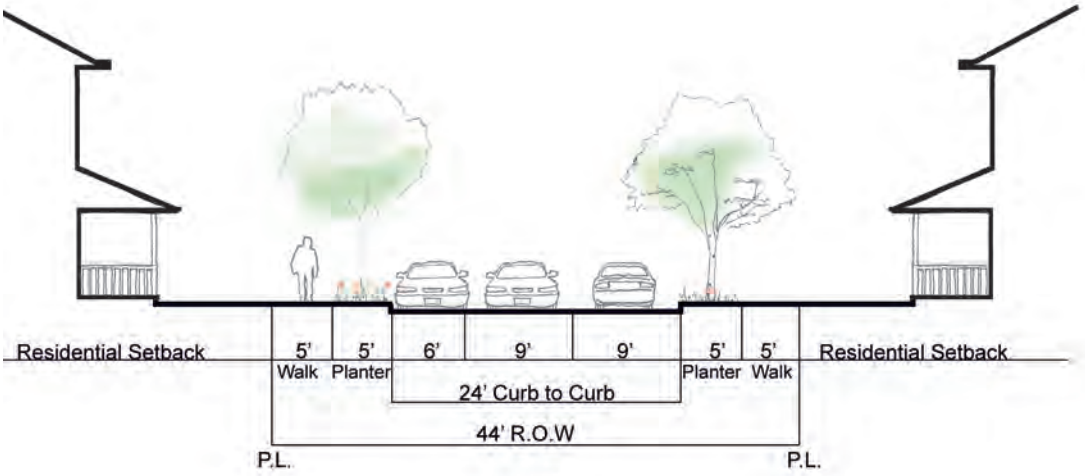


Figure D-23 Lane with Parking on 1 Side

No Parking. Where lanes pass through natural and/or passive open space, lanes may have no parking. At the same time, where recreational activity demands parking, on-street parking should be used to the extent possible in lieu of on-site parking lots. (Figure D-24)

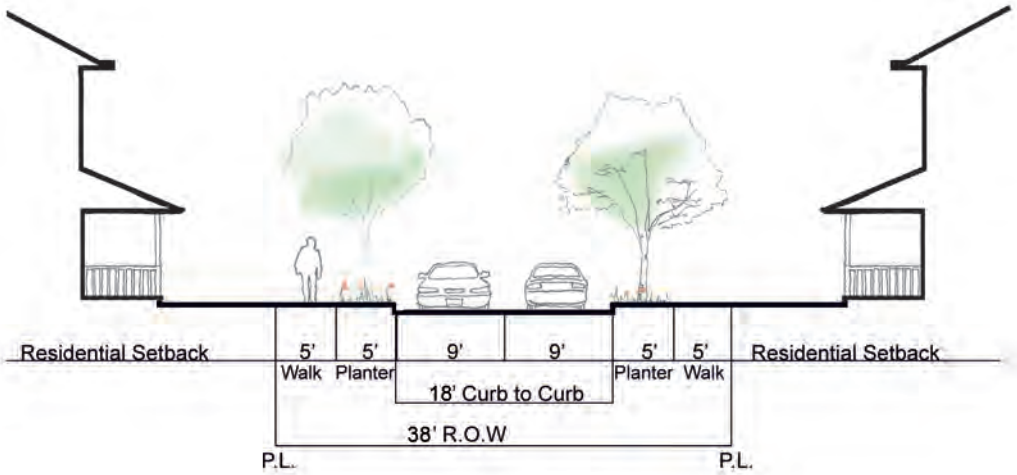


Figure D-24 Lane with No Parking

2.1.5 Traffic Calming

To discourage fast, cut-through traffic, traffic calming measures should accompany the interconnected street network called for in these standards. A large measure of traffic calming would be provided through the use of appropriately dimensioned travel and parking lanes. (Excessive street width has been identified as a major contributor to higher vehicle speeds and a higher incidence of severe injuries). Additional techniques may be employed to calm traffic further, in support of pedestrian safety and convenience.

2.1.5.1 Articulated Crosswalks

At crosswalks, visual and physical articulation signal the special needs of pedestrians to motorists. Articulation can be created through the use of special pavers and textured concrete. Besides forcing motorists to slow down, raised intersections place crosswalks at the same level as abutting sidewalks and signal that pedestrians take precedence.(Figure D-25)

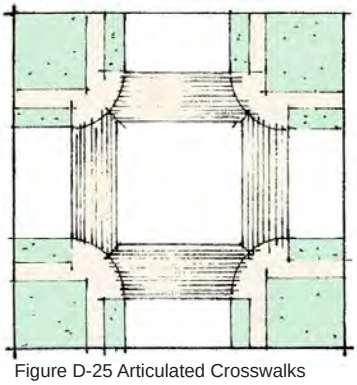


Figure D-25 Articulated Crosswalks

2.1.5.2 Bulbouts

Bulbouts extend curbs and replace parking lanes. They are especially warranted at intersections and other pedestrian crossings, where they slow motorists, provide a pedestrian refuge, and reduce pedestrian crossing distances.(Figure D-26)

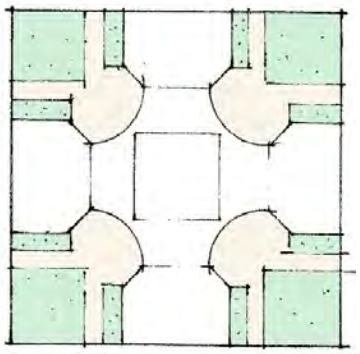


Figure D-26 Bulbouts

2.1.5.3 Curb Radii

To slow traffic and reduce pedestrian crossing distances at intersections, curb radii shall not be more than 25 feet at intersections between boulevards and in industrial areas, 15 feet at intersections between lanes, and 20 feet at all other intersections. (Figure D-27)

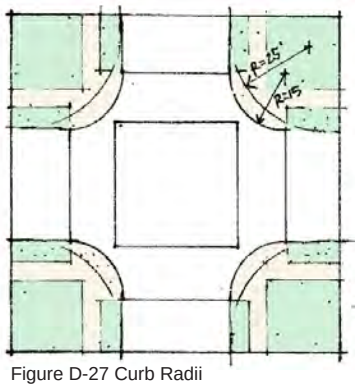


Figure D-27 Curb Radii

2.1.5.4 Offset Intersections

Travel routes that force turns because of offset intersections, slow traffic and discourage cut-through traffic. For safety, intersections should be offset by at least 150 feet (offset intersections also provide special vista opportunities for parks, civic buildings, building entries, monuments, or exceptional architecture).

2.1.5.5 Circles

Traffic circles slow traffic while offering capacities for turning movements that usually exceed conventional four-way intersections. Circles can be small enough to be placed in the middle of typical intersections, or large enough to accommodate parking and handle complex intersection geometries. (Figure D-28)

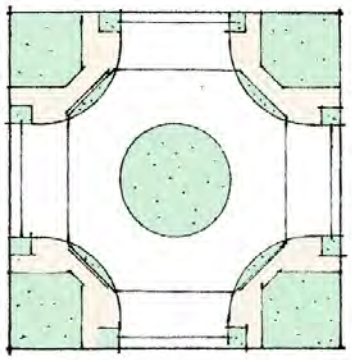


Figure D-28 Circles

2.1.6 Landscaping and Lighting

Landscaping and lighting contribute to pedestrian comfort and a positive project identity.

2.1.7 Stormwater Treatment

2.1.7.1 Swales with Curbs

Swales can be incorporated into the landscape strips along streets to convey rainwater and allow infiltration. Along boulevards and avenues, and where streets abut commercial, industrial, or residential uses in excess of five dwelling units/acre, curbs shall accompany swales. Regularly spaced curb inlets or drains can be used to direct stormwater from gutter to swale.

2.1.7.2 Swales without Curbs

Curbs need not be used where residential densities are less than five dwelling units/acre and where streets abut preserves, parks, and parkways. Curbless streets allow rain to sheet into street-side swales without interruption. For maintenance, a concrete band shall be poured at the edge of the street, such that it is flush with the street surface and accommodates uninterrupted drainage.

2.1.7.3 Porous Parking Lanes

Where residential densities are less than eight dwelling units/acre, open-cell unit pavers may be used in parking lanes and should be accompanied by curbs. Where residential densities are less than five dwelling units/acre and where streets abut natural preserves, gravel shoulders may be substituted for parking lanes and need not be accompanied by curbs.

2.1.7.4 Permeable Concrete

Porous concrete is created when only coarse aggregate is used, without fines. Porous paving technology has advanced such that it may be used for residential lanes and parking lanes (subject to detailed engineering). Porous concrete can be laid above subsurface stormwater storage and infiltration to meet discharge needs and becomes cost-effective in dense urban settings.

2.1.7.5 Dry Wells

Dry wells facilitate subsurface stormwater storage and infiltration, which may be located in planter strips or parking lanes where maintenance can be provided more easily.

2.2 Landscape Guidelines

The Landscape Guidelines contained herein are intended as a framework to maintain consistency of landscape character throughout Kalaeloa, and provide a unifying, engaging, and interesting element to public areas. The design objectives are to:

- Achieve a compatible design character with existing regional uses that reflect Kalaeloa's unique history as a Naval Air Station and as a Hawaiian historical and cultural area.
- Promote a coherent vision of the future of Kalaeloa as it evolves into a vibrant urban core.
- Develop a pedestrian-oriented downtown area that becomes a focal point for the community and serves the needs of both town residents and daytime users.
- Enhance existing landscape patterns and preserve existing trees by incorporating them into the design of the public areas and development parcels.

2.2.2 Landscape Design

The Kalaeloa Master Plan presents a series of bulk parcels that are eligible for redevelopment. The Landscape Guidelines included herein are intended to serve as a guidance document to the formulation of individual landscape plans. Each bulk parcel has different site conditions and program requirements that would require its own set of development guidelines. This section addresses the common unifying elements that will give the community a distinctive image and character. The common general guidelines are as follows:

Views. Mauka and makai views occur from many areas within Kalaeloa. Views to Pu'u-pālailai, the Waianae range, and ocean should be preserved within the development parcels whenever possible and appropriate to maintain visual orientation to the regional context. Bulk parcels that are adjacent to parks and open spaces should take advantage of the views by orienting facilities and enhancing visual corridors to these important public areas.

Open Spaces. Open spaces should also have some level of continuity with adjacent projects and avoid disjointed and visually contrasting design concepts and character. Appropriate site transitions between projects would make adjacent projects relate better to each other. Open spaces within the development parcels should achieve a consistent design concept and use of materials.

Character. Along a mauka to makai transect, the regional landscape pattern varies from intensive plantings in the City of Kapolei to a natural landscape along the shoreline. In Kalaeloa, the man-made landscape of open lawns and large shade trees is predominant throughout. The vast runway area occupies the central portion of the site. Its expanse of pavement and dried groundcovers are maintained to meet the functional requirements of the airport facilities. Low-land scrubs are found along the eastern and western sections of the runway and along the coastline. Kalaeloa has one of the State's best examples of a coastal plant ecosystem. Some areas contain valuable habitats and cultural and historical features.

The landscape design principle is intended to enhance the design character and image of the development parcel and its open spaces with landscape designs that have a dry land or naturalized character. In this way, Kalaeloa will retain its sense of place and maintain its distinctive identity.

Precedent. The existing design styles at the former Naval Air Station should be viewed as existing rather than a direct precedent. Overly historic design elements should be avoided, as the intention is to create a new and vibrant urban center that is innovative and forward looking rather than traditional.

Preservation. Where appropriate and consistent with the adjacent retention of historic buildings, the landscape should be designed to reflect the original use of the buildings, as well as accommodate new uses and tenant requirements. For example, the Aviation and Control Tower building should be preserved and restored as architectural landmarks that reflect the history of the former Naval Air Station. The foreground landscape should be designed to inform visitors of the history of each site, and reflect the integrity of the historic context of each structure.

Orientation. Buildings in the public open spaces and parks should take advantage of views to adjacent public open spaces and be sited to enhance the sense of community by orienting themselves to public zones rather than private areas.

Circulation. A clear and logical pedestrian and bicycle circulation network should be incorporated into the planning and design of each bulk parcel, and this network should connect to the pedestrian and bicycle trails of the Kalaeloa Master Plan.

Parking Areas. Off-street parking areas should be appropriately designed and landscaped to provide significant shaded parking opportunities to reduce reflected heat and ensure a pedestrian-scaled sense of place.

Trees. Street trees provide design and scalar continuity, add visual diversity, and provide shade to sidewalks and public spaces throughout Kalaeloa.

The Master Plan supports the preparation of a unified Kapolei / Kalaeloa Street Tree Master Plan that will ultimately provide a unifying visual and landscape framework supportive of the street hierarchy included herein.

Along streets in the urban core north and south of New Saratoga Boulevard, street trees should be regularly spaced, and be of a size and form consistent with the scale of the roads and streets that they abut. Street trees should be planted on all permanent roads and streets within Kalaeloa.

The streets in the cultural landscape park and beach protection zone should have informal arrangements of tree clusters planted to complement the existing vegetation patterns, frame entries and views, and screen unsightly areas from the public right of way.

Street trees are to be planted in tree lawns that are a minimum of 36-inches wide. In the mixed-use core, where densities are greater than 25 dwelling units per acre, or where shop-front office and retail space are provided, tree wells maybe used to provide pedestrian access.

Preservation. The existing shade trees (larger that 12-inch caliper) and other trees that may be considered exceptional under Hawai'i State law, that are located within the public areas, are to be inventoried for their species, size, and condition. A recommendation to demolish, donate, save, or relocate existing trees is to be provided by a certified arborist. A tree protection and maintenance program should be initiated as soon as possible.

Tree Species. Wherever possible, native trees or plants should be used. There are two types of native plants, indigenous and endemic. Indigenous plants occur naturally in Hawai'i and also elsewhere in the world, while endemic plants can only be found in Hawai'i and no where else in the world.

Introduced or non-native plants were intentionally or accidentally brought to Hawai'i by human activity. Certain species were introduced by Polynesians more than a 1,000 years ago have long been a part of the island culture. A number of species have been brought to Hawai'i since 1778 and are considered relatively recent introductions.

The following preferred species are provided as a guideline, together with locations for planting throughout Kalaeloa. The Hawai'i Community Development Authority will coordinate the final selection of trees with the City Department of Planning and Permitting, Urban Design Branch.

Large Trees. Large trees should be used on all major roads and streets throughout Kalaeloa wherever feasible. Alternate species may be planted, provided they are consistent with the form and scale at maturity of species listed above, and have proven performance characteristics in terms of growth rates, long-term health, and safety in the 'Ewa Region. These species should also be planted in the Great Park, and its affiliated public open spaces wherever possible. (Table D-1)

Table D-1. Large Trees List

Common Name	Scientific Name	Native		Non-Native	
		Endemic	Indigenous	Polynesian Introduction	Recent Introduction (1778)
Benjamin Banyan	*Ficus benjamina*				√
Monkeypod Tree	*Samanea saman*				√
Gold Tree	*Tabebuia donnell-smithii*				√

Small and Medium Trees. Small and medium trees should be used on all interior roads and streets throughout Kalaeloa wherever feasible. Alternate species may be planted, provided they have proven performance characteristics in terms of growth rates, long-term health, and safety in the ‘Ewa Region. These species should also be planted as highlight species within all park spaces in the mixed-use areas of Kalaeloa. (Table D-2)

Table D-2. Small and Medium Trees List

Common Name	Scientific Name	Native		Non-Native	
		Endemic	Indigenous	Polynesian Introduction	Recent Introduction(1778)
Autograph Tree	*Clusia rosea*				√
Be-still Tree	*Cascabela thevetia*				√
Beach Heliotrope	*Tournefortia argentea*				√
Buttonwood	*Conocarpus erectus*				√
Hala	*Pandanus tectorius*		√		
Kamani	*Calophyllum inophyllum*			√	
Kolomona	*Senna surattensis*				√
Kou Haole Tree	*Cordia sebestena*				√
Kou Tree	*Cordia subcordata*		√		
Milo	*Thespesia populnea*			√	
Naio	*Myoporum sandwicense*		√		
Plumeria	*Plumeria spp*				√
Rainbow Shower Tree	*Cassia fistula x javanica*				√
Royal Poinciana	*Delonix regia*				√
Silver Trumpet Tree	*Tabebuia argentea*				√
‘Ulu or Breadfruit	*Artocarpus altilis (Parkinson) Fosberg*		√		
Vertical Wiliwili	*Erythrina variegata cv. tropic coral*	√			
Wiliwili	*Erythrina sandwicensis*	√			

Palms. Palms should be used as a highlight species at intersections, small public open spaces, and building entries in the industrial areas. Alternate species may be planted, provided they have proven performance characteristics in terms of growth rates, long-term health, and safety in the ‘Ewa Region. These species may also be planted as highlight species within all park spaces in the mixed-use areas of Kalaeloa.(Table D-3)

Table D-3. Palms List

Common Name	Scientific Name	Native		Non-Native	
		Endemic	Indigenous	Polynesian Introduction	Recent Introduction (1778)
Blue Latan Palm	*Latania loddigesii*				√
Cabbage Palm	*Sabai palmetto*				√
Chinese Fan Palm	*Livistona chinensis*				√
Coconut Palm	*Cocos nucifera*			√	
Date Palm	*Phoenix dactylifera*				√
Loulu	*Pitchardia spp.*		√		
Triangle Palm	*Neodypsis decaryi*				√

Shrub and Ground Cover. Native shrubs and ground cover should be used along roadways, medians, intersections, and entry drives. Most natives have excellent water-conserving characteristics and are widely used in the ‘Ewa Region. (Table D-4)

Table D-4. Shrub and Ground Cover List

Common Name	Scientific Name	Native		Non-Native	
		Endemic	Indigenous	Polynesian Introduction	Recent Introduction (1778)
‘Akia	*Wikstroemia uva-ursi*	√			
‘A’ali’I	*Dodonaea viscose*		√		
Hau	*Hibiscus tiliaceus*		√		
‘Ilima	*Sida fallax*	√			
Naupaka	*Scaevola sericea*		√		
Pohinahina	*Vitex rotundifolia*		√		

Street Furniture. Street furniture should be designed or chosen to provide consistency and continuity throughout the mixed-use, residential, and industrial areas of Kalaeloa. They should also add visual diversity, and when required, provide shade to sidewalks and public spaces.

The Master Plan supports the preparation of a unified street furniture and signage master plan and installation program that will ultimately provide a unifying visual and landscape framework supportive of the street and public open-space hierarchy included herein.

Along streets in the urban core north and south of the New Saratoga Boulevard, street trees should be regularly spaced, and be of a size and form that is consistent with the scale of the roads and streets that they abut. Street trees should be planted on all permanent roads and streets within Kalaeloa.

Identity. Identity signs should be located at the gateways of Kalaeloa.

Wayfinding. Directional signs should be consistent in design and character and precisely located to provide clear directional information for visitors and residents alike.

Lighting. The street and public open-space lighting system design should be consistent in visual character throughout Kalaeloa, and meet accepted standards of illumination for sidewalks, parks, and other publicly accessible use areas.

Upward light pollution (i.e., into the night sky) should be avoided. Where lateral light overspill is of concern (e.g., to adjacent residences), luminaries should be selected or designed to direct light away from windows, doors, and other apertures.

The light levels for street and other road lighting, where the City adopts the maintenance of a street, shall be specified in accordance with City requirements. Streets within potential Planned Unit Developments or other areas where street maintenance will be conducted by non-City agencies, may be of lower light intensities. However, a consistent, unifying visual design element within each development shall be adopted. Traditionally designed fixtures should be avoided.

Bus Shelters. The bus shelters should be of consistent design and meet City design standards. This design should provide a coordinated set of street furnishings that is unique to Kalaeloa. The area around each bus shelter should be designed for pedestrians' rest stops as well as for transit patrons. Trash receptacles should be provided. Sidewalks need to be widened to accommodate bus shelters wherever they occur. Each bus shelter should satisfy the requirements of the Americans with Disability Act.

Xeriscape. The use of lawns shall be limited to active-use areas such as sports fields, recreation areas, and to special areas that benefit from more intensive landscaping. Plantings are to use drought and salt tolerant species. Soils will be amended and bedding areas and tree drip-line areas will be mulched to reduce moisture loss through evaporation. Landscape design should utilize mulching to capture and retain moisture wherever possible. In order to reduce the total area requiring irrigation, mulch areas should be used as an integral design element to accentuate the landscape with mulch beds, bands, and borders. Drip irrigation is to be incorporated where appropriate, and all irrigation will be automatically controlled.

Irrigation. All public areas should be irrigated with an automatic controller, supplied from a non-potable water source.

3.0 Development Guidelines

3.1 Mixed-Use Development Guidelines

Street-facing buildings with entrances and windows facing pedestrian paths support friendly neighborhood lifestyles and improve safety. Walking or transit activity along the street becomes more likely and more inviting. Street-facing buildings also serve as a deterrent to unwanted behavior by creating environments where workers and residents can keep an eye on things. Furthermore, when paired with calm streets, street-facing architecture can encourage neighbors and co-workers to socialize in enjoyable ways.

While street-facing buildings can have a positive effect on urban life, blank walls, garage doors, and parking lots can have a negative effect. Along streets, these features must be mitigated, if pedestrian activity, transit use, and sense of community are to be encouraged.

Street-facing architecture would also help distinguish Kalaeloa from common-place, auto-oriented, suburban environments. Buildings brought close to the street frame the street spatially, creating outdoor rooms within which the life of a community unfolds. Keeping street-facing setbacks at urban dimensions should be accompanied by large windows and frequent entries to succeed in creating and communicating a welcoming sense of vitality.

These guidelines seek to ensure critical dimensions for accomplishing a healthy and attractive urban environment, while allowing enormous flexibility with regard to style and use. While many features remain constant, some guidelines distinguish between: “Mixed-Use High” (where greater height and intensity is desirable because of proximity to regional transit and proximity to storefront conveniences including retail, professional offices, and personal services); “Mixed-Use Moderate” (where the flexibility and conveniences offered by mixed-use development is desirable, but at moderate intensities); and “Mixed-Use Airport-Related” (for industrial and commercial uses that take advantage of the Airport as a unique opportunity).

These guidelines are intended to allow the built form of Kalaeloa to evolve over time, and establish a new form of living. The guidelines are written to promote a more dense urban fabric; however, the provision of small lot single-family residences,

duplexes, and other less dense housing types is not excluded by these guidelines. It is, however, anticipated that these forms will become less prevalent as Kalaeloa achieves build-out.

3.1.1 Land Use Standards

3.1.1.1 Permitted and Conditional Uses (Table D-5)

USE P = Permitted C = Conditional Uses X = Not Permitted	Mixed-Use High/ Commercial	Mixed-Use Moderate	Mixed-Use Airport-Related
Amusement enterprises including billiard halls, game arcades, and carousels, but exclude driving ranges, miniature golf courses, go-cart tracks, and other land-intensive amusements.	P	P	P
Banquet halls, dance halls/discotheques, and exhibit/convention halls.	C	C	P
Bars, pubs, and cocktail lounges.	C	C	C
Cultural facilities, including libraries, art galleries, and museums.	P	P	P
Churches and other religious places of worship.	P	P	P
Cinemas, theatres, and auditoria, except sports halls.	P	P	X
Community services, incl. community centers, daycare, senior, teen and recreation centers, police stations, and private schools.	P	P	P
Financial, insurance, and real estate services, including banks and offices.	P	P	X
Food stores, including supermarkets, convenience markets, meat and fish stores, produce stores, bakeries, and health food.	P	P	X
Health clubs, swim clubs, tennis clubs and gymnasia.	P	P	P
Health care facilities, including hospitals and laboratories, but not including medical offices and clinics.	X	X	P
Light industrial facilities.	(SEE RESEARCH and DEVELOPMENT.)		
Lodging, including hotels, spas, executive suites, and bed and breakfasts.	P	P	P
Offices, including corporate offices, medical offices and clinics, engineering and design offices, legal and counseling offices.	P	P	P
Personal services, including dry cleaners, laundries, photo developing, hair stylists, and shoe repairs.	P	P	P
Research and development, including light industrial activities combined with office, administrative, or research facilities.*	C	C	P
Residential multi-family, including apartments, condominiums, “live-work” lofts, and attached townhouses	P	P	X
Residential detached single-family on lots under 4,001 square feet	X	P	X
Restaurants and other “sit-down” eating establishments.	P	P	P

USE P = Permitted C = Conditional Uses X = Not Permitted	Mixed-Use High/ Commercial	Mixed-Use Moderate	Mixed-Use Airport-Related
Retail merchandise, including variety stores, garden supplies, home furnishings, household electronics, and. household appliances.	P	P	X
Retail trades incl. florists, magazines, camera, gifts, pet sales and supplies, books, stationary, art and hobby, antiques, stamps and coins, jewelry, and similar trades.	P	P	X

Note: In Mixed-Use/Airport-Related areas, light industrial floor area may not exceed 80 percent of the total floor area, except for facilities with floor areas under 40,000 square feet. In Mixed-Use/High and Mixed-Use/Moderate areas, light industrial floor area may not exceed 30 percent of floor area, and may not pose any hazard or nuisance to potential nearby residential uses.

Table D-6.

INTENSITY	Mixed-Use High/ Commercial	Mixed-Use Moderate	Mixed-Use Airport-Related
Maximum Allowable Floor Area Ratio	2.50	1.50	2.50

Note: Floor Area Ratio shall be defined as the gross floor area of all buildings at all levels, divided by the total site area of a project, less undevelopable areas. Parking structures shall not be counted toward the gross floor area calculation.

3.1.1.2 Required Storefronts

Every building along the proposed “Main Street” shall have ground-floor “storefronts” fronting onto “Main Street.” Storefronts may occur throughout mixed-use areas, and are encouraged along Saratoga Road. Uses that qualify as storefronts are limited to retail shops, personal services, restaurants, cafes, entertainment establishments, professional offices, day care, health clinics, community uses, and other uses that contribute similar levels of activity and visual interest to the street. To qualify as a storefront, buildings must also conform to the building setback, entry, and transparency requirements below.

3.1.1.3 Community Uses

In Mixed-Use High and Mixed-Use Moderate areas, projects that exceed 10 acres in total site area shall devote at least 5 percent of the project’s net developable site area to publicly accessible open space or community serving facilities, including but not limited to parks, plazas, tot lots, community centers, or day care centers. Publicly accessible open space and community serving facilities shall be conveniently located.

3.1.2 Building Standards

3.1.2.1 Building Height

In mixed-use areas, buildings shall not exceed 60 feet in height. Occasional projections may extend 10 feet beyond the height limit (e.g., chimneys, cupolas, flagpoles, screened equipment, and decorative features).

3.1.2.2 Street Frontage

Mixed-Use High Areas. Within each block, buildings shall occupy at least 80 percent of the available frontage along streets.

Mixed-Use Moderate and Mixed-Use Airport-Related Areas. Within each block, buildings shall occupy at least 60 percent of the available frontage along streets.

Mixed-Use Area Buildings with Storefronts.

Table D-7.

Building Orientation	Minimum and Maximums
Street-Facing Setback (1, 2, 3, 4)	0 feet minimum; 5 feet maximum
Interior Side Setback (5)	0 or 5 feet minimum
Interior Separations (5)	0 or 10 feet minimum
Rear Setback (5)	0 or 15 feet minimum
Rear Separation (5)	0 or 30 feet minimum
Rear Setback (Garage Only)	6 feet minimum from alley
Building Height (6)	60 feet maximum

(1) Storefront requirements apply (see text). (For mixed-use buildings without storefronts, see Figure D-29,30 &31).) To meet street- frontage requirements, buildings must not exceed maximum setback.

(2) Street-facing garage doors must be setback at least 20 feet.

(3) Features that may encroach into street right-of-ways and setbacks (up to the maximum specified): eaves (4 feet maximum), awnings (8 feet maximum), bay windows (3 feet maximum), and minor ornamental features (2 feet maximum). Within street rights-of-way and over sidewalks, projections must be more than 8 feet above finished grade.

(4) Features that may encroach into street-facing setbacks but not street right-of-ways (up to the maximum specified): arcades, trellises, porches and stoops (to street ROW). Arcades and porches shall have a clear dimension of at least 8 feet.

(5) Zero-foot setback and separations allow abutting mixed-use buildings to be arranged in a “main street” arrangement. Zero-foot setback and separations can also be used with north-facing facades designed with no openings because of passive-solar considerations.

(6) Occasional vertical projections may extend 10 feet beyond the height limit, such as chimneys, cupolas, flagpoles, screened equipment, and decorative features.

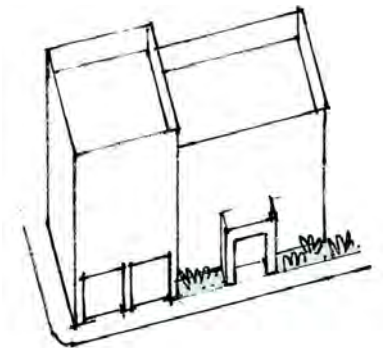


Figure D-29. Mixed use area buildings with 0 to 5 feet street facing setback

Mixed Use Area Buildings with Storefront

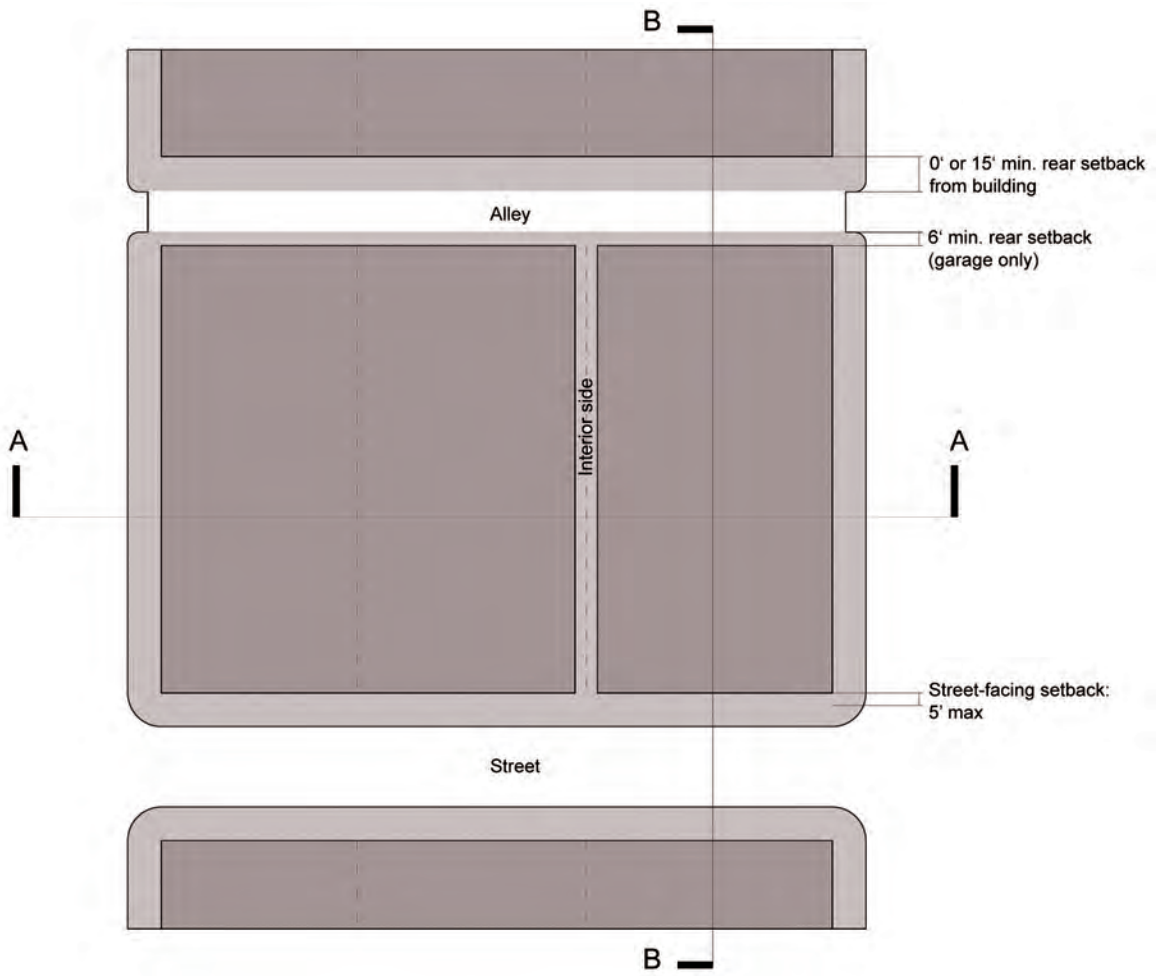


Figure D-30 Mixed Use Area Buildings with Storefront Plan diagram

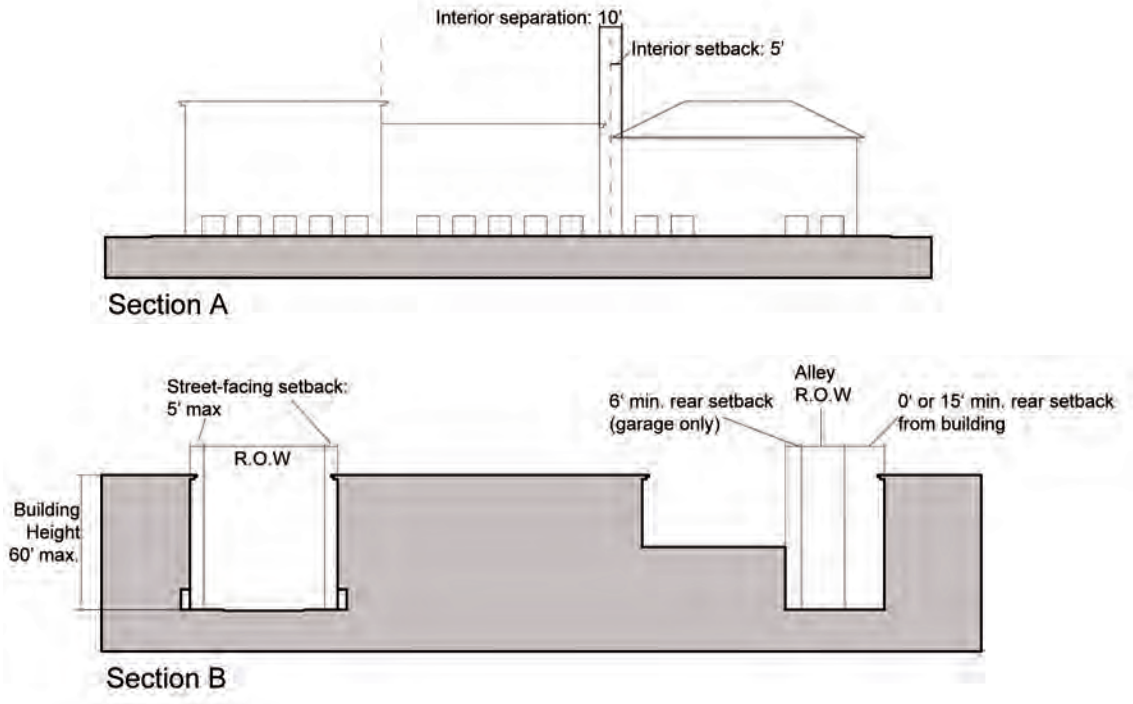


Figure D-31 Mixed Use Area Buildings with Storefront Section diagrams

Mixed-Use Area Buildings without Storefronts

Table D-8.

Building Orientation	Minimum and Maximums
Street-Facing Setback (1, 2, 3)	5 feet minimum; 15 feet maximum
Interior Side Setback (4)	0 or 5 feet minimum
Interior Separations (4)	0 or 10 feet minimum
Rear Setback (4)	0 or 15 feet minimum
Rear Separation (4)	0 or 30 feet minimum
Rear Setback (Garage Only)	6 feet minimum from alley
Building Height (5)	60 feet maximum

(1) With storefronts, street-facing setbacks may be reduced to 0 feet (see Figure D-32, 33 &34).

(2) Street-Facing garage doors must be setback at least 20 feet.

(3) Features that may encroach into street-facing setbacks but not street right-of-ways (up to the maximum specified): bay windows (3 feet maximum), eaves (4 feet maximum); arcades, trellises, porches and stoops (5 feet maximum); minor ornamental features (2 feet maximum). Arcades and porches shall have a clear dimension of at least 8 feet.

(4) Zero-foot setback and separations allow abutting mixed-use buildings to be arranged in a “main street” arrangement. Zero-foot setback and separations can also be used with north-facing facades designed with no openings because of passive-solar considerations.

(5) Occasional vertical projections may extend 10 feet beyond the height limit, such as chimneys, cupolas, flagpoles, screened equipment, and decorative features.

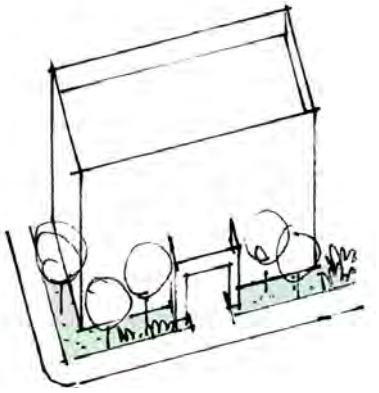


Figure D-32. Mixed use area buildings with 5 to 15 feet street facing setback

Mixed Use Area Buildings without Storefront

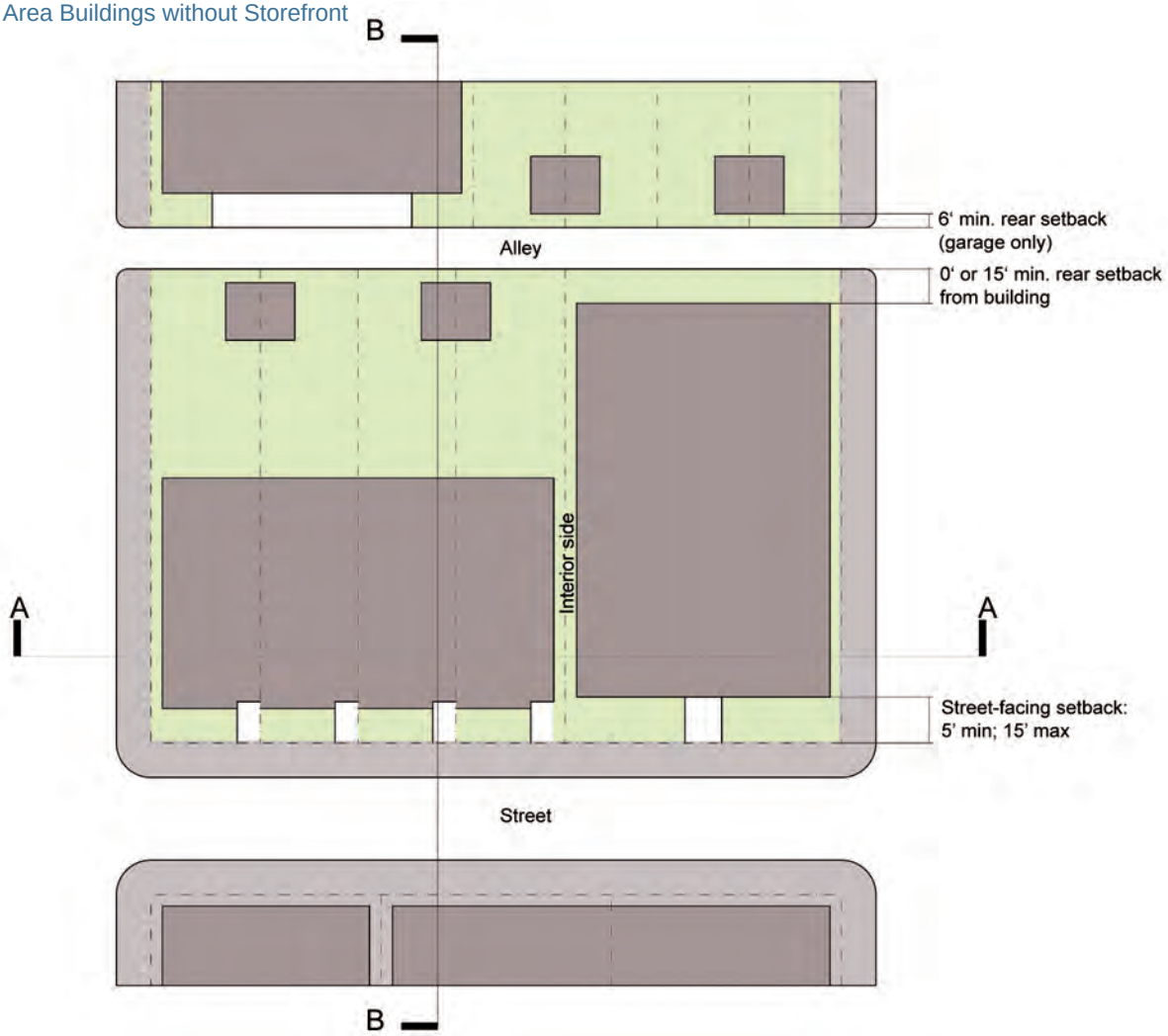


Figure D-33. Mixed Use Area Buildings without Storefront Plan Diagram

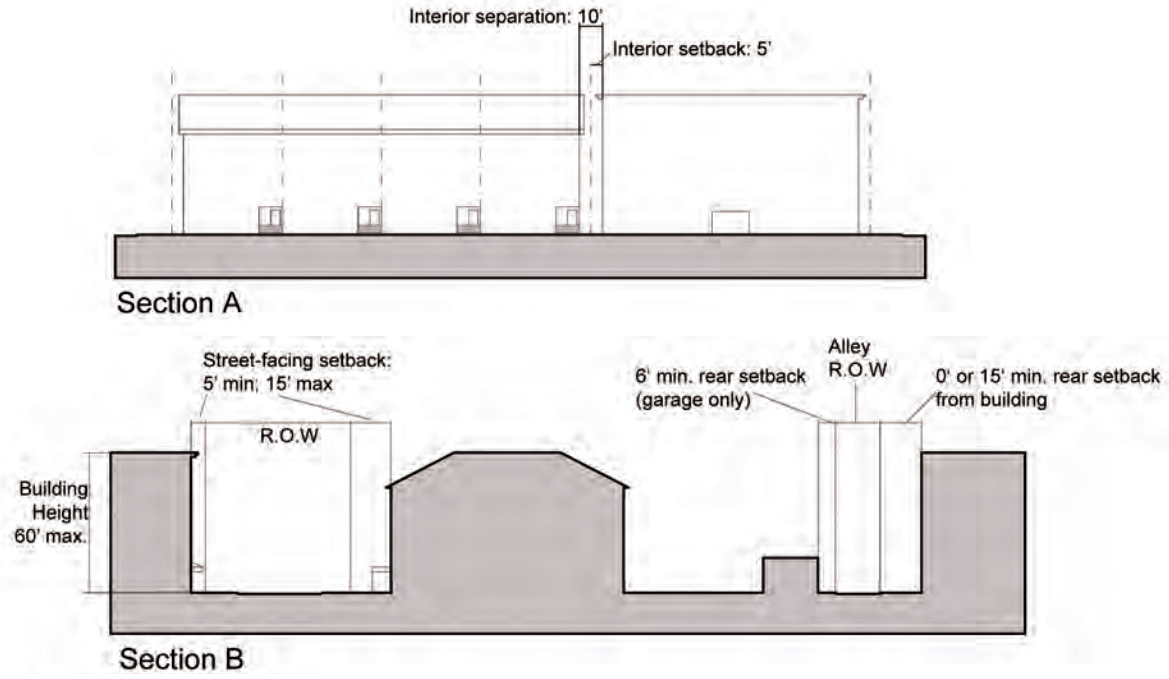


Figure D-34. Mixed Use Area Buildings without Storefront Section Diagram

Qualifying Street Frontage. To meet this requirement, buildings must be within the maximum allowable street-facing setback (see above) and meet entry and transparency requirements (see below). Qualifying buildings may not be separated from the street by on-site parking or drive lanes. Landscaped plazas and/or passages may be used in lieu of buildings for up to 10 percent of the available frontage. The required frontage may be reduced to provide a single 20-foot driveway, where site access cannot be provided otherwise. (Figure D-35,36&37)

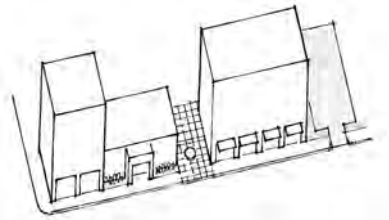


Figure D-35. Street Frontage conforms with storefront

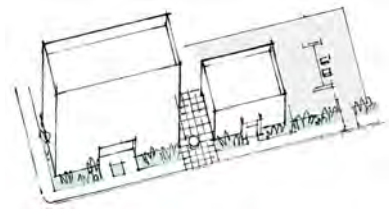


Figure D-36. Street Frontage conforms with no storefront

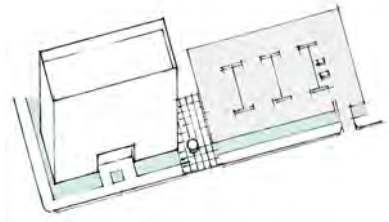


Figure D-37. Street Frontage does notconform

Drive-Through Lanes. Drive-through lanes may be allowed along streets, as long as drive-through lanes have a location or dimension that provides conformance to street frontage requirements noted.

Phasing. Construction may be phased to meet this requirement, so long as street frontage requirements are met within three years. Some form of guarantee may be required to enforce this provision.

Building Entry. Primary entries for new buildings shall connect to a street via a sidewalk, directly where possible, otherwise via landscaped courtyard(s) or plaza(s). Each primary residential entry shall be accompanied by a porch, stoop, or interior vestibule. Porches are required on detached single-family dwellings.

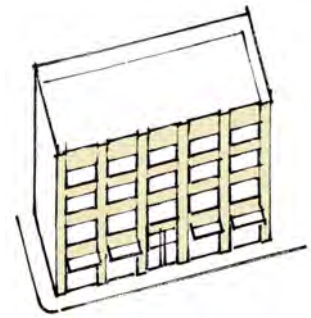


Figure D-38 Mixed use area buidings conforms transparency where storefronts are required

Building Transparency. At least 25 percent of street-facing elevations shall be comprised of windows and/or entrances. To qualify as a storefront, at least 50 percent of the ground-floor elevation shall be comprised of windows and/or entrances. Transparency shall be measured by taking the total area of all windows and entrances, and dividing it by the total area of the street-facing building elevation. Glass block, mirrored glass, frosted glass, clerestory windows (sill heights over 5 feet from floor-level), and other obscured openings may not be used to meet this requirement.(Figure D-38 & 39)

Figure D-39. Mixed use area buidings does not conform transparency

Rooftop Equipment. Mechanical equipment shall not be visible, except when viewed from above. Equipment may be recessed within the profile of the building, or it may be screened architecturally.

Service Areas. Service areas shall not be visible from streets or public open spaces. To conform, they shall be located away from streets or recessed within the building envelope. Service areas recessed within the building envelope and facing streets or public open spaces, shall not comprise more than 25 percent of a building's linear frontage; and shall be accompanied by roll-up doors. Free-standing equipment and refuse containers shall be screened from the view of streets and public open space. (Figure D-40,41& 42)

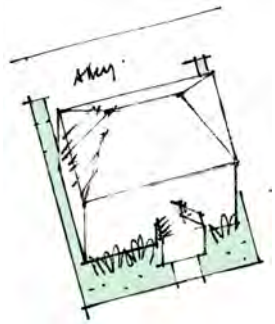


Figure D-40. Multi- family housing with alley access garage conforms

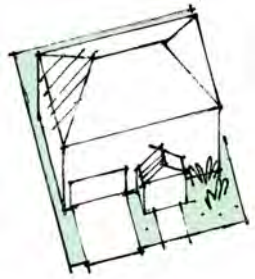


Figure D-41. Multi-family housing with garage less than 30% for front facade conforms

Figure D-42. Multi-family housing with garage greater than 30% for front facade does not conform

3.1.3 Site Standards

Private Open Space. Each residential dwelling shall be accompanied by at least 100 square feet of private open space, which may be a yard, patio, porch, or deck.

Shared Open Space. Residential projects exceeding 100 dwelling units shall provide shared open space, which may be comprised of courtyards, plazas, play areas, community facilities, and mid-block "greens." At least 50 feet of shared open space shall be provided per unit. Shared open spaces shall have a minimum dimension of 40 feet.

Fences and Walls. Fences and walls shall be set back at least two feet from any street or alley right-of-way, with intervening landscaping where possible. Fences and walls shall not exceed a height of 42 inches within street-facing setbacks. Fences and walls shall not exceed a height of 80 inches along interior side and rear property lines. Cyclone fencing, chain-link fencing, barbed-wire fencing, and razor-wire fencing are prohibited.

Parking. Projecting Demand. Peak demand for individual uses shall be calculated using the factors contained in Table D-9. Alternatively, projections for peak demand may consider savings attributable to the joint use of parking by different uses. When used jointly, peak demand shall be calculated utilizing the methodology and time-of-day demand profiles for parking contained in "Shared Parking" (The Urban Land Institute. 1983); subject to the approval of the City. Time-of-day profiles that are not contained in Shared Parking may be developed and applied for uses that are not described in Shared Parking.

Table D-9. Peak Demand for Individual Uses

Amusement enterprises	4 occupants per space
Banquet halls	3 occupants per space
Bars, pubs, and cocktail lounges	8 spaces per 1,000 square feet
Cultural facilities	3 occupants per space
Churches and other places of worship	4 occupants per space
Cinemas, theatres, and auditoriums	3 occupants per space
Community facilities, such as community centers, day care, schools	1 space per employee, plus curbside drop-off
Financial, insurance, and real estate services	3 spaces per 1,000 square feet
Food stores	3 spaces per 1,000 square feet
General merchandise retail	3 spaces per 1,000 square feet
Health clubs	4 spaces per 1,000 square feet
Lodging	1.1 per room
Miscellaneous retail trade	3 spaces per 1,000 square feet
Personal services	3 spaces per 1,000 square feet
Professional services	3 spaces per 1,000 square feet
Residential apartments and condominiums	1.5 space per unit
Residential townhouses	2.0 space per unit (with 1 covered)
Residential “live-work” lofts and townhouses	2.0 space per unit (with 1 covered)
Residential detached single-family	2.0 space per unit (with 2 covered)
Residential accessory units	On-street
Restaurants and other “sit-down” dining	8 spaces per 1,000 square feet

Parking. Projects within 650 feet of bus stops may factor a 10 percent reduction in parking demand. Projects within 800 feet of light rail stops may factor a 20 percent reduction in parking demand.

Calculating Supply. Parking requirements can be met by considering the sum of all on-site parking (at surface and in structures), plus on-street parking contained within or immediately adjacent to the project, plus contributions made by joint-use parking facilities.

Parking Location. Building setback and frontage requirements necessitate that parking lots be placed generally to the rear of buildings. Where parking lots abut streets, a 5-foot landscaped setback shall be provided, and parking shall be screened by a 3-foot hedge or wall. Where multi-level parking structures abut streets, they shall contain Storefront space at ground-floor level. Attached residential parking garages that face streets shall be setback at least 20 feet.

Parking Dimensions – On-Site. Parking spaces shall be assumed to have a length of 18 feet. This may be reduced to 16 feet where cars can overhang wheel stops or curbs. Standard parking spaces shall have a width of 9 feet, and compact parking spaces shall have a width of 8.5 feet. Within every parking lot or garage, up to 50 percent of all spaces may be compact.

Parking Dimensions – On-Street. On-street parking spaces shall have a length of 20 feet. On-street parking shall have a width of 7 feet on Boulevards and Avenues, and a width of 6 feet on Lanes (where hazards due to opening doors are minimal).

Landscaping. Surface parking shall place one tree adjacent to every six parking spaces. Diamond-shaped tree wells (approximately 5 feet by 5 feet) are an efficient means to meet this requirement, as they take advantage of car overhangs. Surface parking lots may not exceed a dimension of 260 feet in any direction without providing a landscaped pedestrian walkway.

3.2 Industrial Development Guidelines

The Kalaeloa Master Plan seeks to reserve appropriate areas for a range of industrial and commercial activities. The industrial areas prevent intrusion from residential uses to avoid presenting residential uses with inappropriate risks and to protect against the loss of industrial jobs and activities. These guidelines provide a high degree of flexibility, while also enhancing the image and identity of Industrial areas.

3.2.1 Land Use Standards

3.2.1.1 Permitted and Conditional Uses (Table D-10.)

USE P = Permitted C = Conditional Uses X = Not Permitted	Light Industrial	Industrial	Industrial Airport-Related
Offices in support of business or industry otherwise permitted (up to 30 percent of total floor area)	P	P	P
Airports and aircraft transportation services, incl. terminals (and ancillary uses), charter services, hangers, heliports,	X	P	P
Amusement enterprises (land-intensive), incl. go-cart, miniature golf, batting cages, and driving ranges.	P	P	X
Bars, pubs, and cocktail lounges.	C	C	C
Bulk postal services.	P	P	P
Car, truck and equipment rental agencies.	P	P	P
Construction goods and services, incl. contractor offices and storage, lumber yards, nurseries and fixture sales.	P	P	X
Cultural facilities, including libraries, art galleries, and museums.	X	X	P
Churches and other religious places of worship.	P	X	X
Cinemas, theatres, and auditoria, including sport halls and arenas.	P	X	X
Community services, including fire and police stations, but not community centers, day care and private schools.	P	P	P
Electronic equipment sales and repairs.	P	P	X
Gas stations, including carwash, accessory retail, and towing.	P	P	P
Health clubs, swim clubs, tennis clubs and gymnasia.	P	P	P
Laboratories, but not including hospitals, medical offices and clinics.	P	X	P
Laundries, industrial, for clothes, carpets, and chemical cleaning.	P	P	P
Limousine and taxi services, not including outdoor storage.	P	P	P
Lodging, incl. hotels, spas, executive suites, and bed and breakfasts.	P	P	P
Manufacturing/Light, including apparel, furniture, fixtures, glass, equipment, ceramics, textiles, jewelry, toys and prepared foods.	P	P	P

USE P = Permitted C = Conditional Uses X = Not Permitted	Light Industrial	Industrial	Industrial Airport-Related
Manufacturing/Heavy, incl. concrete, paper products and petroleum products, chemicals, meatpacking, and sandblasting.	X	P	X
Offices in support of business or industry otherwise permitted (up to 30 percent of total floor area)	P	P	P
Offices, including corporate offices, medical offices and clinics, engineering and design offices, legal and counseling offices.	P	X	X
Personal services, including dry cleaners, laundries, photo developing, hair stylists, and shoe repairs.	P	P	P
Outdoor storage of cars, equipment and goods	X	P	P
Repair services for cars, trucks, machines, and appliances.	X	P	P
Reprographic services.	P	P	P
Research and Development, including light industrial activities combined with office, administrative, or research facilities (1).	C	C	P
Restaurants and other “sit-down” eating establishments.	X	X	P
Schools (land-intensive), incl. driver training and vocational.	P	X	X
Transportation Yards and Freight, incl. truck and transit yards/ services, and freight distribution.	X	P	P
Veterinary services and kennels	P	X	X
Warehousing	C	P	P

Table D-11.

INTENSITY	Light Industrial	Industrial	Industrial Airport-Related
Maximum Allowable Floor Area Ratio		0.50	

Floor Area Ratio shall be defined as the gross floor area of all buildings at all levels, divided by the total site area of a project, less undevelopable areas. Parking structures shall not be counted toward the gross floor area calculation.

In Industrial areas, buildings shall not exceed 40 feet in height. Occasional projections may extend 10 feet beyond the height limit, such as clerestory window assemblies, flagpoles, screened equipment, and decorative features.

3.2.2 Building Standards

3.2.2.1 Industrial Area Buildings

Table D-12.

Building Orientation	Minimum and Maximums
Street-Facing Setback (1)	20 feet minimum
Interior Side Setback	0 or 8 feet minimum
Interior Separations	0 or 16 feet minimum
Rear Setback	15 feet minimum
Rear Separation	30 feet minimum
Building Height (2)	40 feet maximum

(1) Features that may encroach into street-facing setbacks but not street right-of-ways (up to the maximum specified): bay windows (3 feet maximum), eaves (4 feet maximum); arcades, trellises, porches and stoops (5 feet maximum); minor ornamental features (2 feet maximum). Arcades and porches shall have a clear dimension of at least 8 feet.

(2) Occasional vertical projections may extend 10 feet beyond the height limit, such as chimneys, cupolas, flagpoles, screened equipment, and decorative features.

Building Height. In Industrial areas, buildings shall not exceed 40 feet in height. Occasional projections may extend 10 feet beyond the height limit (e.g., clerestory window assemblies, flagpoles, screened equipment, and decorative features).

Street Frontage. A landscaped street frontage is required along 80 percent of street-facing frontage for a depth of at least 10 feet at the street right-of-way, except where site access cannot be otherwise provided. Landscaping shall include shrubs and trees. Parking may occur between this landscaped frontage and street-facing building facades.

Building Entry. Primary entries for new buildings shall connect where possible directly to a street by a sidewalk, or otherwise by landscaped paths. Each primary entry shall be accompanied by an arcade, awning, or portico.

Building Transparency. At least 10 percent of street-facing elevations shall be comprised of windows and/or entrances. Transparency shall be measured by taking the total area of all windows and entrances, and dividing it by the total area of the street-facing building elevation. Glass block, mirrored glass, frosted glass, clerestory windows (sill heights over five feet from floor-level), and other obscured openings may not be used to meet this requirement.

Industrial Area Buildings Standards

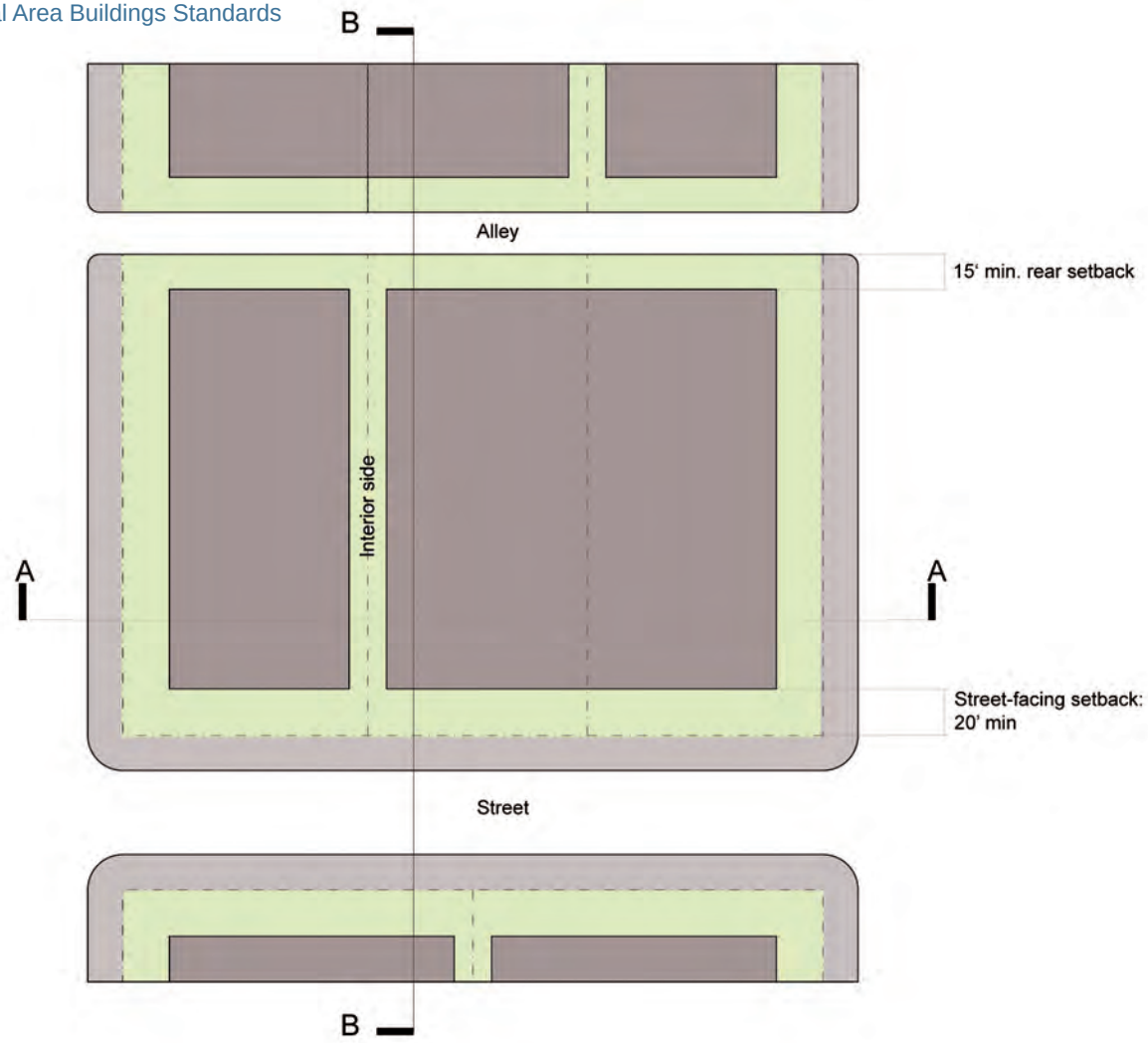


Figure D-43. Industrial Area Buildings Plan Diagram

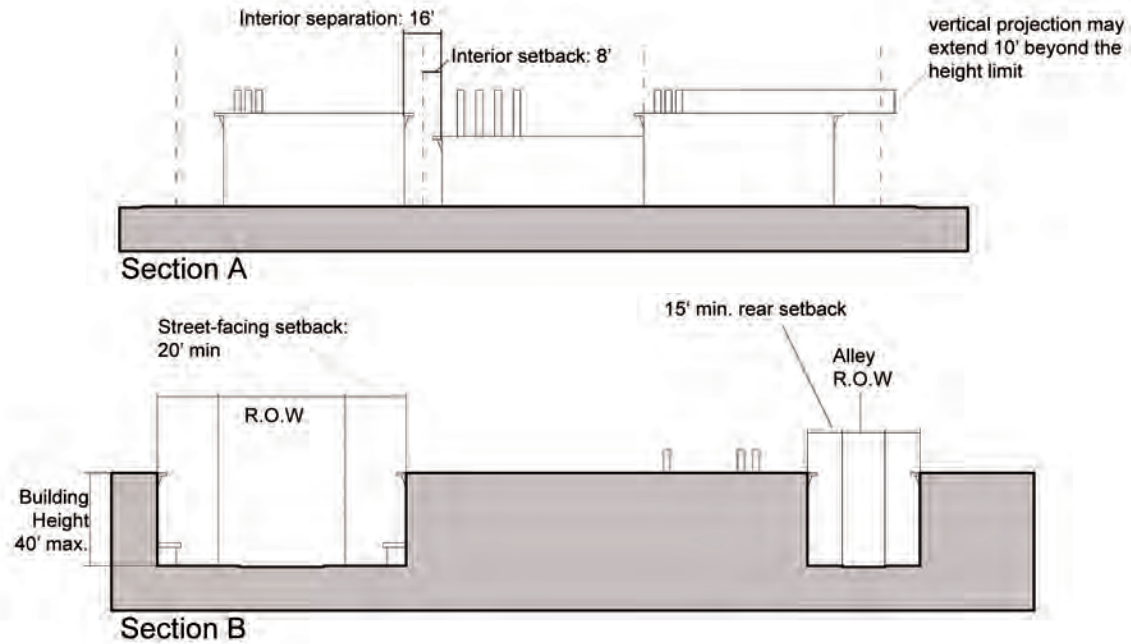


Figure D-44. Industrial Area Buildings Section Diagram

Massing. Street-facing facades shall not be of the same height and setback for more than 60 feet without an architectural projection that projects at least 5 feet in front of the façade, and at least 5 feet above or below the typical façade height. Arcades, window bays, and "towers" may be used.

Rooftop Equipment. Mechanical equipment shall not be visible, except when viewed from above. Equipment may be recessed within the profile of the building, or it may be screened architecturally. Hawaiian Electric Company Inc. is promoting the installation of solar hot water systems. This equipment should be screened from sidewalk level views and located to maximize solar exposure.

Service and Loading Areas. Service and loading areas shall not be visible from streets or public open spaces. To conform, they shall be located away from the side, behind buildings, or screened with landscaping or ornate walls. Free-standing equipment and refuse containers shall be screened from the view of streets and public open space.

Waste Re-Use. Industrial uses within the Kalaeloa area should participate in an aggressive campaign of re-using the waste from other industries. Beginning such a program can be as simple as making an inventory of the industrial wastes generated in the vicinity, and making it available to manufacturers seeking resources (as seen in Brownsville, Texas and Chattanooga, Tennessee). An additional step is for the project to help recruit and co-locate industries that may have complementary processes, with regard to inputs and outputs.

3.2.3 Site Standards

3.2.3.1 Fences and Walls

Fences and walls shall be set back at least 5 feet from any street or alley right-of-way with intervening landscaping. Fences and walls shall not exceed a height of 42 inches within street-facing setbacks, but may be placed on raised berms. Street-facing fences shall not run more than 30 feet without pilasters or a horizontal off-set of at least 5 feet. Fences and walls shall not exceed a height of 80 inches along interior side and rear property lines. Cyclone fencing, chain-link fencing, barbed-wire fencing, and razor-wire fencing are prohibited.

3.2.3.2 Parking

Projecting Demand. Peak demand for individual uses shall be calculated using the factors contained in Table D-13. Alternatively, projections for peak demand may consider savings attributable to the joint use of parking by different uses. When used jointly, peak demand shall be calculated utilizing the methodology and time-of-day demand profiles for parking contained in “S “Shared Parking” (The Urban Land Institute. 1983); subject to the approval of the City and County of Honolulu. Time-of-day profiles that are not contained in Shared Parking may be developed and applied for uses that are not described in Shared Parking.

Table D-13. Peak Demand for Individual Uses

Manufacturing	3 occupants per space
Bars, pubs, and cocktail lounges	8 spaces per 1,000 square feet
Cultural facilities	3 occupants per space
Churches and other places of worship	4 occupants per space
Cinemas, theatres, auditoriums and arenas	3 occupants per space (1)
Community facilities, such as community centers, day care, schools	1 space per employee, plus curbside drop-off
Manufacturing	1 spaces per 1,000 square feet
Office uses	3 spaces per 1,000 square feet
Sales and repair	1 spaces per 1,000 square feet
Warehousing	1.1 spaces per employee
Restaurants, fast-food	8 spaces per 1,000 square feet
Restaurants and other “sit-down” dining	8 spaces per 1,000 square feet

Projects within 650 feet of bus stops may factor a 10 percent reduction in parking demand. Projects within 800 feet of light rail stops may factor a 20 percent reduction in parking demand.

Calculating Supply. Parking requirements can be met by considering the sum of all on-site parking (at surface and in structures), plus on-street parking contained within or immediately adjacent to the project, plus contributions made by joint-use parking facilities.

Parking Location. Building setback and frontage requirements necessitate that parking lots be placed generally to the rear of buildings. Where parking lots abut streets, a 10-foot landscaped setback shall be provided, and parking shall be screened by a 36 - 42 inches hedge or wall. Where multi-level parking structures abut streets, they shall contain storefront space at ground-floor level. Attached residential parking garages that face streets shall be setback at least 20 feet.

Parking Dimensions – On-Site. Parking spaces shall be assumed to have a length of 18 feet; this may be reduced to 16 feet where cars can overhang wheel stops or curbs. Standard parking spaces shall have a width of 9 feet, and compact parking spaces shall have a width of 8.5 feet. Within every parking lot or garage, up to 50 percent of all spaces may be compact.

Parking Dimensions – On-Street. On-street parking spaces shall have a length of 20 feet. On-street parking shall have a width of 7 feet on Boulevards and Avenues, and a width of 6 feet on Lanes (where hazards due to opening doors are minimal).

Landscaping. Surface parking shall place one tree adjacent to every six parking spaces. Diamond-shaped tree wells (approximately 5 feet by 5 feet) are an efficient means to meet this requirement, as they take advantage of car overhangs. Surface parking lots may not exceed a dimension of 260 feet in any direction without providing a landscaped pedestrian walkway.

3.3 Sustainable Design Guidelines

The following guidelines are intended to identify sustainable design features which support the intention of the Kalaeloa Master Plan.

Shaded Heating, Ventilation, Air Conditioning (HVAC) Equipment. Shading HVAC equipment can cut energy use by more than 10 percent. Shade can be created by fixed or temporary canopies, or by trees.

Shaded Openings. South- and west-facing windows, exterior doorways and other openings should be accompanied by awnings and other overhangs, or be recessed within arcades or wall cavities.

Interior Day Lighting. Light shelves, light wells, skylights and other features can bring more daylight to the interior parts of buildings, and dramatically reduce the need for ambient lighting. Skylights and other opening should be shaded, so as not to increase air conditioning loads.

Cross Ventilation. Operable windows and skylights should be incorporated into buildings. “Smart” HVAC systems should be used so that natural ventilation can complement HVAC equipment. Operable windows are especially important during extended power failures.

Thermal Mass. Where direct sunlight enters building envelopes, consider using concrete or other thermal mass to capture that energy during the day and release it at night.

Photovoltaics. Photovoltaic technology and cost competitiveness have advanced dramatically in recent years. Consider their incorporation on roofs and/or window overhangs. Given Kalaeloa’s sunny micro-climate, photovoltaics represent a money making “hybrid” function that can be offered easily and in tandem with other development objectives.

Green Roofs. Green roofs are topped with a layer of soil and vegetation, an effective thermal barrier that reduces energy use and prolongs the life of the conventional roofing materials that lay below it.

Cisterns and Drywells. Consider installing cistern and drywells “close to the source” at the bottom of downspouts, below parking lots, or within planter strips. Cisterns store water and if raised above grade, can irrigate yards and gardens without using a pump. Drywells accelerate the infiltration of stormwater and improve its quality. Downspouts or other conveyance systems should filter stormwater with metal screens to keep out leaves and other debris.

4.0 Kalaeloa Design Guidelines Glossary

Accessory use or structure:	A use or structure that is incidental or subordinate to the principal use or structure.
Alley:	A service lane at the rear of lots and/or mid-block, which is used primarily for vehicular access to parking and urban services.
Avenue:	A major collector street or minor arterial street with not more than two travel lanes (turn lanes excepted), and designed in a way that supports pedestrian comfort and street-facing uses.
Block:	Properties bound on all sides by a street.
Boulevard:	An arterial street with not more than four travel lanes (turn-lanes excepted), and designed in a way that supports pedestrian comfort and street-facing uses, as wells as special functions like bicycle lanes and rapid transit.
Building Entry:	The primary point of ingress into a building for pedestrians.
Community Use:	Facilities for active use by the public or by community members within a project area.
Connectivity:	The extent to which streets are interconnected, often measured as the average number of street intersections per ten acres.
Continuous:	Uninterrupted by obstacles or obstructions.
Courtyards:	A publicly-accessible open space enclosed by buildings along at least 50% of its perimeter, where plants predominate.
Density:	Gross density is the ratio of the overall number of dwelling units over the total developable acreage (inclusive of streets and parks, but exclusive of environmental constraints, landscaped buffers and

peripheral roadways). Net density is the ratio of the overall number of dwelling units over the acreage contained within private lots (exclusive of streets, parks, landscaped buffers and environmental constraints).

Floor Area Ratio: For a parcel or project, FAR is the ratio of the total floor area of all buildings (all levels) divided by the total parcel or project site area. Because they promote transit- and pedestrian-supportive environments, the floor area of multi-level parking garages shall not be considered.

Façade: The exterior walls of a building, with the front façade exposed to public view.

Frontage: The side of a parcel adjacent to a street. See also "Street Frontage."

Height: The vertical dimension of a building or other structure measured from the lowest point of the finished elevation of the abutting site.

Interior Side: The side of parcel that is not adjacent to a street nor opposite the primary street-facing side (or rear) of a use.

Joint-Use Parking: An arrangement where parking is shared among different uses, and resulting in opportunities for more efficient use of parking supplied.

Landscaping: Site areas containing planted areas (such as trees, shrubs, groundcover, and similar) along with non-plant decorative elements (such as stone, pavers, water features, ornate tiles, art, and similar).

Lane: A local street or minor collector street with not more than two travel lanes that are dimensioned such that motorists must slow when approaching on-coming traffic. Lanes are also designed in a way that supports pedestrian comfort and street-facing uses. (See also "Travel Lane")

Parkway:	A linear landscaped area of sufficient width to accommodate paths and generous landscaping.
Preserve:	A natural or environmental asset where future urban development is prohibited.
Plaza:	A publicly-accessible open space enclosed by buildings along at least 50% of its perimeter, where hardscaping generally predominates.
Setback:	The dimension between a required position of a building or other feature within a property and a specified property line.
Separation:	The dimension between buildings or other specified features, without regard to property lines.
Shared Parking:	See Joint-Use Parking.
Street-Facing:	A building or use that orients its front and/or primary entry toward the street, without intervening parking lots or setbacks that exceed maximum permitted. Building sides may be street-facing on corner lots.
Street Frontage:	The ratio that is the linear dimension of all street-facing buildings between two intersecting street right-of-ways divided by the total linear dimension between the intersecting street right of ways.
Storefronts:	Storefronts are street-facing ground-floor businesses or services that are: publicly-accessible during business hours, generate moderate-to-high levels of pedestrian activity with entrances facing the street, and have generous windows and display windows facing the street.
Superblock:	A block (bound by streets on all sides) that exceeds 400 feet on a side and an acreage of 6 acres. Superblocks do not permit traffic to circulate through their interior, and therefore increase traffic volumes on surrounding streets – often to a level where attracting street-facing uses becomes difficult.

Transit-Oriented Development: Urban development that surrounds bus stops or rapid transit stations, which has a density that supports frequent transit service, and has street and building designs that make pedestrian routes to transit safe, convenient, and comfortable.

Travel Lane: That portion of a cartway devoted to vehicular movement, and of a width scaled to accommodate vehicles at design speeds appropriate to surrounding land uses that may be pedestrian-oriented.

Transparency: A measure for the amount of a façade that is penetrated by windows, entrances, and other interior-exterior openings. Obscured glazing (such as mirrored glass and glass block) does not contribute to transparency.

Appendix E

Acoustic Working Paper

ACOUSTIC WORKING PAPER FOR THE KALAELOA COMMUNITY DEVELOPMENT PLAN KALAELOA AIRPORT KAPOLEI, OAHU

Prepared for:

BELT COLLINS HAWAII

Prepared by:

Y. EBISU & ASSOCIATES
1126 12th Avenue, Room 305
Honolulu, Hawaii 96816

AUGUST 2005

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES (CONTINUED)

LIST OF TABLES

LIST OF TABLES (CONTINUED)

LIST OF TABLES (CONTINUED)

CHAPTER I. SUMMARY

This working paper was developed to assist in the development of the new Master Plan for Kalaeloa, which includes the former lands of Naval Air Station, Barbers Point. Kalaeloa Airport is contained within the Kalealoa study area, and is presently operated by the Hawaii State Department of Transportation, Airports Division (HDOTA). Because aircraft noise associated with existing and future operations at Kalaeloa Airport could place constraints on compatible land use developments within the Kalealoa study area, aircraft noise contours for existing and forecast conditions to the year 2025 were developed. Forecast conditions assumed continued operations at Kalaeloa Airport, with general aviation and military training operations continuing to be the predominant types of operations at the airport. Tower, U.S. Coast Guard, FAA personnel, and HDOTA data were the primary sources of aircraft operational data and forecasts used in the noise modeling efforts.

Potential aircraft noise impacts resulting from the existing and forecast operations at the airport through 2025 were evaluated by developing aircraft noise contours using the Federal Aviation Administration (FAA) Integrated Noise Model, Version 6.1 (INM 6.1). Noise contours for Years 2004 and 2025 were developed to provide the initial planning templates for the Master Plan study. The results of the aircraft noise modeling for the 2025 period indicated that adverse noise impacts need not occur as a result of the proposed Master Plan, and that the generally compatible land use situation can be maintained through 2025.

The potential for incompatible land uses and potential noise impacts under alternate uses of the airport were also evaluated to provide additional noise contour templates for the Master Plan study. These alternate uses included: the transfer of interisland and overseas air cargo operations from Honolulu International Airport (HIA) to Kalaeloa Airport; and the use of Kalaeloa Airport by jet fighter aircraft from an aircraft carrier based in Hawaii. These alternate uses were expected to increase the aircraft noise contours around Kalaeloa Airport, and could also place constraints on compatible land uses on land areas beyond the Kalaeloa area boundaries.

Because the planned Ocean Pointe development is located under the local flight tracks used by the large fixed wing aircraft (C-130, P-3C, and C-26), and because the existing military beach cottages are located under the local flight tracks used by the small fixed wing and rotary wing aircraft, the potential for complaints regarding aircraft overflights exists and will continue to exist. These overflights are expected to continue for the foreseeable future, with the frequency of overflights expected to increase as the operations at Kalaeloa Airport increase.

The redevelopment of the Kalaeloa planning area is not expected to change the aircraft operations at Kalaeloa Airport. Continuation of the existing types of aircraft operations at Kalaeloa Airport are not expected to place severe constraints on the redevelopment options within the Kalaeloa planning area. The other potential uses of

Kalaeloa Airport for air cargo and jet fighter operations can increase the aircraft noise contours by significant amounts and extend the 60 DNL contour beyond the Kalaeloa planning area boundaries. Under the worst case scenarios associated with jet fighter aircraft operations at Kalaeloa Airport, large land areas are also expected to be enclosed by the 75 DNL contour. Both the air cargo and jet fighter uses of Kalaeloa Airport are expected to enlarge the aircraft noise contours beyond those originally forecast for 2025.

CHAPTER II. PURPOSE

The purpose of this working paper was to identify the potential aircraft noise contours associated with the possible future operations at Kalaeloa Airport at the site of the former Naval Air Station, Barbers Point on the island of Oahu. This working paper described and evaluated the existing and potential noise environment in the environs of Kalaeloa Airport for various scenarios. These scenarios were: Year 2025 using currently available forecasts for Kalaeloa Airport; potential conditions at some future period with Year 2004 cargo aircraft operations transferred from Honolulu International Airport to Kalaeloa Airport, and with an 11,000 foot runway at Kalaeloa Airport; and potential conditions at some future period with military fighter training operations at Kalaeloa Airport. The aircraft noise contours associated with the cargo and military fighter aircraft operations are considered to be speculative, and have been developed to describe the potential (rather than forecast) future noise environment associated with those scenarios.

CHAPTER III. NOISE DESCRIPTORS AND THEIR RELATIONSHIP TO LAND USE COMPATIBILITY

A general consensus has developed for using the Day-Night Sound Level (DNL or Ldn) in describing environmental noise in general, and for relating the acceptability of the noise environment for various land uses. The Day-Night Sound Level represents the 24-hour average sound level for a typical day, with nighttime noise levels (10:00 P.M. to 7:00 A.M.) increased by 10 decibels prior to computation of the 24-hour average. By definition, the minimum averaging period for the DNL descriptor is 24 hours. The total number of annual aircraft operations are divided by 365 days to obtain the 24-hour average used in DNL computations.

The DNL descriptor employs a process of averaging instantaneous A-Weighted sound levels as read on a standard Sound Level Meter, which are normally referred to as meter readings in dBA. A brief description of the acoustic terminology and symbols used are provided in Appendix B. The maximum A-Weighted sound level occurring during an aircraft flyby event (or single event) is referred to as the Lmax value. The mathematical product (or integral) of the instantaneous sound level times the duration of the event is known as the Sound Exposure Level, or Lse, and is analogous to the energy of the time varying sound levels associated with an aircraft flyby event. Current noise standards and criteria which associate land use compatibility or adverse health and welfare effects with various levels of environmental noise are normally described in terms of DNL rather than the single event (Lmax or Lse) noise descriptors. The reasons for this are based on the relatively good correlation between the cumulative DNL descriptor and annoyance reactions of the exposed population. However, at very low levels of environmental noise (55 DNL or less), other attitudinal variables and biases (besides noise) of the exposed population tend to influence annoyance reactions, and the correlation between annoyance reactions and DNL levels deteriorates.

Table III-1, derived from Reference 1, presents current federal noise standards and acceptability criteria for residential land uses. One example of land use compatibility guidelines for various levels of environmental noise as measured by the DNL descriptor system are contained in Reference 2 and are shown in Figure III-1. As a general rule, noise levels of 55 DNL or less occur in rural areas, or in areas which are removed from high volume roadways. In urbanized areas which are shielded from high volume streets, DNL levels generally range from 55 to 65 DNL, and are usually controlled by motor vehicle traffic noise. Residences which front major roadways are generally exposed to levels of 65 DNL, and as high as 80 DNL when the roadway is a high speed freeway. Due to noise shielding effects from intervening structures, interior lots are usually exposed to 3 to 10 DNL lower noise levels than the front lots which are not shielded from the traffic noise.

For the purposes of determining noise acceptability for funding assistance from federal agencies (FAA, FHA/HUD, and VA), an exterior noise level of 65 DNL or lower is considered acceptable. This standard is applied nationally (Reference 3), including

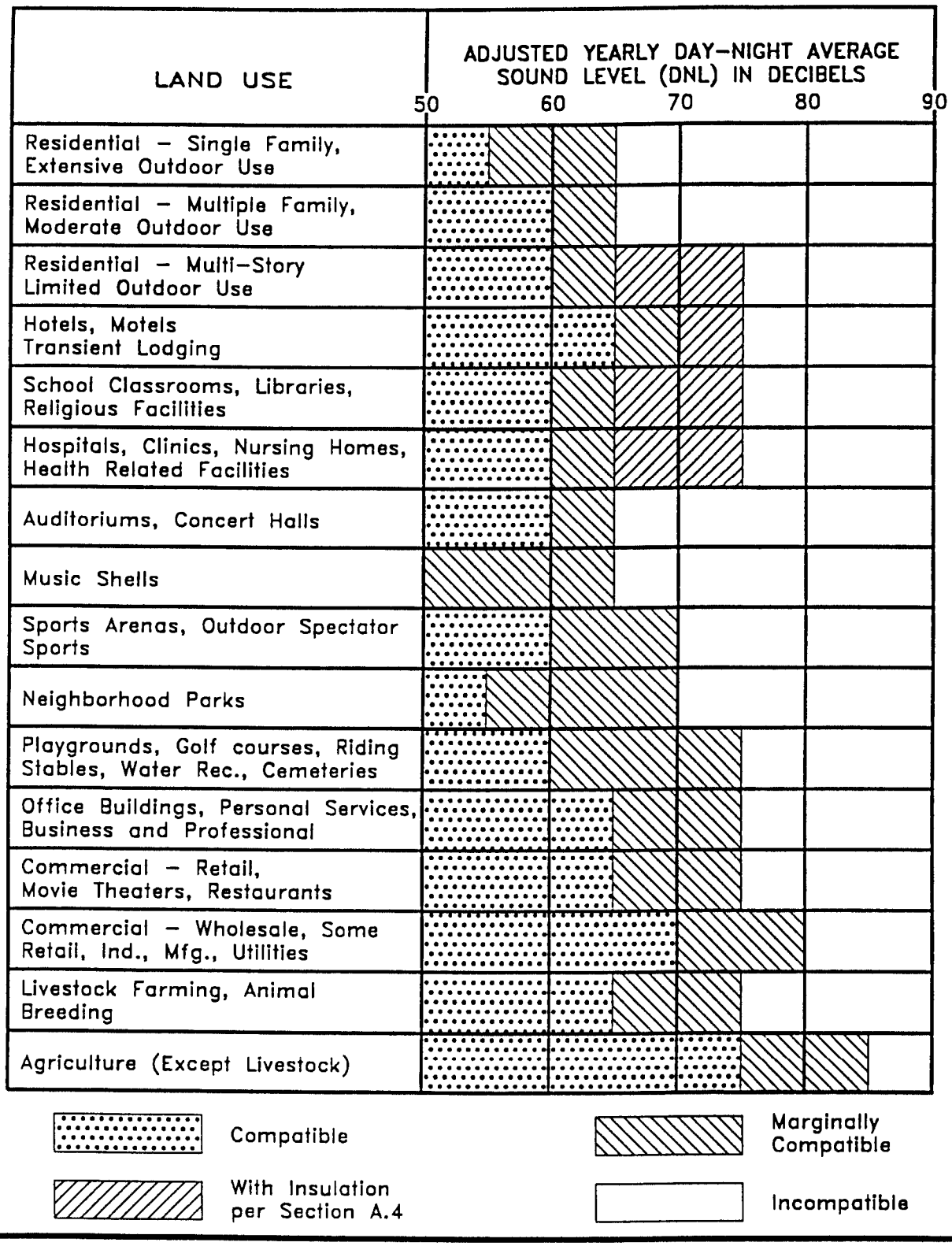
TABLE III–1

EXTERIOR NOISE EXPOSURE CLASSIFICATION (RESIDENTIAL LAND USE)

NOISE EXPOSURE CLASS	DAY–NIGHT SOUND LEVEL	EQUIVALENT SOUND LEVEL	FEDERAL (1) STANDARD
Minimal Exposure	Not Exceeding 55 DNL	Not Exceeding 55 Leq	Unconditionally Acceptable
Moderate Exposure	Above 55 DNL But Not Above 65 DNL	Above 55 Leq But Not Above 65 Leq	Acceptable(2)
Significant Exposure	Above 65 DNL But Not Above 75 DNL	Above 65 Leq But Not Above 75 Leq	Normally Unacceptable
Severe Exposure	Above 75 DNL	Above 75 Leq	Unacceptable

Notes: (1) Federal Housing Administration, Veterans Administration, Department of Defense, and Department of Transportation.

(2) FHWA uses the Leq instead of the Ldn descriptor. For planning purposes, both are equivalent if: (a) heavy trucks do not exceed 10 percent of total traffic flow in vehicles per 24 hours, and (b) traffic between 10:00 PM and 7:00 AM does not exceed 15 percent of average daily traffic flow in vehicles per 24 hours. The noise mitigation threshold used by FHWA for residences is 67 Leq.



LAND USE COMPATIBILITY WITH YEARLY AVERAGE DAY–NIGHT AVERAGE SOUND LEVEL (DNL) AT A SITE FOR BUILDINGS AS COMMONLY CONSTRUCTED.
(Source: American National Standards Institute S12.9–1998/Part 5)

FIGURE III–1

Hawaii. Because of our open-living conditions, the predominant use of naturally ventilated dwellings, and the relatively low exterior-to-interior sound attenuation afforded by these naturally ventilated structures, an exterior noise level of 65 DNL does not eliminate all risks of noise impacts. Because of these factors, and as recommended in Reference 4, a lower level of 55 DNL is considered as the "Unconditionally Acceptable" (or "Near-Zero Risk") level of exterior noise. For typical, naturally ventilated structures in Hawaii, an exterior noise level of 55 DNL results in an interior level of approximately 45 DNL, which is considered to be the "Unconditionally Acceptable" (or "Near-Zero Risk") level of interior noise in respect to potential adverse health and welfare effects. However, after considering the cost and feasibility of applying the lower level of 55 DNL, government agencies such as FAA, FHA/HUD, and VA have selected 65 DNL as a more appropriate regulatory standard.

For aircraft noise, the State Department of Transportation, Airports Division, has recommended that 60 DNL be used as the common level for determining land use compatibility in respect to noise sensitive uses near its airports. Table III-2 presents the current land use compatibility guidelines which have been recommended for use around the Hawaii State airports. It should be noted that for residential and certain public uses (schools, daycare centers, libraries, and churches), aircraft noise levels less than 60 DNL are considered to be compatible in Table III-2. In order to further reduce risks of adverse noise impacts from airport noise in the State of Hawaii, Reference 5 requires that disclosure of the airport noise levels be provided prior to real property transactions concerning properties located within Air Installation Compatibility Use Zones (AICUZ) or located within airport noise maps developed under Federal Aviation Regulation (FAR) Part 150 - Airport Noise Compatibility Planning (14 CFR Part 150). AICUZ or FAR Part 150 Noise Exposure Maps have not been developed for Kalaeloa Airport.

For commercial, industrial, and other non-noise sensitive land uses, exterior noise levels as high as 75 DNL are generally considered acceptable. Exceptions to this occur when naturally ventilated office and other commercial establishments are exposed to exterior levels which exceed 65 DNL.

It is of interest to note from Table III-2 that noise levels below 60 DNL are considered "Compatible" for lands with "Extensive Natural Wildlife and Recreation Areas." For beach park areas and active playgrounds, such as those which exist or are planned within the environs of the project, noise levels as high as 75 DNL are considered to be "Compatible" in Table III-2. Also from Figure III-1, neighborhood parks and golf courses are considered to be "Marginally Compatible" at levels as high as 70 and 75 DNL, respectively.

On the island of Oahu, the State Department of Health (DOH) regulates noise from fixed mechanical equipment but not aircraft noise levels (Reference 6). State DOH noise regulations for on-site mechanical equipment are expressed in maximum allowable property line noise limits rather than DNL (see Reference 6). Although they

TABLE III–2

HAWAII STATE DEPARTMENT OF TRANSPORTATION RECOMMENDATIONS FOR LOCAL LAND USE COMPATIBILITY WITH YEARLY DAY–NIGHT AVERAGE SOUND LEVELS (DNL).

TYPE OF LAND USE	**** Yearly Day-Night Average Sound Level ****					
	< 60	60-65	65-70	70-75	75-80	80-85
RESIDENTIAL						
Low density residential, resorts, and hotels (outdoor facil.)	Y(a)	N(b)	N	N	N	N
Low density apartment with moderate outdoor use	Y	N(b)	N	N	N	N
High density apartment with limited outdoor use	Y	N(b)	N(b)	N	N	N
Transient lodgings with limited outdoor use	Y	N(b)	N(b)	N	N	N
PUBLIC USE						
Schools, day-care centers, libraries, and churches	Y	N(c)	N(c)	N(c)	N	N
Hospitals, nursing homes, clinics, and health facilities	Y	Y(d)	Y(d)	Y(d)	N	N
Indoor auditoriums and concert halls	Y(c)	Y(c)	N	N	N	N
Government services and office buildings serving the general public	Y	Y	Y(d)	Y(d)	N	N
Transportation and Parking	Y	Y	Y(d)	Y(d)	Y(d)	Y(d)
COMMERCIAL AND GOVERNMENT USE						
Offices - government, business, and professional	Y	Y	Y(d)	Y(d)	N	N
Wholesale and retail - building materials, hardware and heavy equipment	Y	Y	Y(d)	Y(d)	Y(d)	Y(d)
Airport businesses - car rental, tours, lei stands, ticket offices, etc.	Y	Y	Y(d)	Y(d)	N	N
Retail, restaurants, shopping centers, financial institutions, etc.	Y	Y	Y(d)	Y(d)	N	N
Power plants, sewage treatment plants, and base yards	Y	Y	Y(d)	Y(d)	Y(d)	N
Studios without outdoor sets, broadcasting, production facilities, etc.	Y(c)	Y(c)	N	N	N	N
MANUFACTURING, PRODUCTION, AND STORAGE						
Manufacturing, general	Y	Y	Y(d)	Y(d)	Y(d)	N
Photographic and optical	Y	Y	Y(d)	Y(d)	N	N
Agriculture (except livestock) and forestry	Y	Y(e)	Y(e)	Y(e)	Y(e)	Y(e)
Livestock farming and breeding	Y	Y(e)	Y(e)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
RECREATIONAL						
Outdoor sports arenas and spectator sports	Y	Y(f)	Y(f)	N	N	N
Outdoor music shells, amphitheaters	Y(f)	N	N	N	N	N
Nature exhibits and zoos, neighborhood parks	Y	Y	Y	N	N	N
Amusements, beach parks, active playgrounds, etc.	Y	Y	Y	Y	N	N
Public golf courses, riding stables, cemeteries, gardens, etc.	Y	Y	N	N	N	N
Professional/resort sport facilities, locations of media events, etc.	Y(f)	N	N	N	N	N
Extensive natural wildlife and recreation areas	Y(f)	N	N	N	N	N

Numbers in parentheses refer to notes.

KEY TO TABLE III-2:

Y(Yes) = Land Use and related structures compatible without restrictions.

N(No) = Land Use and related structures are not compatible and should be prohibited.

TABLE III–2 (CONTINUED)

HAWAII STATE DEPARTMENT OF TRANSPORTATION RECOMMENDATIONS FOR LOCAL LAND USE COMPATIBILITY WITH YEARLY DAY–NIGHT AVERAGE SOUND LEVELS (DNL)

NOTES FOR TABLE III-2:

(a) A noise level of 60 DNL does not eliminate all risks of adverse noise impacts from aircraft noise. However, the 60 DNL planning level has been selected by the State Airports Division as an appropriate compromise between the minimal risk level of 55 DNL and the significant risk level of 65 DNL.

(b) Where the community determines that these uses must be allowed, Noise Level Reduction (NLR) measures to achieve interior levels of 45 DNL or less should be incorporated into building codes and be considered in individual approvals. Normal local construction employing natural ventilation can be expected to provide an average NLR of approximately 9 dB. Total closure plus air conditioning may be required to provide additional outdoor to indoor NLR, and will not eliminate outdoor noise problems.

(c) Because the DNL noise descriptor system represents a 24-hour average of individual aircraft noise events, each of which can be unique in respect to amplitude, duration, and tonal content, the NLR requirements should be evaluated for the specific land use, interior acoustical requirements, and properties of the aircraft noise events. NLR requirements should not be based solely upon the exterior DNL exposure level.

(d) Measures to achieve required NLR must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

(e) Residential buildings require NLR. Residential buildings should not be located where noise is greater than 65 DNL.

(f) Impact of amplitude, duration, frequency, and tonal content of aircraft noise events should be evaluated.

are not directly comparable to noise criteria expressed in DNL, State DOH noise limits for preservation/residential, apartment/commercial, and agricultural/industrial lands equate to approximately 55, 60, and 76 DNL, respectively.

CHAPTER IV. NOISE STUDY METHODOLOGY

Overall Methodology Used. This aircraft noise study was performed using the most current version of the FAA Integrated Noise Model (INM 6.1) as well the use of the DNL noise metric for describing and analyzing aircraft noise exposure. Airport noise modeling using the INM for the Base Year (2004) and for 2025 were performed. Using the DNL metric, aircraft noise contours were developed for various future scenarios to assist in the creation of the Kalaeloa Community Development Plan.

Base Year Aircraft Operations. The modeling of aircraft noise using the INM requires the development of various data for input into the INM. These inputs include: aircraft flight tracks and altitude profiles, the type and frequency of aircraft operations, the types of aircraft utilizing the airport, and the runway utilization by the various aircraft types during the daytime and nighttime periods. For the purposes of this study, 2004 was considered to be the Base Year, and 2025 was considered to be the future or forecast year. Information regarding Base Year operations at Kalaeloa Airport were obtained primarily from information provided by Kalaeloa Tower personnel, and the Kalaeloa Airport Master Plan (Reference 8). Table IV-1 summarizes some of the key information regarding the runway configuration and Base Year operations at Kalaeloa Airport.

The aircraft flight tracks used to model Base Year operations are shown in Figures IV-1 through IV-4. The Kalaeloa Airport flight tracks shown were developed by modifying and supplementing the Master Plan flight tracks of Reference 8 using information provided by Kalaeloa Tower personnel. The tradewind arrival flight tracks to Honolulu International Airport over the Kalaeloa Airport environs were obtained from draft INM input data used to model Honolulu International Airport noise levels in 2003 and 2008 (Reference 9).

Base Year aircraft operations were derived from 2004 reports provided by Kalaeloa Tower. Downward adjustments to the reported aircraft operations for 2004 were made for the following reasons:

1. The total reported operations for 2004 at Kalaeloa Airport was 140,407. Included in this total were aircraft in transit which communicate with Kalaeloa Tower but which did not physically land at, depart from, or perform local operations at Kalaeloa Airport. The total number of these operations were estimated to be 12,412 operations based on recorded counts of IFR Arrivals, IFR Departures, Overflights, and VFR Itinerant operational categories.

2. The adjusted total operations for 2004 used in this study was 127,726 operations. The adjusted total of 127,726 operations is equal to the reported total of "VFR Local" operations recorded by Kalaeloa Tower. Prior to June 2004, the tower only counted airport operations using the "military" method, where flights by based aircraft (such as from the U.S. Coast Guard or flight school) were counted as local

TABLE IV-1
NOISE MODELING ASSUMPTIONS FOR KALAELOA AIRPORT

RUNWAY LENGTHS (FT):

04R-22L	8,000
04L-22R	4,500
11-29	6,000

LOCAL TRAFFIC PATTERNS:

RUNWAY 04R-22L:

All Propeller General Aviation Aircraft:	800 feet pattern altitude.
All C-130, P-3C, and C-26 Aircraft:	1,000 feet pattern altitude.
All Helicopters:	800 feet pattern altitude.

RUNWAY 04L-22R:

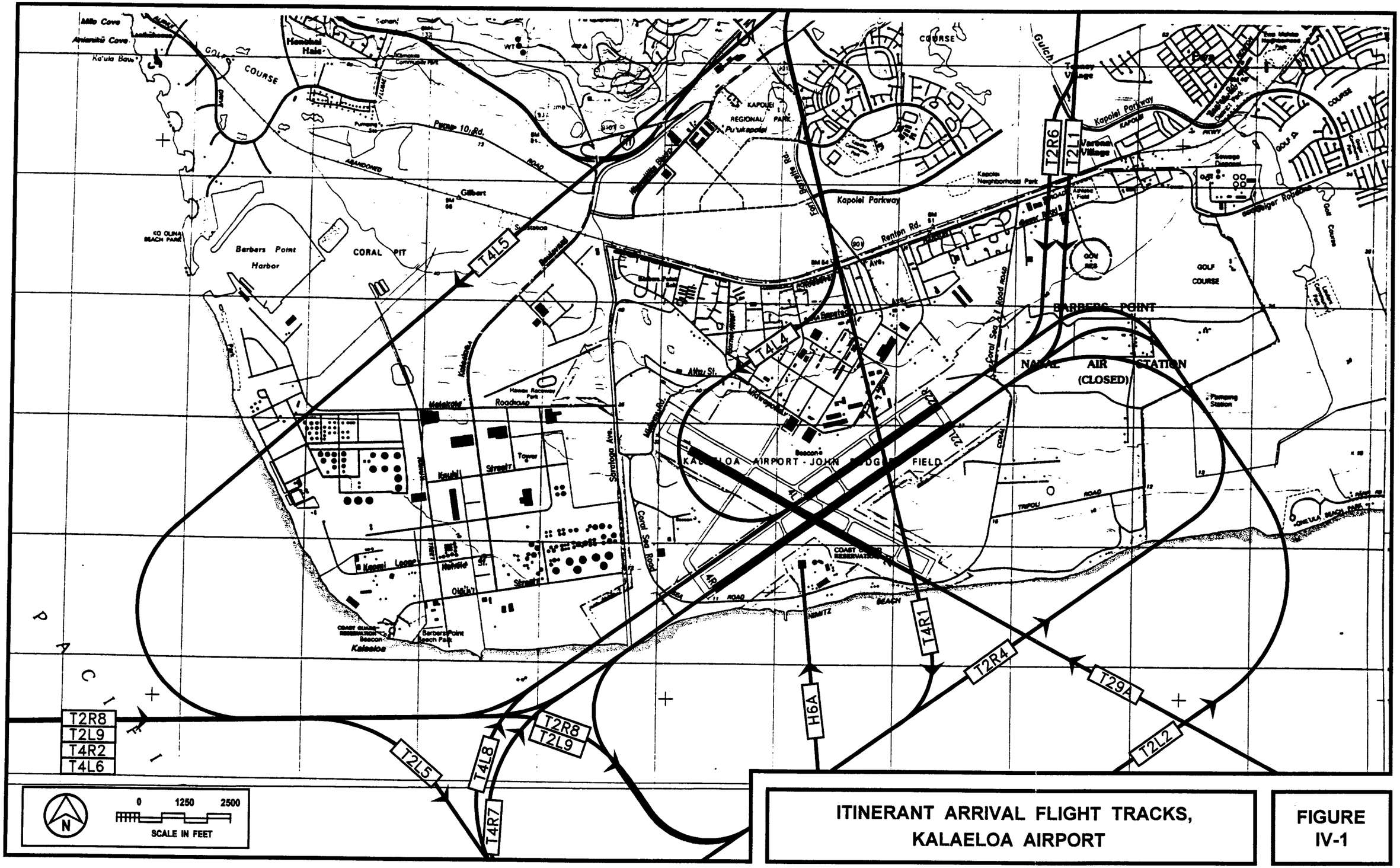
All Propeller General Aviation Aircraft:	800 feet pattern altitude.
All Helicopters:	800 feet pattern altitude.

DAYTIME / NIGHTTIME OPERATIONS:

97 Percent from 0700 to 2200 hours and 3 Percent from 2200 to 0700 hours.

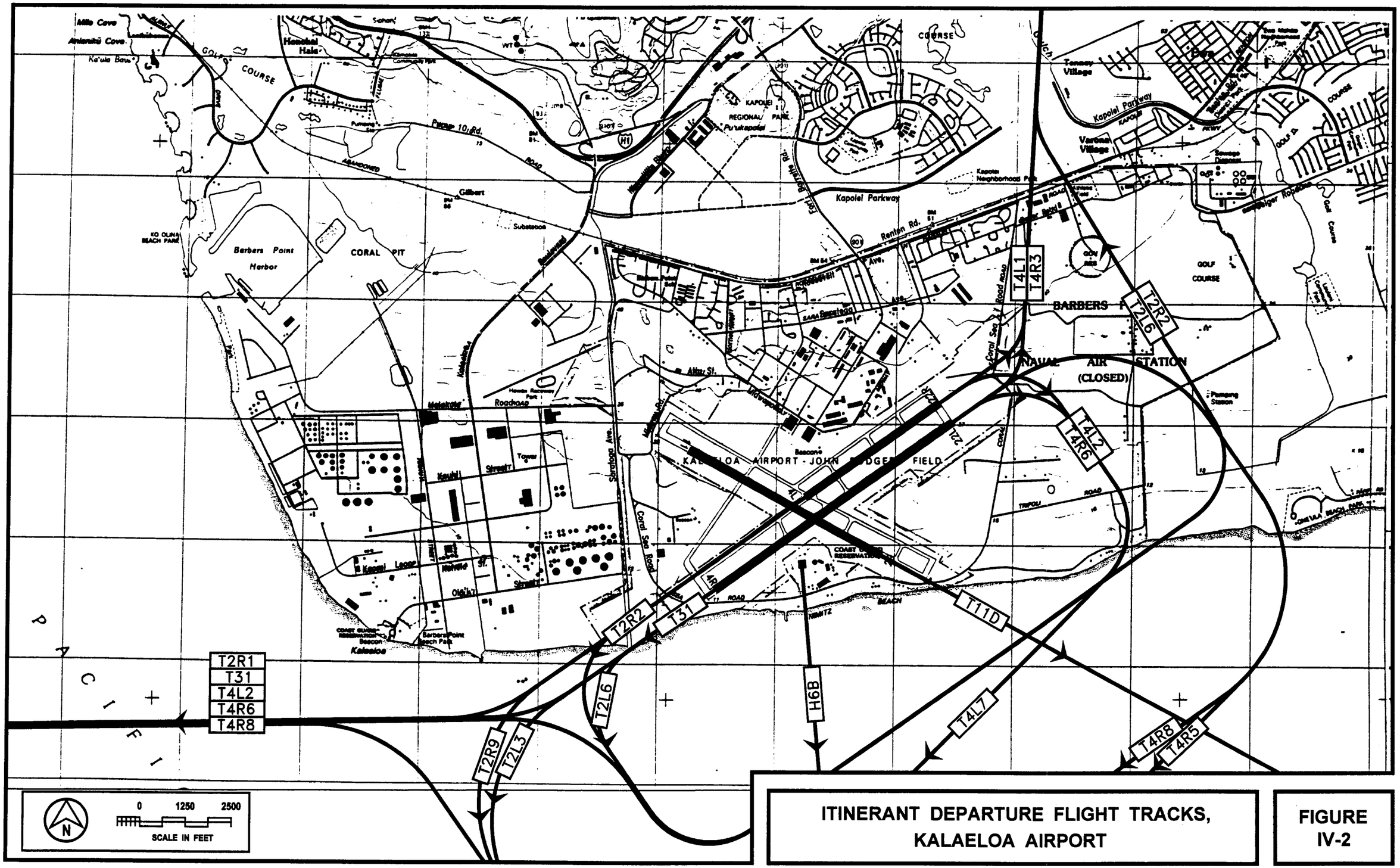
TRADEWIND / KONA OPERATIONS:

85 Percent Tradewind and 15 Percent Kona operations.



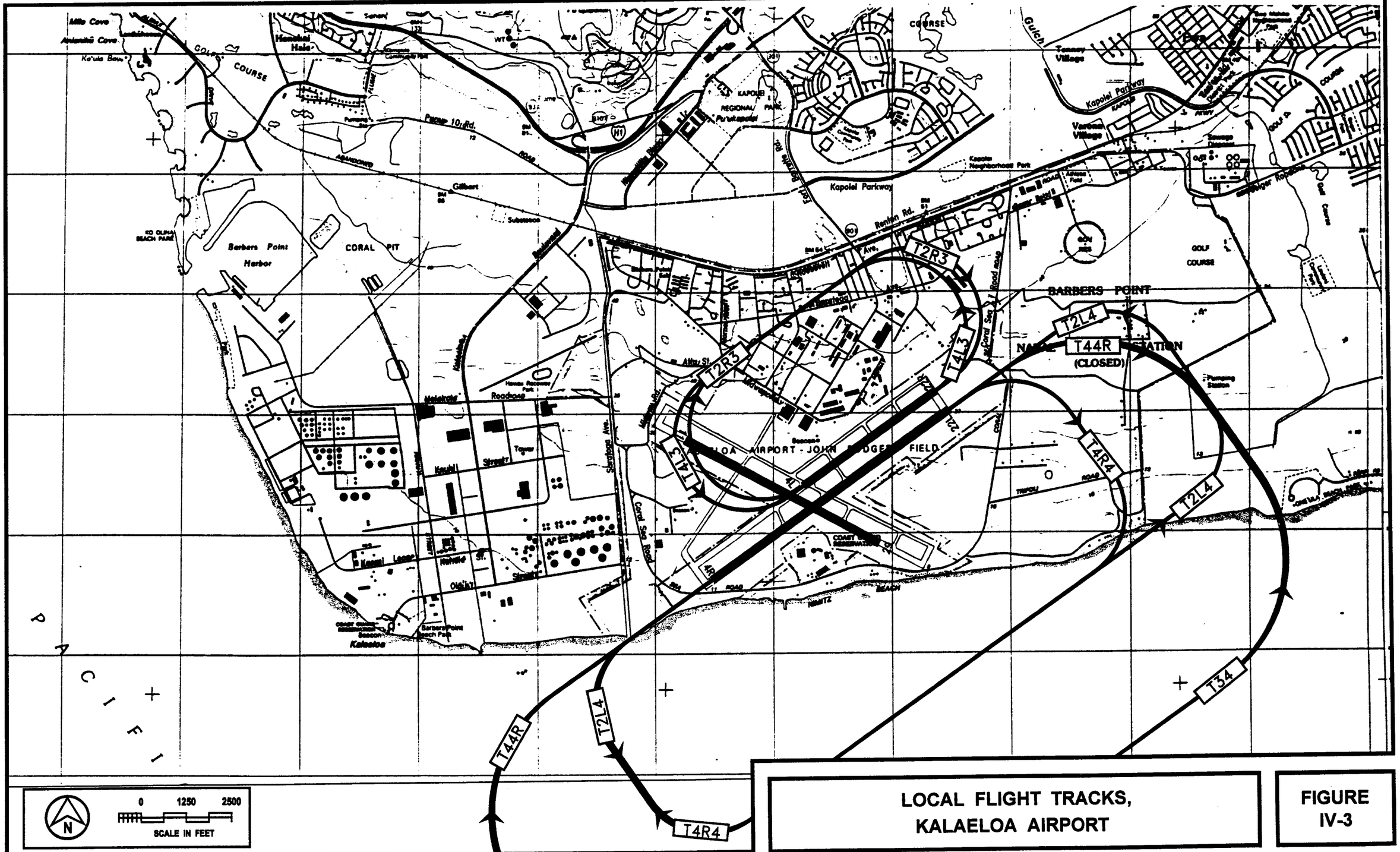
ITINERANT ARRIVAL FLIGHT TRACKS, KALAELOA AIRPORT

FIGURE IV-1



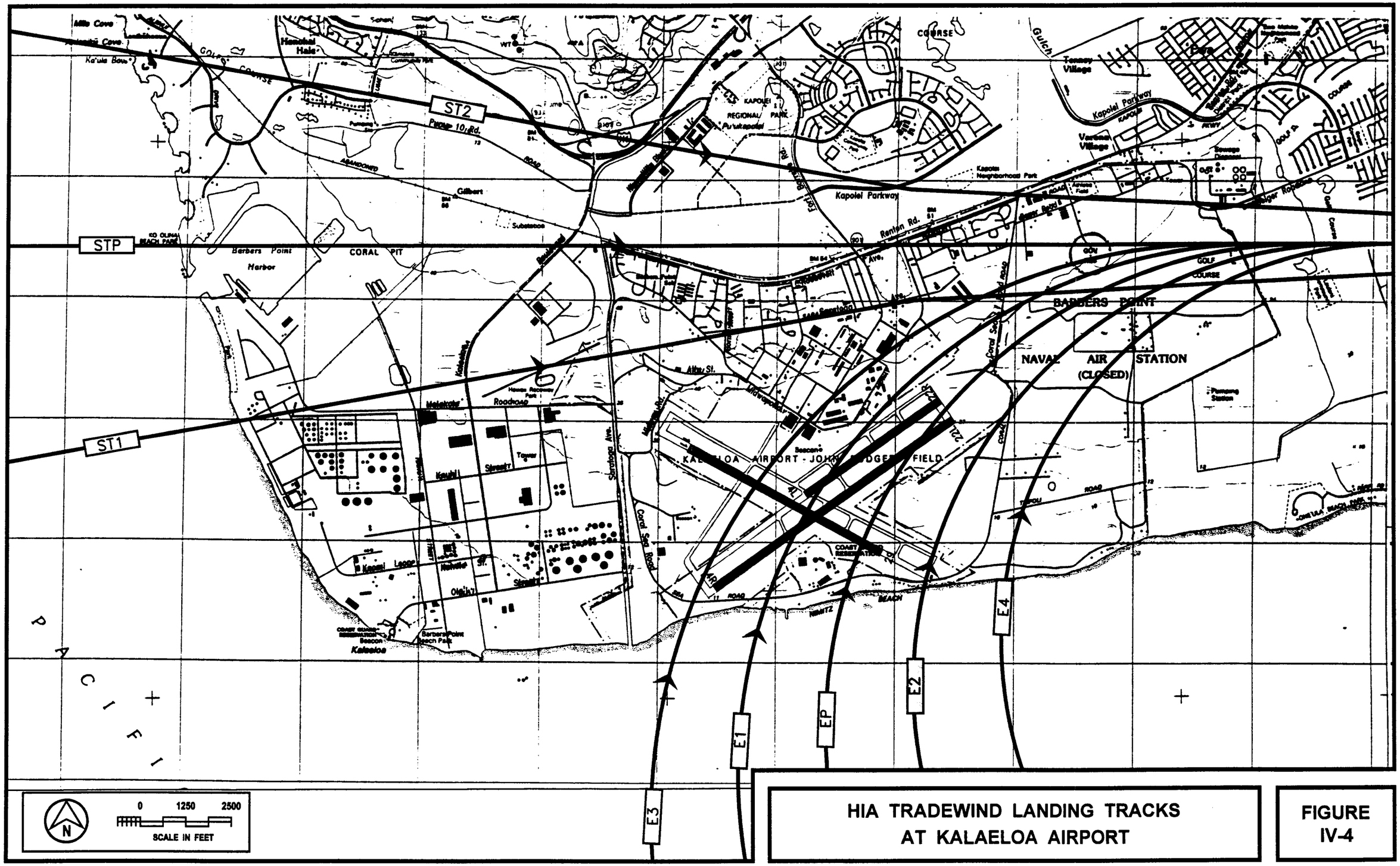
ITINERANT DEPARTURE FLIGHT TRACKS, KALAELOA AIRPORT

FIGURE IV-2



LOCAL FLIGHT TRACKS, KALAELOA AIRPORT

FIGURE IV-3



HIA TRADEWIND LANDING TRACKS AT KALAELOA AIRPORT

FIGURE IV-4

rather than as itinerant operations even if they departed the airport area, or arrived to the airport from an outlying area. In June of 2004, the tower began to also perform operations counts using the "FAA" method where such flights by based aircraft were counted as itinerant rather than as local operations. Also, in June of 2004, the tower began to categorize the airport operations by the "FAA" method by separating local and itinerant operations, by categorizing itinerant operations by Air Carrier, Air Taxi, General Aviation, and Military, and by categorizing local operations by Civil and Military. An examination of the 2004 tower records from June to December 2004 was made to estimate the possible error in using the 127,726 "VFR Local" value to represent the total airport operations in 2004.

3. After comparing the 6 month 2004 tower counts of 63,016 local operations using the "military" method, with the 64,109 total operations obtained by the "FAA" method for the same 6 month period, it was concluded that the use of the 127,726 total operations for 2004 could be 1.7 percent below the total operations as would have been counted using the "FAA" method. This uncertainty was considered to be more acceptable than the 10 percent potential excess in total operations which would be associated with the use of the 140,507 total reported operations for 2004.

After the downward adjustment for total 2004 operations from 140,507 to 127,726 was made, the 6 month 2004 tower counts by the "FAA" method were used to distribute the operations by the standard reporting categories used by the FAA as described in Paragraph 2 above. In distributing the total 2004 operations, the total percentage of military operations was raised from 10.66 percent (indicated from the 6 month 2004 "FAA" method counts) to 12.3 percent (as indicated in the 12 month 2004 "military" method counts). The use of the "military" method counts to determine the percentage military aircraft was considered justifiable since the 6 month 2004 military aircraft percentage using the "military" method was 10.80 percent, which agreed fairly well with the 10.66 percent obtained using the "FAA" counting method for the same 6 month period.

In addition to fixing the military percentage at 12.3 percent for 2004, the total mix of itinerant and local operations were fixed to 13.5 percent and 86.5 percent, respectively, based on the percentages within the 6 month 2004 counts by the "FAA" method. The final annual distribution of the 127,726 operations for 2004 is shown in Table IV-2. Military operations include operations by U.S. Coast Guard C-130, HH-65, Army, Navy, and Air Force aircraft.

The estimate of aircraft mix during 2004 was based on information provided by Kalaeloa Tower personnel and information contained in the Kalaeloa Master Plan document (Reference 8). Table IV-3 presents the distribution of aircraft types assumed for 2004, and distributes them into the local and itinerant operations categories in accordance with the percentage distributions shown in Table IV-2. The key departures from the Master Plan assumptions shown in Table IV-3 were as follows: CH-47 operations were deleted and replaced with P-3C and miscellaneous military helicopter

TABLE IV-2
ASSUMED BASE YEAR AND 2025 AIRPORT OPERATIONS

	ITINERANT OPS					LOCAL OPS			TOTAL
YEAR	AC	AT	GA	MIL	TOTAL	CIVIL	MIL	TOTAL	OPS
2004	213	326	13,919	2,790	17,248	97,556	12,922	110,478	127,726
2025	553	847	27,572	4,578	33,550	228,328	28,632	256,960	290,510

TABLE IV-3
AIRCRAFT MIX FOR BASE YEAR

	--- MASTER PLAN ---		---- CURRENT HCDA STUDY ---		
A/C	CY 2020 ANNUAL OPS.	CY 2020 ANNUAL OPS.	CY 2004 ANNUAL OPS.	CY 2004 ANNUAL ITIN OPS.	CY 2004 ANNUAL LOCAL OPS
DAYTIME:		% Civ or Mil			
C-130	3,541	27.78%	4,233	752	3,482
C-26	708	5.56%	847	150	696
P-3C	0	0.00%	5,080	902	4,178
CH-47	4,957	38.89%	0	0	0
HH-65A	3,541	27.78%	4,233	752	3,482
Mil. Helos	0	0.00%	847	150	696
PA31/C402	37,529	20.31%	22,064	2,848	19,216
C172/PA28	138,788	75.10%	81,594	10,531	71,063
BELL	8,497	4.60%	0	0	0
Robin. Helo	0	0.00%	4,996	645	4,351
TOT DAY:	197,560		123,894	16,730	107,164
NIGHT:					
C-130	110	27.78%	131	23	108
C-26	22	5.56%	26	5	22
P-3C	0	0.00%	157	28	129
CH-47	153	38.89%	0	0	0
HH-65A	110	27.78%	131	23	108
Mil. Helos	0	0.00%	26	5	22
PA31/C402	1,161	20.31%	682	88	594
C172/PA28	4,292	75.10%	2,524	326	2,198
BELL	263	4.60%	0	0	0
Robin. Helo	0	0.00%	155	20	135
TOT NITE:	6,110		3,832	517	3,314
24-HR TOT	203,670		127,726		

operations; and Bell 206 helicopter operations were replaced with Robinson helicopter operations. This was based on discussions with the Kalaeloa Airport Tower manager.

The distribution of aircraft onto the flight tracks shown in Figures IV-1 through IV-3 was based on information provided by Kalaeloa Tower personnel. The major differences between the current study's and the Master Plan's assumptions were as follows: 75 percent of single-engine general aviation, 20 percent of miscellaneous military helicopters, and 80 percent of civil helicopter operations use Runways 04L and 22R, and use a new local flight pattern mauka of those runways; the remaining percentages of these aircraft use runways 04R and 22L, and use the local flight pattern makai of these runways as described in the Master Plan; helicopters use the same flight tracks and local pattern altitude of 800 feet as do the light fixed wing aircraft; except for the HH-65A Coast Guard helicopters, all other helicopters land on and takeoff from the two parallel runways; and new itinerant arrival tracks to Runways 04L and 04R from the northeast were added for light fixed wing and helicopter aircraft. The 2004 runway utilization assumed for Kalaeloa Airport are shown in Tables IV-4A and IV-4B. Appendix C contains the distribution of Base Year aircraft operations on the various flight tracks.

2025 Aircraft Operations (Future Scenario). For the 2025 period, 2010 aircraft operations forecasts developed during an earlier study of the planned ILS (Instrument Landing System) installation at Kalaeloa Airport (Reference 10) were used to adjust the 2025 forecasts for Kalaeloa Airport contained in Table 5-2 of the 2004 Hawaii Aviation Forecasts (Reference 11). The revised 2025 airport operations forecasts used for Kaleloa Airport includes the anticipated influence of the new ILS in attracting more instrument training flights to Kalaeloa Airport. Tables IV-5A and IV-5B show the relationships of the Reference 11 (or State DOT) forecasts to the forecasts used in the ILS Study and this current HCDA study. Kalaeloa Airport operations with the ILS installed was forecast to total 213,400 annual operations by 2010 in the ILS Study, and to total 290,510 annual operations by 2025 in this current HCDA study. In this current study's 2025 forecasts, military operations at Kalaeloa Airport were increased above the levels forecast in Table 5-2 of Reference 11, since the anticipated influence of the ILS installation in attracting more military operations was not shown in the Reference 11 forecasts.

By 2025, the current P-3C antisubmarine warfare (ASW) patrol aircraft were expected to be replaced with the P-8A, a twin-engine jet aircraft which was assumed to be similar in noise characteristics to the B-737(700) commercial passenger aircraft. All P-3C aircraft included in the forecasted operations at Kalaeloa Airport for 2025 were replaced with B-737(700) aircraft on a one-for-one basis. The 2025 runway utilization and aircraft mix assumed for Kalaeloa Airport are shown in Tables IV-6A and IV-6B.

Following the installation of the ILS at Kalaeloa Airport, the flight tracks associated with the new local operations on Runway 4R are shown in Figure IV-5. Flight track T4RI is the new straight-in, ILS landing track to Runway 04R; flight track

TABLE IV-4A - KALAELOA AIRPORT 2004 BASE YEAR LANDINGS

A/C	BASE YR. ANNUAL OPS.	TOTAL ANNUAL LAND'S	RWY 04R LAND'S	RWY 04L LAND'S	RWY 22R LAND'S	RWY 22L LAND'S	RWY 29 LAND'S	RWY 01 LAND'S
DAYTIME:								
C-130	4,233	2,117	1,792	0	0	318	8	0
C-26	847	423	360	0	0	64	0	0
P-3C	5,080	2,540	2,159	0	0	381	0	0
HH-65A	4,233	2,117	1,401	350	62	247	0	56
Mil. Helos	847	423	288	72	13	51	0	0
PA31/C402	22,064	11,032	7,015	2,338	413	1,238	28	0
C172/PA28	81,594	40,797	8,647	25,941	4,578	1,526	105	0
Robin. Helo	4,996	2,498	425	1,698	300	75	0	0
TOT DAY:	123,894	61,947	22,086	30,400	5,365	3,899	141	56
NIGHT:								
C-130	131	65	55	0	0	10	0	0
C-26	26	13	11	0	0	2	0	0
P-3C	157	79	67	0	0	12	0	0
HH-65A	131	65	43	11	2	8	0	2
Mil. Helos	26	13	9	2	0	2	0	0
PA31/C402	682	341	218	73	13	38	1	0
C172/PA28	2,524	1,262	268	804	140	47	3	0
Robin. Helo	155	77	13	53	9	2	0	0
TOT NITE:	3,832	1,916	684	943	164	120	4	2
12-MON TOT	127,726	63,863	22,770	31,343	5,528	4,018	146	58

Note:

Runway 01 is the noise model designation for the U.S.C.G. ramp area, and is not an actual airport runway.

TABLE IV-4B - KALAELOA AIRPORT 2004 BASE YEAR DEPARTURES

A/C	BASE YR ANNUAL OPS	TOTAL ANNUAL DEPART.	RWY 04R DEPART.	RWY 04L DEPART.	RWY 22R DEPART.	RWY 22L DEPART.	RWY 11 DEPART.	RWY 19 DEPART.
DAYTIME:								
C-130	4,233	2,117	1,792	0	0	318	8	0
C-26	847	423	360	0	0	64	0	0
P-3C	5,080	2,540	2,159	0	0	381	0	0
HH-65A	4,233	2,117	1,427	357	63	252	0	19
Mil. Helos	847	423	288	72	13	51	0	0
PA31/C402	22,064	11,032	7,015	2,338	413	1,238	28	0
C172/PA28	81,594	40,797	8,647	25,941	4,578	1,526	105	0
Robin. Helo	4,996	2,498	425	1,698	300	75	0	0
TOT DAY:	123,894	61,947	22,111	30,406	5,366	3,903	141	19
NIGHT:								
C-130	131	65	55	0	0	10	0	0
C-26	26	13	11	0	0	2	0	0
P-3C	157	79	67	0	0	12	0	0
HH-65A	131	65	44	11	2	8	0	1
Mil. Helos	26	13	9	2	0	2	0	0
PA31/C402	682	341	217	72	13	38	1	0
C172/PA28	2,524	1,262	267	802	142	47	3	0
Robin. Helo	155	77	13	53	9	2	0	0
TOT NITE:	3,832	1,916	684	940	166	121	4	1
12-MON TOT	127,726	63,863	22,795	31,347	5,532	4,024	146	19

Note:

Runway 19 is the noise model designation for the U.S.C.G. ramp area, and is not an actual airport runway.

TABLE IV-5A
STATE DOT KALAELOA AIRPORT FORECASTS

YEAR	AC / AT	GA	MIL	TOTAL
2001	**264**	**159,631**	**23,705**	**183,600**
2002	**968**	**163,541**	**24,302**	**188,811**
2003	**629**	**128,654**	**21,410**	**150,693**
2004	**539**	**111,475**	**15,712**	**127,726**
2005	1,000	173,700	24,300	199,000
2006				
2007				
2008				
2009				
2010	1,100	193,800	24,300	219,200
2025	1,400	255,900	24,300	281,600

Notes:

a. Bold Values for 2001, 2002, 2003, and 2004 are Historical Counts.

b. 2.01% Forecasted annual increase in Kalaeloa Total Operations from 2002 to 2010.

c. 2.31% Forecasted annual increase in Kalaeloa GA Operations from 2002 to 2010.

d. 1.70% Forecasted annual increase in Kalaeloa Air Taxi Operations from 2002 to 2010.

e. 2.14% Forecasted annual increase in Kalaeloa Total Operations from 2002 to 2025.

f. 2.46% Forecasted annual increase in Kalaeloa GA Operations from 2002 to 2025.

g. 1.94% Forecasted annual increase in Kalaeloa Air Taxi Operations from 2002 to 2025.

TABLE IV-5B
HCDA STUDY KALAELOA AIRPORT FORECASTS

YEAR	AC / AT	GA	MIL	TOTAL	
2001	**264**	**159,631**	**23,705**	**183,600**	
2002	**968**	**163,541**	**24,302**	**188,811**	
2003	**629**	**128,654**	**21,410**	**150,693**	
2004	**539**	**111,475**	**15,712**	**127,726**	
2005					
2006					
2007					
2008					
2009					
2010	1,100	193,800	24,300	219,200	State DOT Forecast Without ILS
2010	704	149,457	24,300	174,461	FAA ILS Study; Without ILS
2010	704	179,488	33,210	213,402	FAA ILS Study; With ILS
2025	1,400	255,900	24,300	281,600	State DOT Forecast Without ILS
2025	1,400	255,900	33,210	290,510	HCDA Study Forecast With ILS

Notes:

a. Bold Values for 2001, 2002, 2003, and 2004 are Historical Counts.

b. 2.14% State DOT forecasted annual increase in Kalaeloa Total Operations from 2002 to 2025.

c. 2.46% State DOT forecasted annual increase in Kalaeloa GA Operations from 2002 to 2025.

d. 1.94% State DOT forecasted annual increase in Kalaeloa Air Taxi Operations from 2002 to 2025.

TABLE IV-6A - KALAELOA AIRPORT FUTURE YEAR (2025) LANDINGS:

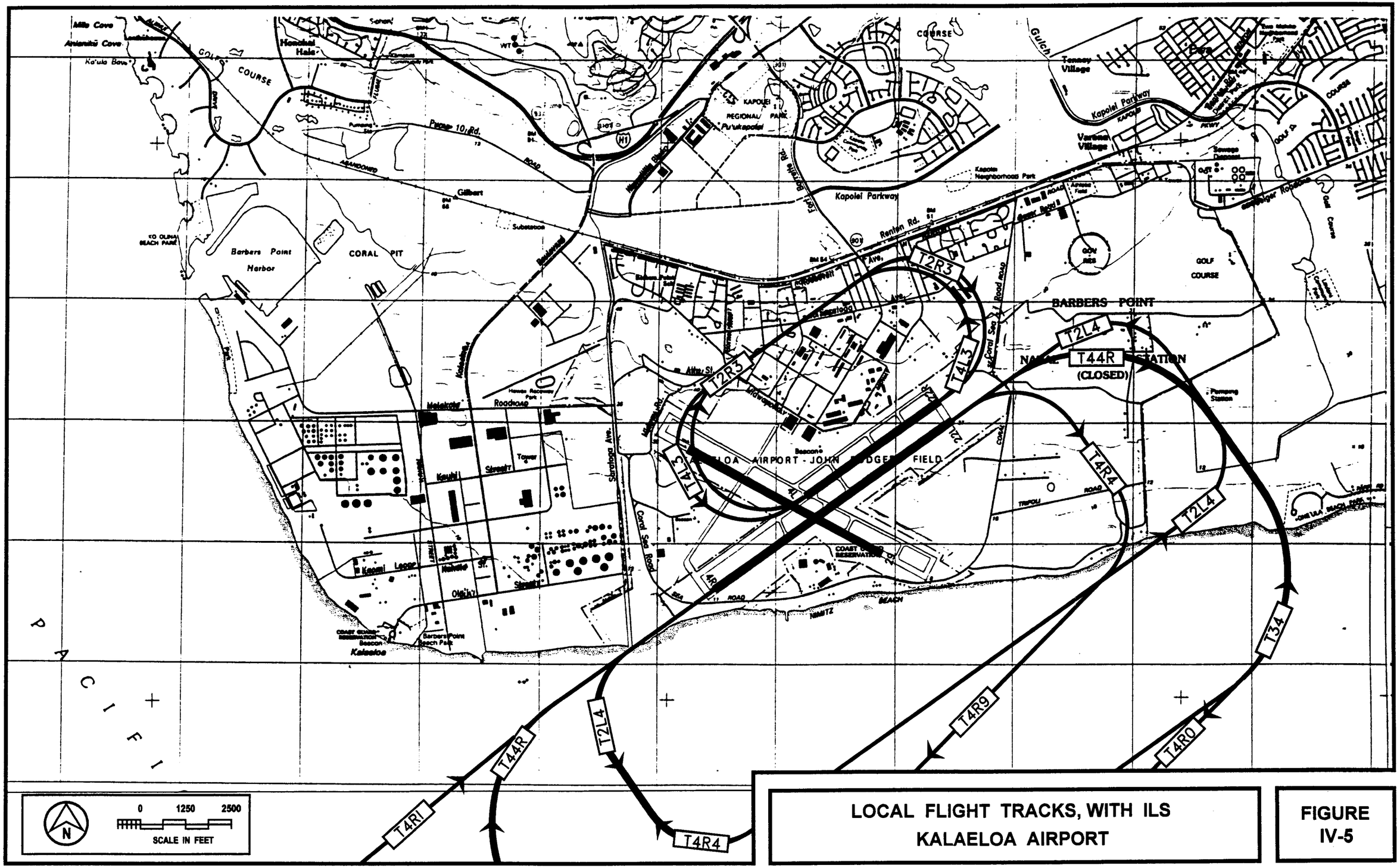
A/C	2025 ANNUAL OPS.	TOTAL ANNUAL LAND'S	RWY 04R LAND'S	RWY 04L LAND'S	RWY 22R LAND'S	RWY 22L LAND'S	RWY 29 LAND'S	RWY 01 LAND'S
DAYTIME:								
C-130	9,821	4,911	4,407	0	0	491	12	0
C-26	1,571	786	688	0	0	98	0	0
P-8A	9,428	4,714	4,125	0	0	589	0	0
HH-65A	9,821	4,911	3,349	993	96	382	0	92
Mil. Helos	1,571	786	486	201	20	79	0	0
PA31/C402	64,062	32,029	21,428	7,386	789	2,369	57	0
C172/PA28	174,048	87,024	21,890	53,240	8,762	2,921	211	0
Robin. Helo	11,475	5,737	1,594	3,426	574	143	0	0
TOT DAY:	281,797	140,899	57,966	65,246	10,239	7,074	280	92
NIGHT:								
C-130	303	151	136	0	0	15	0	0
C-26	48	24	21	0	0	3	0	0
P-8A	292	146	128	0	0	18	0	0
HH-65A	303	151	103	31	3	12	0	3
Mil. Helos	48	24	16	6	1	2	0	0
PA31/C402	1,979	990	663	229	25	73	1	0
C172/PA28	5,386	2,693	676	1,652	268	89	7	0
Robin. Helo	354	177	48	107	17	4	0	0
TOT NITE:	8,713	4,356	1,790	2,026	314	216	9	3
12-MON TOT	290,510	145,255	59,758	67,272	10,553	7,290	289	95

Note:
Runway 01 is the noise model designation for the U.S.C.G. ramp area, and is not an actual airport runway.

TABLE IV-6B - KALAELOA AIRPORT FUTURE YEAR (2025) DEPARTURES:

A/C	2010 ANNUAL OPS	TOTAL ANNUAL DEPART.	RWY 04R DEPART.	RWY 04L DEPART.	RWY 22R DEPART.	RWY 22L DEPART.	RWY 11 DEPART.	RWY 19 DEPART.
DAYTIME:								
C-130	9,821	4,911	4,407	0	0	491	12	0
C-26	1,571	785	687	0	0	98	0	0
P-8A	9,428	4,714	4,125	0	0	589	0	0
HH-65A	9,821	4,911	3,389	1,003	97	389	0	31
Mil. Helos	1,571	786	486	201	20	79	0	0
PA31/C402	64,062	32,031	21,428	7,387	790	2,369	57	0
C172/PA28	174,048	87,024	21,890	53,240	8,762	2,920	211	0
Robin. Helo	11,475	5,737	1,593	3,428	574	143	0	0
TOT DAY:	281,797	140,899	58,006	65,260	10,242	7,079	281	31
NIGHT:								
C-130	303	151	136	0	0	15	0	0
C-26	48	24	21	0	0	3	0	0
P-8A	292	146	128	0	0	18	0	0
HH-65A	303	151	105	31	3	12	0	1
Mil. Helos	48	24	15	6	1	2	0	0
PA31/C402	1,979	990	663	228	25	73	1	0
C172/PA28	5,386	2,692	676	1,647	271	91	7	0
Robin. Helo	354	177	49	106	17	5	0	0
TOT NITE:	8,713	4,355	1,793	2,018	317	219	9	1
12-MON TOT	290,510	145,255	59,800	67,277	10,559	7,298	289	32

Note:
Runway 19 is the noise model designation for the U.S.C.G. ramp area, and is not an actual airport runway.



LOCAL FLIGHT TRACKS, WITH ILS
KALAELOA AIRPORT

FIGURE IV-5

T4R0 is the new local departure track for large fixed wing aircraft; and flight track T4R9 is the new local departure track for small fixed wing and rotary wing aircraft. Aircraft departing on Runway 4R during local operations would intercept the ILS approach flight track T4RI approximately 5 to 7 miles offshore.

The new ILS installation is not expected to alter the other operational assumptions used to model CY 2004 operations at Kalaeloa Airport.

Appendix C contains the distribution of 2025 aircraft operations on the various flight tracks for the Future Scenario.

Airport Noise Modeling. Airport noise contours from 60 to 75 DNL were developed for the 2004 Base Year and 2025 Future Year cases. All airport noise contours for Kalaeloa Airport were developed using the Federal Aviation Administration (FAA) Integrated Noise Model (INM), Version 6.1. Using the average daily frequency of aircraft operations (see Appendix C), their runway use, flight tracks, and flight profiles, and their source noise levels, the model calculates both the daily DNL (Day-Night Sound Level) noise exposure level as well as the Lse (Sound Exposure Level) of single aircraft flyby events.

The Kalaeloa Airport noise contours developed for the Base Year and 2025 were used to describe the existing and future aircraft noise levels in the project environs for 2004 and 2025. The addition of the aircraft operations associated with tradewind landings at Honolulu International Airport (HIA) was also included in the development of the Base Year and future airport noise contours to allow for evaluation of the total aircraft noise levels in the Kalaeloa Airport environs.

Tradewind landing operations at Honolulu International Airport during 2004 and 2025 on the flight tracks shown in Figure IV-4 were also combined with the Kalaeloa Airport Base Year and 2025 operations to develop the total aircraft noise contours in the study area for 2004 and 2025. HIA aircraft operations along the flight tracks shown in Figure IV-4 for 2003 and 2008 were available from Reference 9. FAA tower counts for HIA were also available for 2003 and 2004 as shown in Table IV-7. The 2004 aircraft operations along the flight tracks shown in Figure IV-4 were developed by adjusting the 2003 data from Reference 9 in accordance with the changes in HIA operations as reflected in the 2003 and 2004 FAA tower counts for HIA. As shown in Table IV-8, the 2003 HIA aircraft operations along the flight tracks shown in Figure IV-4 were increased as follows to obtain the operations for 2004: 5.77 percent increase for air carrier aircraft; 5.05 percent increase for military aircraft; and 6.85 percent increase for air taxi and general aviation aircraft.

The 2008 aircraft operations along the flight tracks shown in Figure IV-4 obtained from Reference 9 were adjusted as follows to reflect the HIA operations forecasts for 2025 contained in Reference 11: air carrier landings were increased by 22.53 percent over 2008 values; commuter/air taxi and general aviation aircraft landings were

TABLE IV-7 - FAA TOWER COUNTS FOR 2003 AND 2004, HONOLULU INTERNATIONAL AIRPORT

	ITINERANT OPS					LOCAL OPS			TOTAL
	AC	AT	GA	MIL	TOTAL	CIVIL	MIL	TOTAL	OPS
CY 2003	165,406	46,012	69,403	15,946	296,767	4,890	262	5,152	301,919
CY 2003	54.78%	15.24%	22.99%	5.28%	98.29%	1.62%	0.09%	1.71%	100.00%
CY 2004	174,944	57,567	66,812	16,751	316,074	4,162	284	4,446	320,520
CY 2004	54.58%	17.96%	20.84%	5.23%	98.61%	1.30%	0.09%	1.39%	100.00%
Increase '03 to '04	9,538	11,555	(2,591)	805	19,307	(728)	22	(706)	18,601
Increase '03 to '04	5.77%	25.11%	-3.73%	5.05%	6.51%	-14.89%	8.40%	-13.70%	6.16%

TABLE IV-8
LANDINGS TO HIA OVER KALAELOA AIRPORT

AIRCRAFT TYPE	LANDINGS PER DAY			
	2003	2004	2008	2025
B-717(200)	33.1325	35.0443	40.9715	50.2025
B-727(EM2)	0.3853	0.4074	0.0000	0.0000
B-737(200)	34.7471	36.7518	42.9666	52.6468
B-737(500)	0.0065	0.0069	0.0000	0.0000
B-737(700)	2.7219	2.8787	3.3638	4.1217
B-737(800)	0.2534	0.2680	0.3133	0.3838
B-747(200)	3.2162	3.4018	4.1163	5.0435
B-747(20B)	0.0030	0.0031	0.0001	0.0001
B-747(400)	4.6766	4.9464	6.0732	7.4415
B-757(300)	1.7401	1.8406	2.4706	3.0271
B-757(RR)	1.7401	1.8406	2.4706	3.0271
B-767(300)	5.9739	6.3187	5.5340	6.7807
B-767(400)	4.4719	4.7297	4.1425	5.0757
B-767(JT9)	8.9098	9.4241	8.2535	10.1131
B-777(200)	3.2319	3.4182	3.4094	4.1777
B-777(300)	0.0969	0.1027	0.1019	0.1247
A-310	0.0052	0.0053	0.0001	0.0001
A-320	0.0260	0.0273	0.0000	0.0000
A-330	0.0497	0.0527	0.0526	0.0646
A-340	1.0356	1.0953	1.3613	1.6681
AV8B (HARRIER)	0.0304	0.0319	0.0212	0.0235
B-1	0.0024	0.0025	0.0021	0.0022
B-2A	0.0000	0.0000	0.0012	0.0013
B-52H	0.0024	0.0025	0.0031	0.0035
BEC58P	17.5600	18.7627	23.9814	22.7799
C-20	0.0592	0.0622	0.0410	0.0451
C-12	0.0265	0.0277	0.0181	0.0199
C-130	0.0387	0.0405	0.0266	0.0294
C-130E	1.5546	1.6333	0.8636	0.9520
C-141A	0.3601	0.3782	0.2478	0.2733
C-17	0.2841	0.2983	0.8680	0.9568
C-5A	0.3626	0.3808	0.2498	0.2753

TABLE IV-8 (CONTINUED)
LANDINGS TO HIA OVER KALAELOA AIRPORT

AIRCRAFT TYPE	LANDINGS PER DAY			
	2003	2004	2008	2025
C-9A	0.1363	0.1434	0.0940	0.1036
CL-601	0.0112	0.0118	0.0111	0.0106
CNA-206	0.1643	0.1755	0.1620	0.1539
CNA-750	0.0045	0.0047	0.0044	0.0043
DC-8(70)	0.8615	0.9111	1.0445	1.2797
DC-9(50)	5.3009	5.6066	0.0000	0.0000
DC-1010	2.0787	2.1985	0.0000	0.0000
DC-1030	2.4519	2.5931	0.0000	0.0000
DC-1040	0.7996	0.8456	0.0000	0.0000
DHC-6	0.5930	0.6335	0.3577	0.3400
DHC-8	21.1962	22.6482	14.6090	13.8768
F-18	0.0327	0.0342	0.0210	0.0252
F-111AE	0.0000	0.0000	0.0017	0.0018
F-15(E20)	4.3004	4.5177	4.9476	5.4539
F-16(PWO)	0.0753	0.0789	0.0518	0.0570
GASEPF	2.1724	2.3213	2.1424	2.0350
G11B	0.0000	0.0000	0.0012	0.0012
GIV	0.0482	0.0514	0.0356	0.0340
GV	0.0928	0.0990	0.0707	0.0672
IA1125	0.0037	0.0038	0.0037	0.0036
KC-10A	0.2540	0.2668	0.1749	0.1926
KC-135R	1.8781	1.9728	1.7724	1.9540
LEAR 35	0.1212	0.1295	0.1047	0.0996
L-1011	0.0080	0.0085	0.0000	0.0000
MD-11(GE)	0.6809	0.7200	2.2205	2.7206
MD-11(PW)	0.6767	0.7157	2.2165	2.7161
P-3C	0.0139	0.0146	0.0096	0.0106
SD-330	6.7481	7.2102	9.7672	9.2778
TOTALS:	177	188	192	220

Note:

P-3C replaced by P-8A aircraft by 2025.

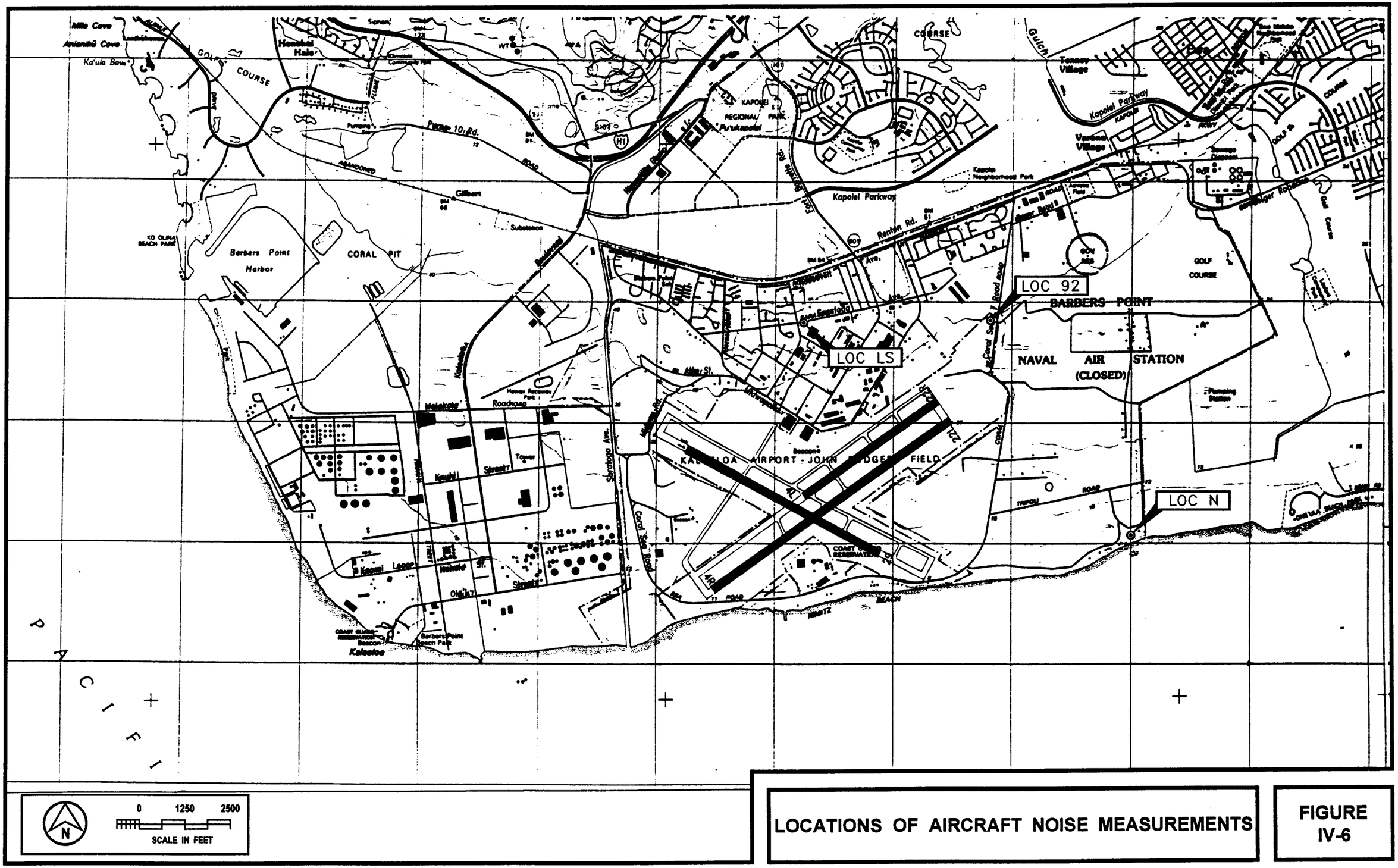
decreased by 5.01 percent below 2008 values; and military aircraft landings were increased by 10.23 percent above their 2008 values. Table IV-8 depicts the landings at HIA which were used to model total aircraft noise levels in the study area during 2004 and 2025.

Noise Measurements. Existing aircraft noise levels were measured in the project environs during the recent FAA ILS study for Kalaeloa Airport (Reference 10) to provide a basis for describing the existing background ambient and aircraft noise levels. The locations of the three measurement sites in the project environs are shown in Figure IV-6. The aircraft noise measurements were made to confirm that single event noise levels associated with existing aircraft operations at Kalaeloa Airport were consistent with the single event noise predictions produced by the FAA INM, and that the cumulative average noise levels recorded at the three measurement locations were also consistent with the DNL contours developed for the Base Year.

Aircraft Noise Impact Analysis. The aircraft noise contours developed for the Base Year (2004) and future year (2025) were compared and evaluated for their potential impacts on the surrounding community. Risks of adverse noise impacts and complaint risks associated with the Base Year and future year aircraft operations were evaluated by examining the relationship of the aircraft noise contours to the noise sensitive land uses expected in the airport environs under existing land use plans for Kalaeloa. In addition, the relationship of the forecasted CY 2025 airport noise levels to historical (CY 2004) aircraft noise levels indicated by the 2004 noise contours were described.

Noise impacts associated with proposed land use scenarios were identified where the 2025 60 DNL noise contour would encompass residential, resort, school, or other noise sensitive land uses. If any noise sensitive land uses were expected to be located within the 2025 60 DNL noise contour under a proposed land use scenario, the FAA criteria of 1.5 DNL increase in aircraft noise level at these noise sensitive properties would also be used in defining noise impacts resulting from increases in aircraft noise exposure associated with any Action Alternative. Although this 1.5 DNL increase criteria was originally intended for use within the 65 DNL noise contour (see Reference 7), the 1.5 DNL criteria was applied at all noise sensitive uses within the 60 DNL noise contour for this study. This was consistent with the State DOT recommendation to use the 60 DNL contour to identify noise levels which were considered to be incompatible with noise sensitive land uses (dwellings, schools, day care centers, other public use facilities, hotels, etc.).

Because aircraft noise complaints occur from residents who are located outside the 60 DNL contour, other differences between the existing and future conditions were also evaluated. These included the changes in single event noise levels during aircraft flyby events and the changes in aircraft overflight patterns or frequencies at noise sensitive locations. The relative degrees of potential complaint risks between



LOCATIONS OF AIRCRAFT NOISE MEASUREMENTS

FIGURE IV-6

alternative land use scenarios were compared by examining the increase in noise levels at the closest noise sensitive properties, as well as by examining the amount of new noise sensitive properties which would be newly enclosed by the 60 DNL contours.

Using the DNL and single event aircraft noise predictions for CY 2025, evaluations were made of potential annoyance responses from future area residences. Based on the above evaluations, recommendations for mitigation measures which would minimize risks of health and welfare impacts and risks of annoyance responses from area residences were provided. Recommendations associated with the conduct and regulation of flight operations at the facility were also provided to minimize impacts and complaint risks at outlying areas.

CHAPTER V. EXISTING NOISE ENVIRONMENT

Noise Measurements. Aircraft noise measurements were obtained and analysed during an earlier ILS Study for Kalaeloa Airport (Reference 10). The results of those noise measurements are presented herein. The results of the single event (Lmax and Lse) noise measurements and their comparisons with the predictions of the FAA INM, Version 6.1, are shown in Tables V-1 through V-9. In general, the FAA INM predictions were relatively consistent with the measured aircraft noise levels, and were considered to be sufficiently accurate for use in this study. Typical single event noise levels of aircraft operating at Kalaeloa Airport ranged from 60 to 80 dBA (Lmax). The U.S. Coast Guard's C-130 was typically the loudest aircraft measured while operating at Kalaeloa Airport. For the purposes of comparison, typical maximum noise levels of heavy trucks are in the order of 80 to 85 dB at 50 FT distance. Typical single event noise levels of aircraft landing at Honolulu International Airport ranged from 60 to 75 dBA (Lmax). The noise from aircraft landing at HIA are the more frequent noise sources in the project environs between the hours of 7:00 AM to 7:00 PM, when Runway 8L is normally used for landings. During the late evening and nighttime hours, as well as during kona wind conditions, aircraft noise from HIA operations are typically lower and are primarily associated with distant aircraft in transit.

The measured average noise levels resulting from aircraft and other background noise sources at the three measurement locations are summarized in Table V-10. As indicated in Table V-10, the average cumulative noise levels associated with Kalaeloa Airport operations were relatively low when compared with non-airport noise sources such as the noise from aircraft landing at Honolulu International Airport. The cumulative average noise levels associated with Kalaeloa Airport operations were typically 5 Leq lower than those associated with other non-airport sources. The relatively low measured aircraft noise levels resulting from Kalaeloa Airport operations were consistent with the relatively small Base Year noise contours for the airport.

Base Year Noise Contours. The 2004 noise contours for Kalaeloa Airport with and without the aircraft noise contributions from Honolulu International Airport (HIA) are shown in Figures V-1 and V-2. These noise contours are relatively small, with HIA aircraft noise having a negligible effect on the Kalaeloa Airport noise contours. The Base Year noise contours do not enclose residential or other noise sensitive land uses, so they were considered to be compatible with the land uses in the immediate environs of the airport. Recreational lodging, park, and beach areas south of the airport are exposed to single event aircraft noise levels ranging from 56 to 89 dBA (Lmax). Because the number of these aircraft flybys are relatively low, the 60 DNL contour does not encompass these recreational areas.

Existing land use maps depicting the newly developed areas of Kapolei beyond the former Naval Air Station, Barbers Point boundaries were not available for this study. For the areas east of the former Naval Air Station, Barbers Point boundary (along South Hansen Road), the 2020 land use map from Reference 8 was used to depict the

TABLE V-1

SUMMARY OF AIRCRAFT NOISE MEASUREMENTS AT LOCATION "N" (10/28/04)

AIRCRAFT TYPE	MAXIMUM SOUND LEVELS Lmax (in dB)	SOUND EXPOSURE LEVELS Lse (in dB)
GA-1 (Tradewind Takeoff)	69.1; 68.9; 70.9; 73.9; 69.4; 67.9; 56.0; 59.4; 67.7; 63.8; 78.4; 59.8; 66.0; 70.4; 58.0; 56.0; 61.0; 68.0; 58.1; 64.0 66.5; 65.4; 55.3; 53.0; 61.0 53.6; 63.3; 59.8; 57.5 (AVE. = 63.5)	76.8; 76.7; 77.1; 80.9; 74.5; 70.5; 76.3; 72.9; 81.9; 72.5; 73.7; 70.3; 72.9; 69.7; 71.2; 71.0; 68.1; 66.9; 65.7 (AVE. = 73.1)
GA-2 (Tradewind Takeoff)	72.0; 68.4; 70.8; 65.4; 75.7; 75.4; 57.0 (AVE. = 69.2)	80.0; 73.5; 75.1; 74.1; 82.1; 81.6 (AVE. = 77.7)
C-130 (Tradewind Takeoff)	75.4; 67.8; 67.0; 69.0; 69.9; 73.5; 88.7; 77.4; 76.9; 76.6 (AVE. = 74.2)	82.7; 79.2; 79.9; 79.2; 81.6; 92.7; 84.4; 83.6; 82.7 (AVE. = 82.9)
HH-65A (Tradewind Takeoff)	N/A	N/A
CIV.HELO (Tradewind Takeoff)	N/A	N/A

Measured Leq(8.0 hours) = 51.7 Leq

TABLE V-2

SUMMARY OF AIRCRAFT NOISE MEASUREMENTS AT LOCATION "N" (11/01/04)

AIRCRAFT TYPE	MAXIMUM SOUND LEVELS Lmax (in dB)	SOUND EXPOSURE LEVELS Lse (in dB)
GA-1 (Tradewind Takeoff)	63.5; 58.3; 58.5; 62.1; 65.7; 60.9; 60.9; 69.9; 68.1; 74.3; 73.4; 62.7; 63.1; 63.1; 61.6; 66.6 (AVE. = 64.5)	72.8; 72.1; 74.0; 79.9; 75.4; 83.0; 82.0; 71.5; 71.5; 71.5; 70.9; 76.4 (AVE. = 75.1)
GA-2 (Tradewind Takeoff)	71.4; 64.7; 65.3; 75.9 (AVE. = 69.3)	81.2; 74.0; 72.6; 83.9 (AVE. = 77.9)
C-130 (Tradewind Takeoff)	79.0 (AVE. = 79.0)	87.3 (AVE. = 87.3)
HH-65A (Tradewind Takeoff)	56.4; 62.7; 58.0; 57.3; 59.7; 61.2; 58.5; 62.7; 60.2; 59.0 (AVE. = 59.6)	66.6; 62.7; 62.7; 65.8; 62.1; 64.3 (AVE. = 64.0)
CIV.HELO (Tradewind Takeoff)	71.6; 65.8; 69.1; 72.2; 67.0 58.9 (AVE. = 67.4)	73.4; 67.2; 72.4; 78.4; 73.3; 64.0 (AVE. = 71.5)

Measured Leq(8.0 hours) = 47.9 Leq

TABLE V-3

SUMMARY OF AIRCRAFT NOISE MEASUREMENTS AT LOCATION "92" (11/03/04)

AIRCRAFT TYPE	MAXIMUM SOUND LEVELS Lmax (in dB)	SOUND EXPOSURE LEVELS Lse (in dB)
GA-1 (Kona Landing)	62.6; 52.4; 50.5; 59.4; 56.0; 58.5; 68.8; 53.0; 52.8; 55.9; 51.2; 48.7; 52.6; 52.4; 64.7; 51.6 (AVE. = 55.7)	65.9; 68.0; 63.0; 68.4; 71.4; 59.0; 57.5; 57.2; 60.9; 59.3; 67.4; 58.3 (AVE. = 63.0)
GA-2 (Kona Landing)	67.3; 69.8; 67.9; 65.8; 67.7 (AVE. = 67.7)	72.6; 75.3; 72.5; 71.0; 72.7 (AVE. = 72.8)
C-130 (Kona Landing)	77.8; 64.6; 73.1; 74.0 (AVE. = 72.4)	82.6; 72.0; 78.8; 83.2 (AVE. = 79.2)
HH-65A (Kona Landing)	74.0; 69.8; 67.4; 74.0; 73.2; 71.6; 72.2; 74.1; 69.9; 73.0; 75.9 (AVE. = 72.3)	78.4; 72.8; 71.4; 75.9; 79.8; 77.7; 77.5; 77.0; 75.6; 78.9; 82.5 (AVE. = 77.0)
CIV.HELO (Kona Landing)	73.0; 71.0; 66.7; 65.6; 64.8 (AVE. =68.2)	77.0; 76.2; 69.2; 69.1; 69.2 (AVE. =72.1)

Measured Leq(3.0 hours) = 47.0 Leq

TABLE V-4

SUMMARY OF AIRCRAFT NOISE MEASUREMENTS AT LOCATION "92" (11/03/04)

AIRCRAFT TYPE	MAXIMUM SOUND LEVELS Lmax (in dB)	SOUND EXPOSURE LEVELS Lse (in dB)
GA-1 (Tradewind Takeoff)	66.2; 66.8; 68.2; 66.1; 66.5; 67.9; 74.6; 64.0; 63.0; 67.4; 72.7; 60.4; 72.3; 74.0; 64.2; 72.6; 73.0; 71.2; 68.6; 70.3; 67.7; 70.0; 69.7; 69.6; 68.2; 66.9; 70.0; 71.2; 69.5; 72.3; 73.8; 70.4; 74.7; 72.0; 74.6; 65.5; 75.2; 68.0; 63.9; 70.2; 75.9; 71.7; 66.3; 74.0; 71.0; 65.7; 72.0; 68.0; 72.7; 67.1; 73.8; 72.2; 79.3 (AVE. = 69.9)	74.3; 77.3; 78.0; 73.9; 75.1; 77.3; 81.1; 67.1; 64.0; 79.4; 66.0; 78.2; 81.5; 72.3; 78.5; 80.3; 75.6; 72.2; 75.2; 71.3; 75.8; 76.7; 79.0; 74.5; 76.3; 79.1; 74.5; 75.4; 82.2; 77.4 81.6; 78.6; 80.8; 72.2; 81.3 72.1; 68.6; 76.6; 81.3; 78.8; 70.0; 74.6; 77.9; 74.5; 77.8; 73.8; 80.7; 73.6; 80.7; 74.4; 84.5 (AVE. = 76.2)
GA-2 (Tradewind Takeoff)	76.7; 81.2; 77.0; 76.2 (AVE. = 77.8)	81.6; 83.3; 81.3; 82.3 (AVE. = 82.1)
C-130 (Tradewind Takeoff)	85.5 (AVE. = 85.5)	89.5 (AVE. = 89.5)
HH-65A (Tradewind Takeoff)	58.8; 63.6; 69.5 (AVE. = 64.0)	61.3; 67.9; 80.5 (AVE. = 69.9)
CIV.HELO (Tradewind Takeoff)	61.6; 69.7; 61.8; 63.1; 71.1; 70.0; 72.3; 72.3; 71.3 (AVE. =68.1)	65.3; 77.1; 64.1; 64.0; 74.7; 75.2; 75.6; 77.1; 80.7 (AVE. =72.6)

Measured Leq(5.0 hours) = 54.6 Leq

TABLE V-5

SUMMARY OF AIRCRAFT NOISE MEASUREMENTS AT LOCATION "92" (11/08/04)

AIRCRAFT TYPE	MAXIMUM SOUND LEVELS Lmax (in dB)	SOUND EXPOSURE LEVELS Lse (in dB)
GA-1 (Kona Landing)	68.8; 60.4; 64.0; 49.3; 62.4; 61.9; 48.8; 69.7; 63.9; 70.0; 57.7; 60.1; 62.9 (AVE. = 61.5)	72.4; 65.9; 68.2; 51.8; 68.6 69.7; 55.4; 73.5; 68.5; 74.4; 63.1; 62.4; 65.7 (AVE. = 66.1)
GA-2 (Kona Landing)	N/A	N/A
C-130 (Kona Landing)	73.9; 75.0 (AVE. = 74.5)	80.0; 81.7 (AVE. = 80.9)
HH-65A (Kona Landing)	N/A	N/A
CIV.HELO (Kona Landing)	N/A	N/A

Measured Leq(2.5 hours) = 46.0 Leq

TABLE V-6

SUMMARY OF AIRCRAFT NOISE MEASUREMENTS AT LOCATION "92" (11/08/04)

AIRCRAFT TYPE	MAXIMUM SOUND LEVELS Lmax (in dB)	SOUND EXPOSURE LEVELS Lse (in dB)
GA-1 (Tradewind Takeoff)	71.2; 68.0; 68.6; 67.6; 66.6; 68.9; 66.7; 68.6; 64.2; 72.5; 67.4; 74.1; 67.0; 68.6; 66.3; 69.4; 64.2; 64.5; 67.4; 66.1; 66.0; 63.4; 63.7; 67.8; 78.9; 70.5; 76.7; 69.1; 73.8; 65.5; 45.4; 64.0; 68.2; 66.4; 68.0; 68.1; 70.6; 69.2; 70.2; 73.9; 73.1; 66.8; 66.0; 66.7; (AVE. = 68.0)	78.6; 78.2; 75.4; 77.2; 72.3; 76.2; 68.0; 76.1; 69.2; 79.4; 72.2; 80.1; 72.2; 75.2; 73.6; 78.9; 71.3; 72.6; 75.0; 71.1; 70.2; 65.1; 68.6; 71.1; 86.1; 74.9; 81.3; 74.7; 79.9; 73.0; 70.5; 76.7; 72.6; 75.9; 73.7; 76.6; 75.6; 76.4; 81.1; 80.2; 72.3; 70.8; 70.6 (AVE. = 74.7)
GA-2 (Tradewind Takeoff)	75.3 (AVE. = 75.3)	80.9 (AVE. = 80.9)
C-130 (Tradewind Takeoff)	83.5; 81.2 (AVE. = 82.4)	90.4; 87.6 (AVE. = 89.0)
HH-65A (Tradewind Takeoff)	60.7; 63.3; 84.0 (AVE. = 69.3)	64.8; 66.7; 89.8 (AVE. = 73.8)
CIV.HELO (Tradewind Takeoff)	55.1; 65.7; 61.7; 60.0; 71.5; 67.3; 67.8; 64.4; 70.6; 69.0; 69.4; 70.0; 68.2; 74.4; 68.7; 82.2; 68.1 (AVE. = 67.9)	73.7; 67.5; 70.0; 80.4; 77.3; 74.1; 71.4; 76.1; 77.2; 78.2; 76.0; 74.2; 81.9; 77.2; 87.3; 70.4 (AVE. = 75.8)

Measured Leq(5.5 hours) = 54.8 Leq

TABLE V-7

SUMMARY OF AIRCRAFT NOISE MEASUREMENTS AT LOCATION "92" (11/13/04)

AIRCRAFT TYPE	MAXIMUM SOUND LEVELS Lmax (in dB)	SOUND EXPOSURE LEVELS Lse (in dB)
GA-1 (Kona Landing)	54.5; 50.7; 50.6; 51.2; 48.4; 43.7; 52.5; 53.6; 52.3; 57.4; 49.3; 53.7; 50.6; 61.4; 64.8; 56.7; 50.6; 55.6; 43.7; 51.2; 52.3; 54.8; 54.9; 70.0; 63.6; 56.9; 62.5; 53.3; 61.4; 57.4; 51.6; 50.8; 60.5; 56.5; 57.4; 59.8; 52.6; 55.1; 60.1; 52.2; 62.3; 54.7; 48.7; 59.9; 66.8; 52.1; 54.8; 50.6; 51.4; 53.9; 53.9; 46.6; 62.1; 51.7; 50.4; 54.1; 49.8; 52.8; 64.0 (AVE. = 54.9)	61.0; 54.3; 62.5; 57.3; 67.9; 69.5; 56.3; 63.0; 57.7; 62.0; 59.0; 76.4; 68.4; 63.3; 68.9; 57.3; 61.5; 57.5; 56.8; 66.1; 61.3; 59.4; 64.8; 66.5; 76.3; 59.5; 57.3; 57.8; 55.4; 58.5; 58.3; 66.3 (AVE. = 60.2)
GA-2 (Kona Landing)	75.4; 76.8; 62.1; 74.8; 63.1 66.2; 62.5; 71.8; 66.2 (AVE. = 68.8)	79.0; 82.2; 69.4; 82.2; 70.5; 70.6; 71.2; 75.6; 72.2 (AVE. = 74.8)
C-130 (Kona Landing)	76.0; 74.8; 74.4 (AVE. = 75.1)	82.0; 79.1; 82.9 (AVE. = 81.3)
HH-65A (Kona Landing)	N/A	N/A
CIV.HELO (Kona Landing)	68.9; 68.1; 69.0; 69.6; 65.5; 67.1 (AVE. = 68.0)	73.0; 72.9; 76.1; 74.0; 71.3; 71.8 (AVE. =73.2)

Measured Leq(5.5 hours) = 47.9 Leq

TABLE V-8

SUMMARY OF AIRCRAFT NOISE MEASUREMENTS AT LOCATION "92" (11/13/04)

AIRCRAFT TYPE	MAXIMUM SOUND LEVELS Lmax (in dB)	SOUND EXPOSURE LEVELS Lse (in dB)
GA-1 (Tradewind Takeoff)	67.1; 68.8; 64.2; 65.1; 64.1; 72.6; 63.6; 72.8; 62.3; 73.8; 67.4; 61.6; 69.6; 63.7; 69.3; 67.5; 51.7; 63.3; 67.8; 63.9; 68.2; 72.7; 69.6; 59.5; 74.2; 72.2; 74.2; 72.5; 73.5; 65.8; 76.9; 63.9; 80.0; 76.8; 74.0; 61.4; 74.6; 63.1; 63.5; 74.9 (AVE. = 68.3)	74.7; 74.0; 71.8; 71.9; 72.5; 79.9; 72.7; 79.0; 71.0; 82.5; 76.0; 69.5; 76.8; 73.2; 74.8; 75.7; 56.9; 71.1; 76.8; 70.5; 74.7; 78.7; 78.5; 82.3; 78.7; 81.8; 80.3; 80.9; 73.6; 85.1; 69.9; 86.9; 82.4; 80.5; 68.3; 81.7; 69.8; 69.9; 81.8 (AVE. = 75.8)
GA-2 (Tradewind Takeoff)	N/A	N/A
C-130 (Tradewind Takeoff)	83.5 (AVE. =83.5)	89.3 (AVE. =89.3)
HH-65A (Tradewind Takeoff)	N/A	N/A
CIV.HELO (Tradewind Takeoff)	N/A	N/A

Measured Leq(2.5 hours) = 56.3 Leq

TABLE V-9

SUMMARY OF AIRCRAFT NOISE MEASUREMENTS AT LOCATION "LS" (12/21/04)

AIRCRAFT TYPE	MAXIMUM SOUND LEVELS Lmax (in dB)	SOUND EXPOSURE LEVELS Lse (in dB)
GA-1 (Tradewind Takeoff)	63.5; 60.6; 57.3; 65.1; 59.9; 61.4; 63.7; 60.6; 62.3; 57.8; 78.5; 72.1; 70.1; 67.8; 54.6; (AVE. = 63.7)	70.4; 67.2; 69.2; 65.4; 68.6; 70.4; 69.0; 71.3; 84.3; 80.1; 77.6; 75.2 (AVE. = 72.4)
GA-2 (Tradewind Takeoff)	67.7 (AVE. = 67.7)	74.2 (AVE. = 74.2)
C-130 (Tradewind Takeoff)	N/A	N/A
HH-65A (Tradewind Takeoff)	76.4; 71.6 (AVE. = 74.0)	80.9; 76.8 (AVE. = 78.9)
CIV.HELO (Tradewind Takeoff)	83.2; 80.8; 80.5; 77.3; 79.2; 78.4 (AVE. = 66.8)	91.1; 89.1; 88.6; 83.8; 87.7; 87.5 (AVE. = 88.0)

Measured Leq(8.0 hours) = 52.3 Leq

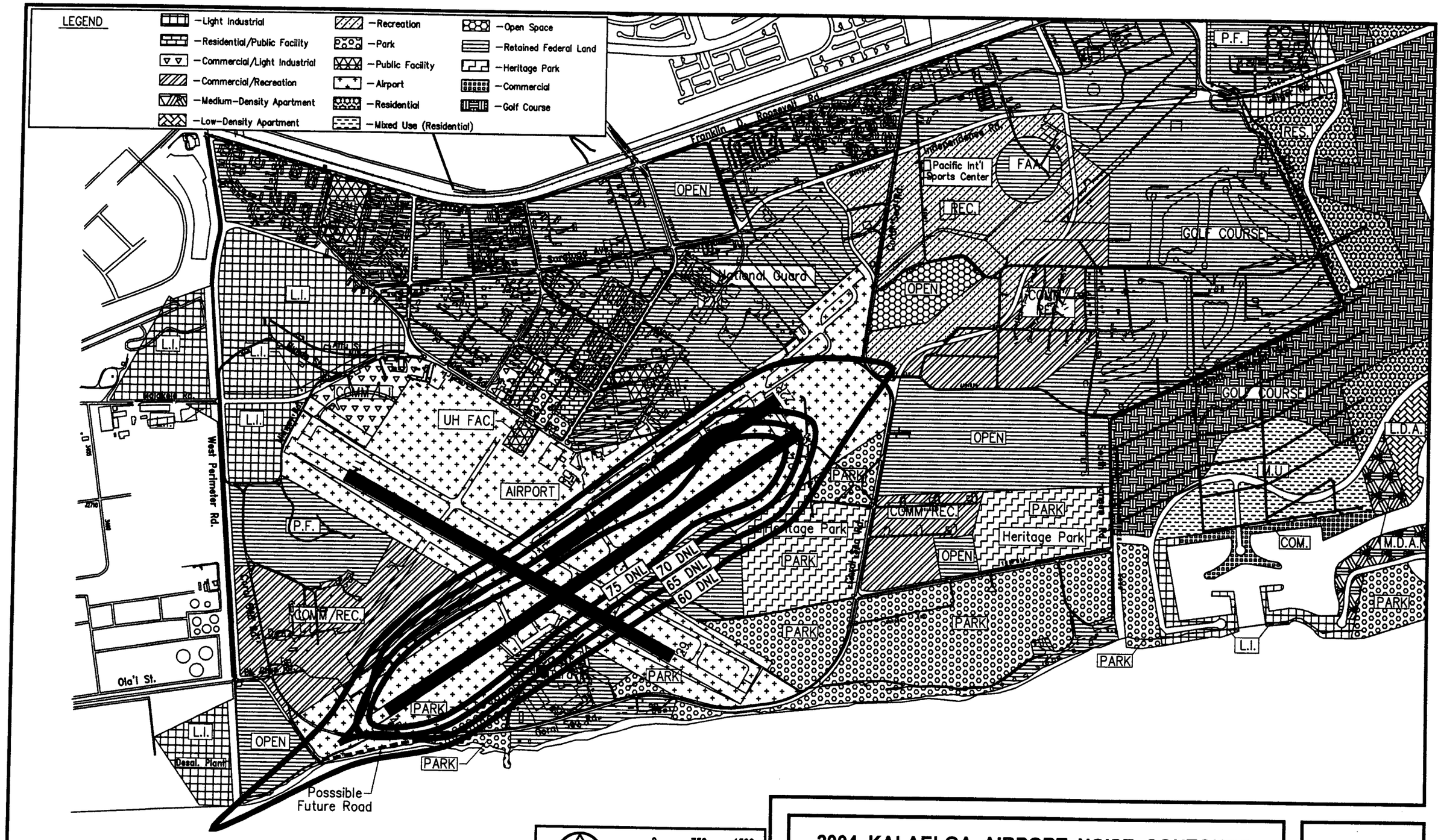
TABLE V - 10
SUMMARY OF MEASURED AVERAGE NOISE LEVELS

LOCATION: Kalaeloa Airport
PROJECT: ILS Instalation at Kalaeloa Airport

Date	Start Time	End Time	Total Leq	Proj. Leq	Other Leq	Event Description
10/28/04	8:45	16:45	58.4	51.7	57.4	At Location N
11/01/04	7:45	15:45	59.6	47.9	59.3	At Location N
11/03/04	7:51	15:51	60.3	53.0	59.4	At Location 92
11/08/04	7:45	15:46	59.7	53.4	58.5	At Location 92
11/13/04	7:31	15:30	58.4	52.4	57.1	At Location 92
12/21/04	7:45	15:45	57.8	52.3	56.4	At Location LS

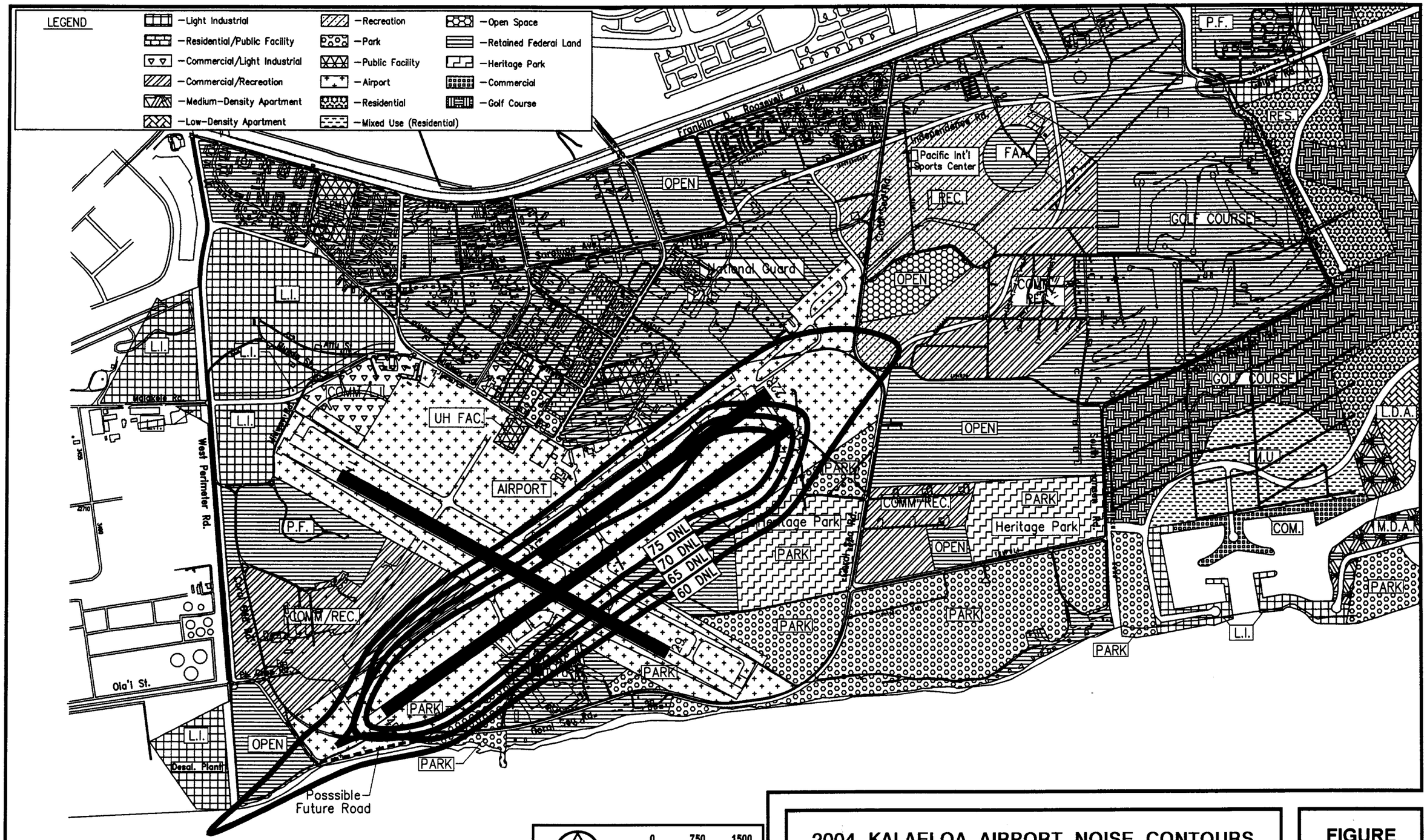
Notes:

a. Leq = Average A-Weighted Sound Level (in dBA)
b. Tot. Leq = Average A-Weighted Sound Level (in dBA) of All Noise Sources.
c. Proj. Leq = Average A-Weighted Sound Level (in dBA) from Kalaeloa Aircraft Operations.
d. Other Leq = Average A-Weighted Sound Level (in dBA) from Non-Project Noise Sources.



2004 KALAELOA AIRPORT NOISE CONTOURS WITHOUT HIA LANDINGS

FIGURE V-1



2004 KALAELOA AIRPORT NOISE CONTOURS WITH HIA LANDINGS

FIGURE V-2

planned land uses in that area. Because the Kapolei Area was and is being developed as a Master Planned Second City with prior disclosure of the aircraft noise contours in Reference 8 being adequate during the planning process, it is suspected that the more recently completed existing land uses in Kapolei are compatible with existing aircraft noise levels. Also, by Reference 5 and legislation which preceded it, adequate disclosures of aircraft noise have probably been made to new tenants in the project area.

Background Ambient Noise Levels. Between aircraft flyby events, background ambient noise levels are typically less than 55 dBA, and may decrease to levels less than 40 dBA during calm wind periods at locations which are removed from motor vehicle traffic, surf noise, or developed areas. Aircraft noise events are typically audible in the project environs because they are louder than the background ambient noise levels during an aircraft flyby event. Average background ambient noise levels measured at Sites "N", "92", and "LS" from noise sources not associated with Kalaeloa Airport operations and which include the noise contributions from aircraft landing at Honolulu International Airport were 58, 58, and 56 Leq, respectively. These background ambient levels are relatively low and compatible for noise sensitive land uses.

Aircraft Noise - Using Modified State DOT Forecasts. Using the 2025 State DOT forecasts for Kalaeloa Airport with adjustments for the additional increase in operations associated with the new ILS installation, the forecasted aircraft noise levels for Kalaeloa Airport in CY 2025 with and without the contributions from HIA operations are shown in Figures VI-1 and VI-2. These noise contours will remain relatively small, with HIA aircraft noise having a relatively small effect on the Kalaeloa Airport noise contours. The 2025 noise contours do not enclose residential or other noise sensitive land uses, so they were considered to be compatible with the land uses in the immediate environs of the airport. Recreational lodging, park, and beach areas south of the airport will continue to be exposed to single event aircraft noise levels ranging from 56 to 89 dBA (Lmax). Because the number of these aircraft flybys are expected to remain relatively low, the 60 DNL contour should not encompass these recreational areas.

The forecasted Kalaeloa Airport departure and landing operations and HIA landing operations for CY 2025 are shown in Appendix C and Table IV-8. The assumed flight tracks for 2025 were assumed to be identical to the flight tracks shown in Figures IV-1, IV-2, IV-4, and IV-5.

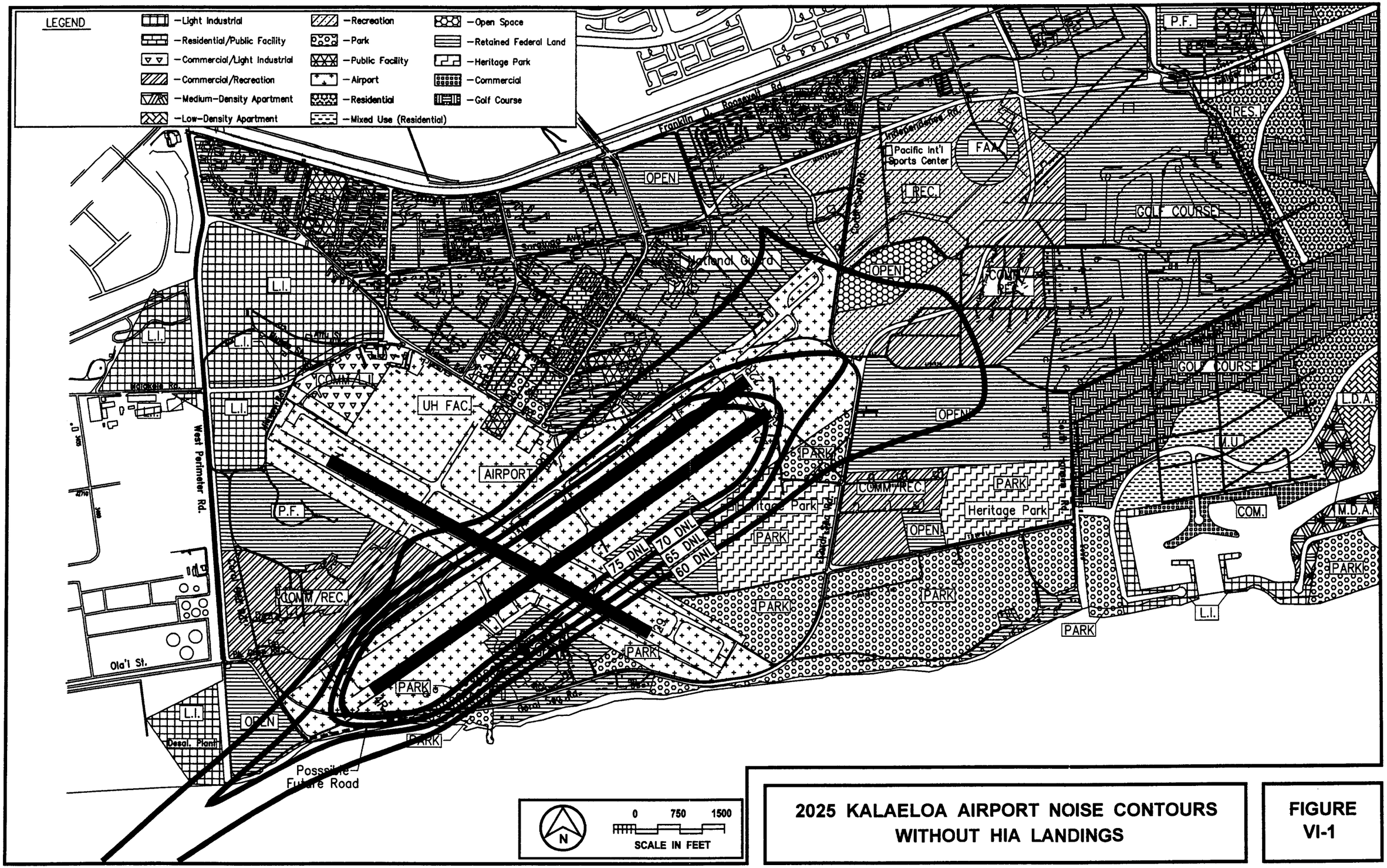
By CY 2025, aircraft noise levels in the Kalaeloa Airport environs are expected to increase by approximately 3 to 8 DNL from 2004 noise levels due to the forecast increase in airport operations at Kalaeloa Airport. These increases are considered to be relatively large and may be noticeable to existing receptors around the airport. The relative mix of aircraft utilizing Kalaeloa Airport is also expected to change between the Base Year and CY 2025 with the replacement of the P-3C propellor aircraft with the P-8A jet aircraft. The additional increase in aircraft noise levels associated with changes in operations at HIA is expected to be less than 1 DNL. These changes in aircraft noise levels are considered to be very small and should not be noticeable.

Future Aircraft Noise - With Additional Cargo Operations. The potential increases in aircraft noise levels associated with the relocation of air cargo operations from Honolulu International Airport to Kalaeloa Airport was investigated. Assumptions were made solely for the purposes of modeling and were was follows:

a. Runway 4R/22L was lengthened from 8,000 to 11,000 feet toward the northeast;

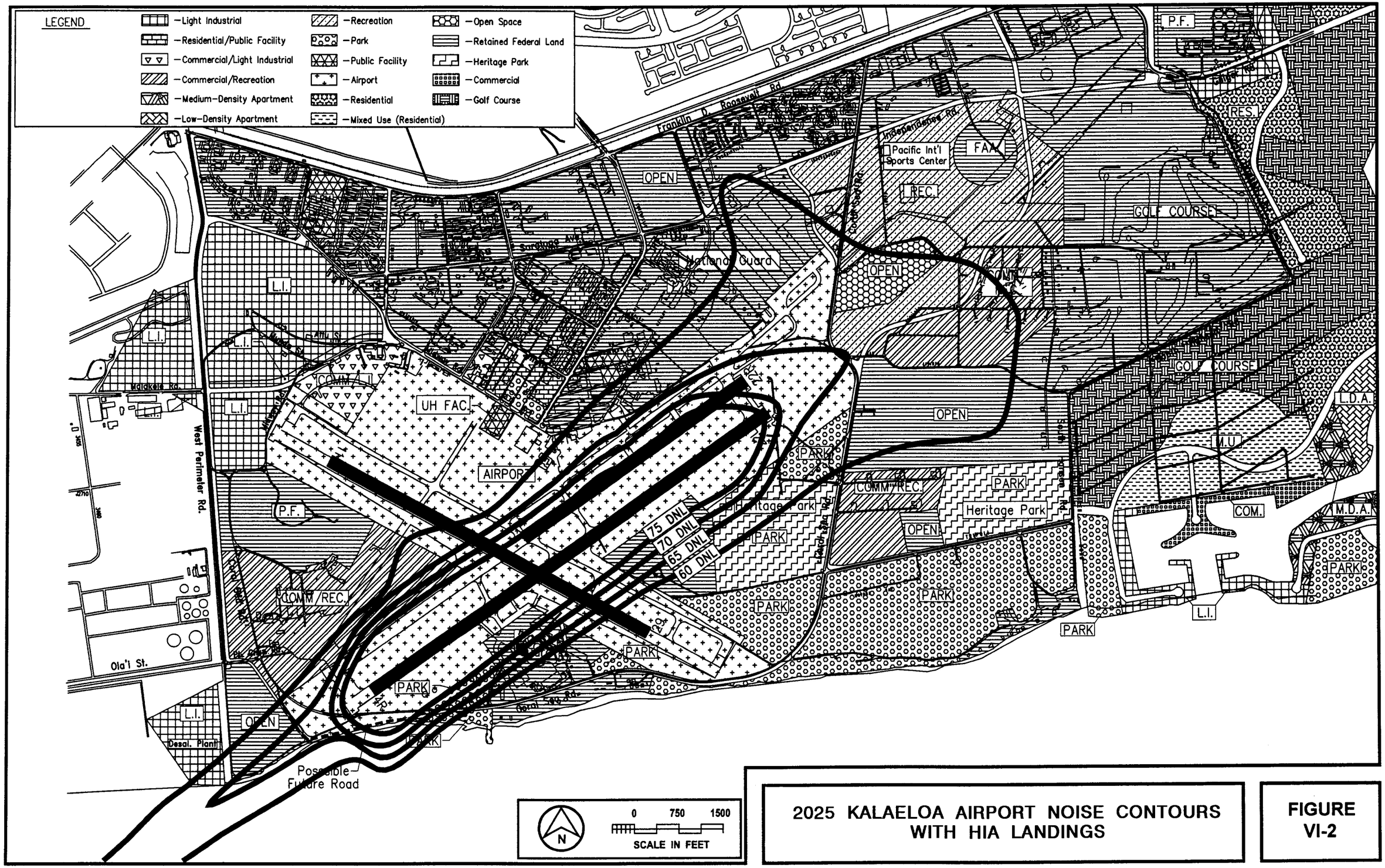
b. 90 percent of interisland cargo aircraft landings and takeoffs were assumed to occur during the nighttime hours (2200 to 0700 hours), and 10 percent were assumed to occur during the daytime hours (0700 to 2200 hours);

c. 50 percent of overseas cargo aircraft landings and takeoffs were assumed to occur during the nighttime hours (2200 to 0700 hours), and 50 percent were assumed to occur during the daytime hours (0700 to 2200 hours); and



2025 KALAELOA AIRPORT NOISE CONTOURS WITHOUT HIA LANDINGS

FIGURE VI-1



2025 KALAELOA AIRPORT NOISE CONTOURS WITH HIA LANDINGS

FIGURE VI-2

d. The mix of cargo aircraft and their frequency of operations were assumed to be similar to those which were recorded at HIA in 2004. This 2004 data on cargo aircraft operations at HIA were obtained from Reference 12. Tables VI-1A and VI-1B depict the fictitious landing and takeoff operations of the cargo aircraft which were modeled at Kalaeloa Airport. Figure VI-3 depicts the landing and takeoff flight tracks assumed for the cargo aircraft.

Figure VI-4 depicts the Kalaeloa Airport noise contours associated with the assumed air cargo operations described above. The 60 and 65 DNL contours extend beyond the east boundary of the Kalaeloa study area, and the 60 DNL contour encloses all but the northwest corner of the Kalaeloa study area.

Figure VI-5 depicts the Kalaeloa Airport noise contours with the Aloha Airlines air cargo operations deleted from the cargo operations shown in Tables VI-1A and VI-1B. Only the 60 DNL contour extends beyond the east boundary of the Kalaeloa study area, and the 60 DNL contour encloses a much smaller portion of the Kalaeloa study area. The reason for the large reduction in the potential cargo noise contours of Figure VI-4 is the high noise level associated with the Aloha Airlines B-737(200) aircraft when compared to the lower noise levels of the more modern overseas jet aircraft.

Future Aircraft Noise - With Additional Military Fighter Aircraft Operations. In order to provide an estimate of the potential noise levels associated with the homebasing of approximately 80 combat jet fighter aircraft at Kalaeloa Airport, noise contours were developed using operational information contained in Reference 13. Estimates of the number of annual training operations by 80 combat jet fighter aircraft were made using historical data presented in Reference 13 for NAS Oceana and NALF Fentress airfields.

Table VI-2A presents the derivation of the modeling assumptions used to convert the Reference 13 operational data to the potential situation at Kalaeloa Airport. Only local training operations such as Touch and Go and Fleet Carrier Landing Practice (FCLP) were included in the Kalaeloa modeling effort. Itinerant operations between Kalaeloa Airport and other airfields were not included in the initial modeling efforts, but were included in later modeling efforts. In-frame and out-of-frame testing of the fighter jet engines were not included in the noise modeling effort for Kalaeloa Airport.

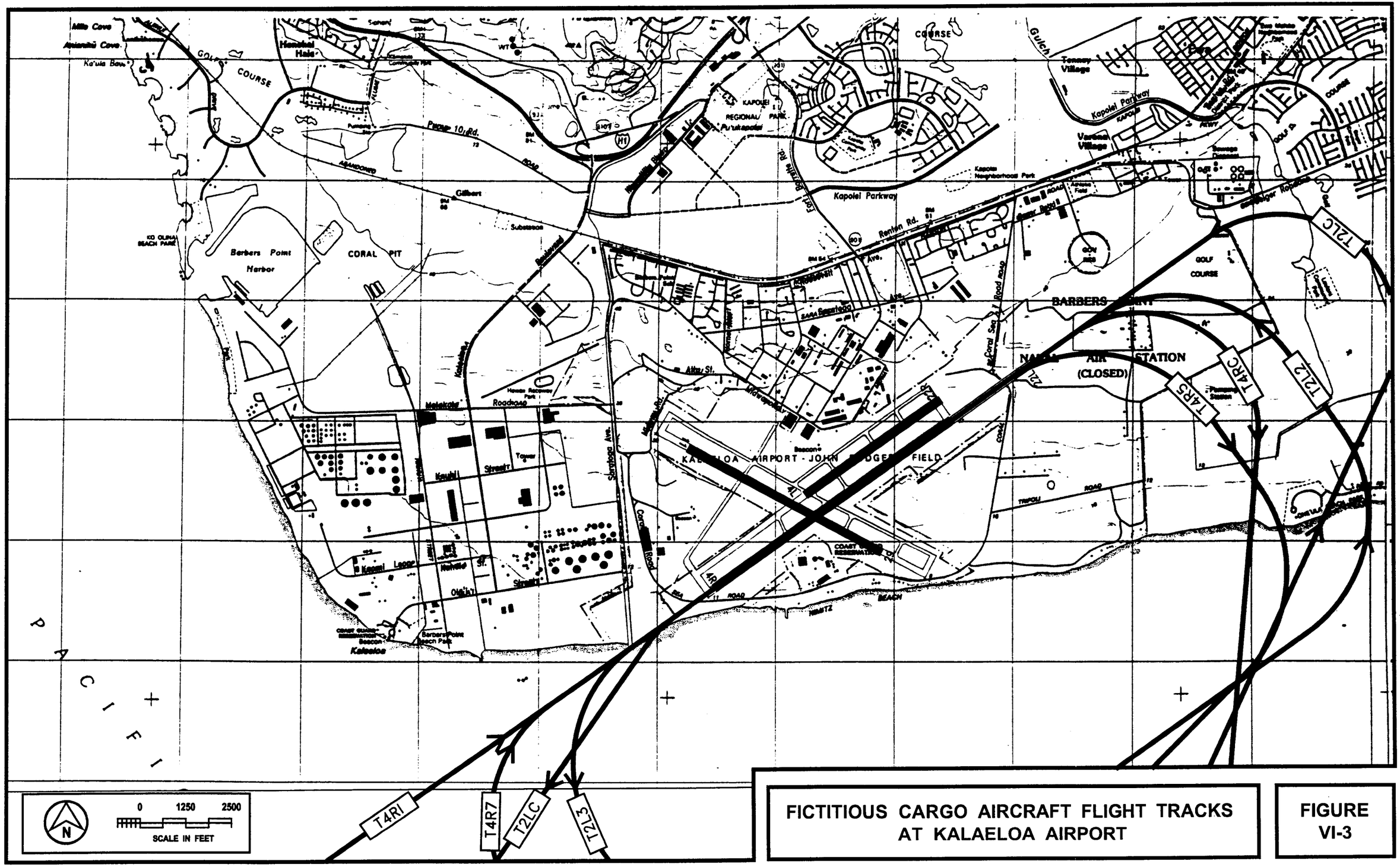
Noise contours were initially developed using the FAA INM 6.1 for two scenarios: use of only left hand turns for FLCP operations as indicated at NALF Fentress; and use of left and right hand turns for FLCP operations to remain south of Runway 4R/22L. Touch and Go operations were assumed to remain south of Runway 4R/22L for both scenarios. The FCLP and Touch and Go flight tracks assumed for each scenario are shown in Figures VI-6 and VI-7, with flight tracks "CLPT" and "CLPK" used for FCLP operations, and with flight tracks "14TT" and "14TK" used for Touch and Go operations.

TABLE VI-1A - KALAELOA AIRPORT 2004 FICTITIOUS CARGO LANDINGS

A/C	BASE YR. ANNUAL OPS.	TOTAL ANNUAL LAND'S	RWY 04R LAND'S	RWY 22L LAND'S	--- RWY 04R -- ITIN. T4RI	ITIN. T4R7	---- RWY 22L --- ITIN. T2LC	ITIN. T2L2	
DAYTIME:									DAYTIME:
B727-200	203	102	86	15	86	0	15	0	B727-200
B737-200C	969	485	412	73	412	0	73	0	B737-200C
B747	113	57	48	8	48	0	8	0	B747
B747-100	507	254	215	38	215	0	38	0	B747-100
B747-200	145	73	62	11	62	0	11	0	B747-200
B747-200F	14	7	6	1	6	0	1	0	B747-200F
B747-300	3	2	1	0	1	0	0	0	B747-300
B747-400	109	55	46	8	46	0	8	0	B747-400
B747-400F	71	36	30	5	30	0	5	0	B747-400F
B747A	21	11	9	2	9	0	2	0	B747A
B747B	93	47	40	7	40	0	7	0	B747B
B757	1	1	0	0	0	0	0	0	B757
B767-300ER	510	255	217	38	217	0	38	0	B767-300ER
B777-200	4	2	2	0	2	0	0	0	B777-200
BEECH 1900	218	109	92	16	0	92	0	16	BEECH 1900
BEECH 99	283	141	120	21	0	120	0	21	BEECH 99
BEECH E-18	230	115	98	17	0	98	0	17	BEECH E-18
CESSNA 208 CAR	236	118	100	18	0	100	0	18	CESSNA 208 CARAVAN
DC-10	14	7	6	1	6	0	1	0	DC-10
DC-3S	10	5	4	1	0	4	0	1	DC-3S
DC10-30	219	110	93	16	93	0	16	0	DC10-30
MD-11	944	472	401	71	401	0	71	0	MD-11
SHORTS 330	78	39	33	6	0	33	0	6	SHORTS 33(
SHORTS SD360	270	135	115	20	0	115	0	20	SHORTS SD360
DC-8-62F	1	1	0	0	0	0	0	0	DC-8-62F
TOT DAY:	5,265	2,632	2,238	395	1,675	562	296	99	
NIGHTTIME:									NIGHTTIME:
B727-200	203	101.5	86	15	86	0	15	0	B727-200
B737-200C	8,725	4362.3	3,708	654	3,708	0	654	0	B737-200C
B747	113	56.5	48	8	48	0	8	0	B747
B747-100	507	253.5	215	38	215	0	38	0	B747-100
B747-200	145	72.5	62	11	62	0	11	0	B747-200
B747-200F	14	7.0	6	1	6	0	1	0	B747-200F
B747-300	3	1.5	1	0	1	0	0	0	B747-300
B747-400	109	54.5	46	8	46	0	8	0	B747-400
B747-400F	71	35.5	30	5	30	0	5	0	B747-400F
B747A	21	10.5	9	2	9	0	2	0	B747A
B747B	93	46.5	40	7	40	0	7	0	B747B
B757	1	0.5	0	0	0	0	0	0	B757
B767-300ER	510	255.0	217	38	217	0	38	0	B767-300ER
B777-200	4	2.0	2	0	2	0	0	0	B777-200
BEECH 1900	1,958	979.2	832	147	0	832	0	147	BEECH 1900
BEECH 99	2,545	1272.6	1,082	191	0	1,082	0	191	BEECH 99
BEECH E-18	2,068	1034.1	879	155	0	879	0	155	BEECH E-18
CESSNA 208 CAR	2,120	1060.2	901	159	0	901	0	159	CESSNA 208 CARAVAN
DC-10	14	7.0	6	1	6	0	1	0	DC-10
DC-3S	92	45.9	39	7	0	39	0	7	DC-3S
DC10-30	219	109.5	93	16	93	0	16	0	DC10-30
MD-11	944	472.0	401	71	401	0	71	0	MD-11
SHORTS 330	700	350.1	298	53	0	298	0	53	SHORTS 330
SHORTS SD360	2,426	1213.2	1,031	182	0	1,031	0	182	SHORTS SD360
DC-8-62F	1	0.5	0	0	0	0	0	0	DC-8-62F
TOT NIGHT:	23,607	11,804	10,033	1,771	4,971	5,062	877	893	
DAY-NITE TOT:	28,872	14,436	12,271	2,165	6,646	5,624	1,173	993	

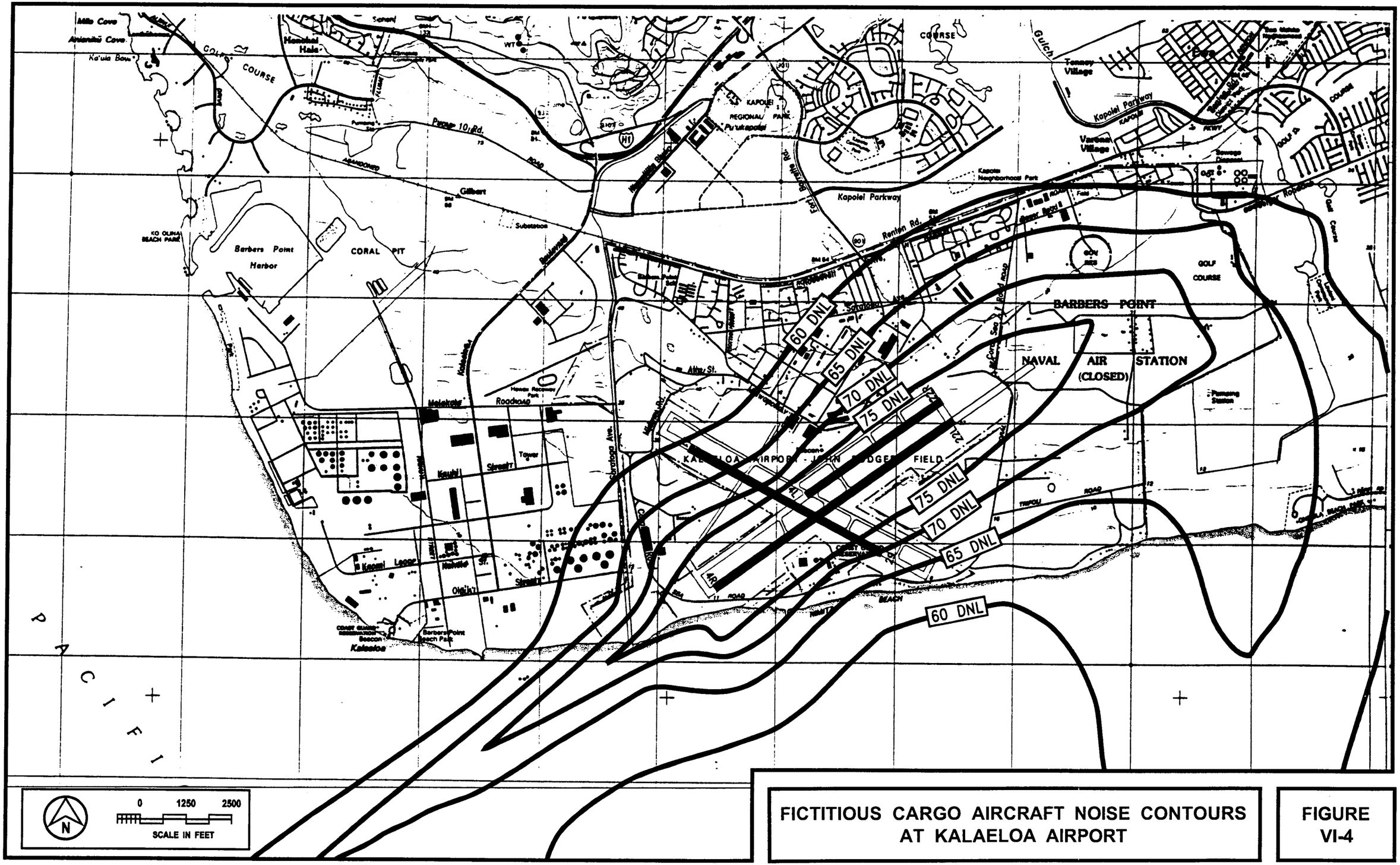
TABLE VI-1B - KALAELOA AIRPORT 2004 FICTITIOUS CARGO DEPARTURES

A/C	BASE YR ANNUAL OPS	TOTAL ANNUAL DEPART.	RWY 04R DEPART.	RWY 22L DEPART.	--- RWY 04R -- ITIN. T4RC	ITIN. T4R5	---- RWY 22L --- ITIN. T2LC	ITIN. T2L3	
DAYTIME:									DAYTIME:
B727-200	203	102	86	15	86	0	15	0	B727-200
B737-200C	969	485	412	73	412	0	73	0	B737-200C
B747	113	57	48	8	48	0	8	0	B747
B747-100	507	254	215	38	215	0	38	0	B747-100
B747-200	145	73	62	11	62	0	11	0	B747-200
B747-200F	14	7	6	1	6	0	1	0	B747-200F
B747-300	3	2	1	0	1	0	0	0	B747-300
B747-400	109	55	46	8	46	0	8	0	B747-400
B747-400F	71	36	30	5	30	0	5	0	B747-400F
B747A	21	11	9	2	9	0	2	0	B747A
B747B	93	47	40	7	40	0	7	0	B747B
B757	1	1	0	0	0	0	0	0	B757
B767-300ER	510	255	217	38	217	0	38	0	B767-300ER
B777-200	4	2	2	0	2	0	0	0	B777-200
BEECH 1900	218	109	92	16	0	92	0	16	BEECH 1900
BEECH 99	283	141	120	21	0	120	0	21	BEECH 99
BEECH E-18	230	115	98	17	0	98	0	17	BEECH E-18
CESSNA 208 CAR	236	118	100	18	0	100	0	18	CESSNA 208 CARAVAN
DC-10	14	7	6	1	6	0	1	0	DC-10
DC-3S	10	5	4	1	0	4	0	1	DC-3S
DC10-30	219	110	93	16	93	0	16	0	DC10-30
MD-11	944	472	401	71	401	0	71	0	MD-11
SHORTS 330	78	39	33	6	0	33	0	6	SHORTS 330
SHORTS SD360	270	135	115	20	0	115	0	20	SHORTS SD360
DC-8-62F	1	1	0	0	0	0	0	0	DC-8-62F
TOT DAY:	5,265	2,632	2,238	395	1,675	562	296	99	
NIGHTTIME:									NIGHTTIME:
B727-200	203	102	86	15	86	0	15	0	B727-200
B737-200C	8,725	4,362	3,708	654	3,708	0	654	0	B737-200C
B747	113	57	48	8	48	0	8	0	B747
B747-100	507	254	215	38	215	0	38	0	B747-100
B747-200	145	73	62	11	62	0	11	0	B747-200
B747-200F	14	7	6	1	6	0	1	0	B747-200F
B747-300	3	2	1	0	1	0	0	0	B747-300
B747-400	109	55	46	8	46	0	8	0	B747-400
B747-400F	71	36	30	5	30	0	5	0	B747-400F
B747A	21	11	9	2	9	0	2	0	B747A
B747B	93	47	40	7	40	0	7	0	B747B
B757	1	1	0	0	0	0	0	0	B757
B767-300ER	510	255	217	38	217	0	38	0	B767-300ER
B777-200	4	2	2	0	2	0	0	0	B777-200
BEECH 1900	1,958	979	832	147	0	832	0	147	BEECH 1900
BEECH 99	2,545	1,273	1,082	191	0	1,082	0	191	BEECH 99
BEECH E-18	2,068	1,034	879	155	0	879	0	155	BEECH E-18
CESSNA 208 CAR	2,120	1,060	901	159	0	901	0	159	CESSNA 208 CARAVAN
DC-10	14	7	6	1	6	0	1	0	DC-10
DC-3S	92	46	39	7	0	39	0	7	DC-3S
DC10-30	219	110	93	16	93	0	16	0	DC10-30
MD-11	944	472	401	71	401	0	71	0	MD-11
SHORTS 330	700	350	298	53	0	298	0	53	SHORTS 330
SHORTS SD360	2,426	1,213	1,031	182	0	1,031	0	182	SHORTS SD360
DC-8-62F	1	1	0	0	0	0	0	0	DC-8-62F
TOT NIGHT:	23,607	11,804	10,033	1,771	4,971	5,062	877	893	
DAY-NITE TOT:	28,872	14,436	12,271	2,165	6,646	5,624	1,173	993	



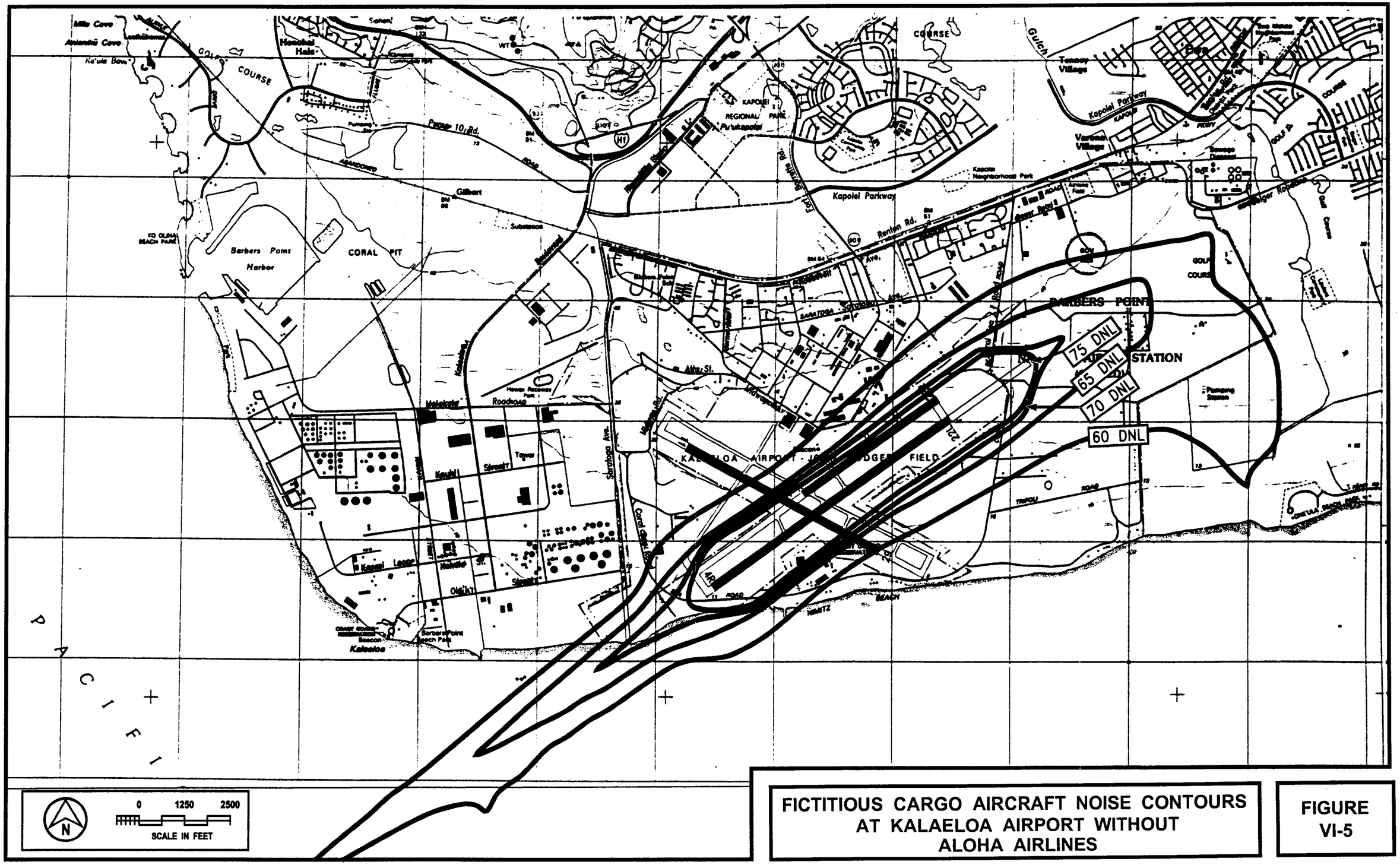
FICTITIOUS CARGO AIRCRAFT FLIGHT TRACKS AT KALAELOA AIRPORT

FIGURE VI-3



FICTITIOUS CARGO AIRCRAFT NOISE CONTOURS AT KALAELOA AIRPORT

FIGURE VI-4



FICTITIOUS CARGO AIRCRAFT NOISE CONTOURS AT KALAELOA AIRPORT WITHOUT ALOHA AIRLINES

FIGURE VI-5

TABLE VI-2A
ASSUMPTIONS AND DERIVATION OF KALAELOA JET FIGHTER OPERATIONS (ALL FCLP AND TOUCH & GO OPERATIONS AT KALAELOA AIRPORT)

Data Source: NAS Oceana and NALF Fentress Base Year Operations; 2000

Total Number of Based Aircraft: 11 F-14B/D squadrons; 1 F-14B/D FRS; 9 F/A-18C/D squadrons; 1 F/A-18C/D FRS; and 1 F-18C/D adversary squadron

Say 12 aircraft per squadron; 24 aircraft per FRS; and 10 aircraft per adversary squadron.

Total Aircraft: 156 F-14B/D 142 F/A-18C/C

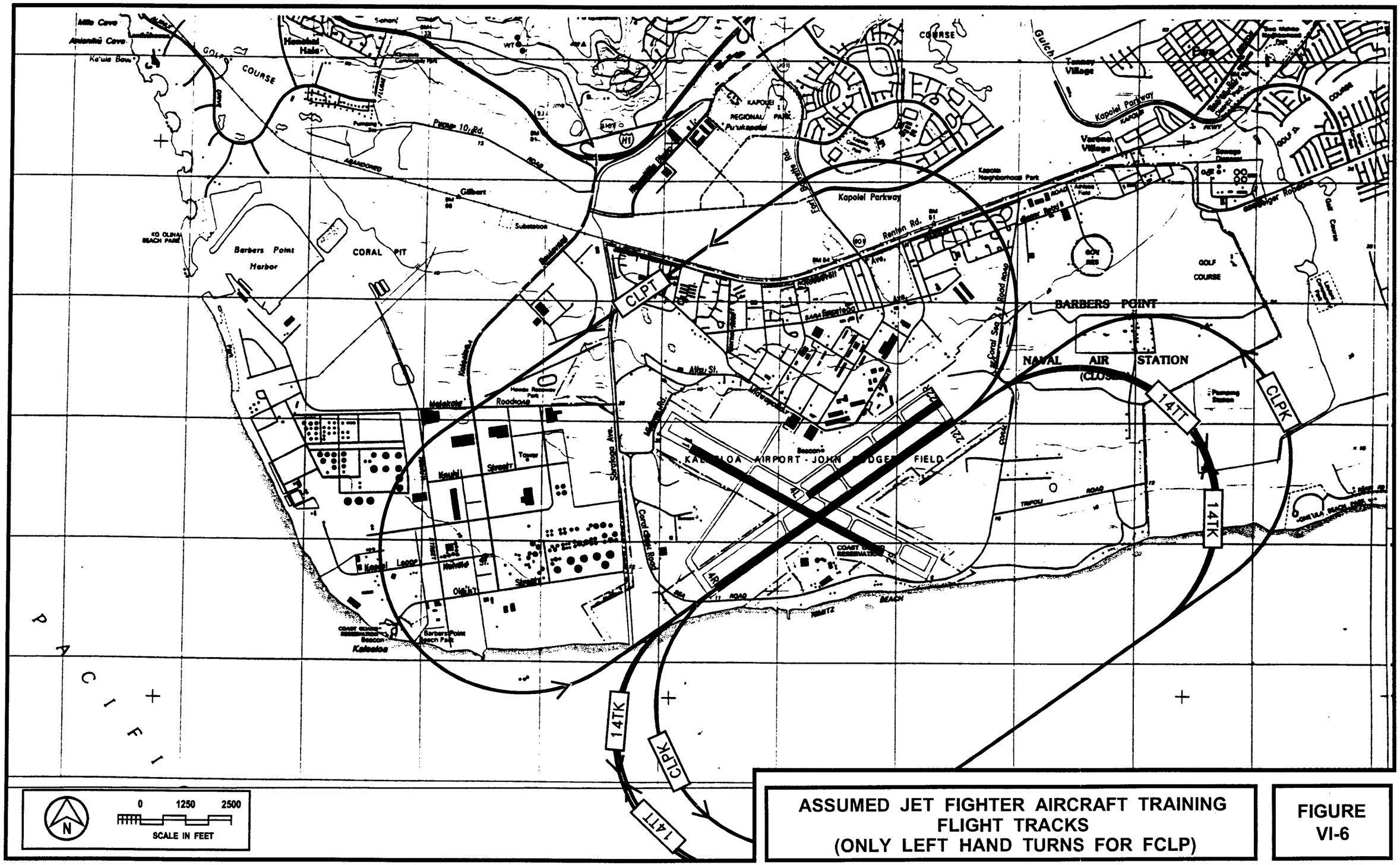
Honolulu Carrier to have 80 based aircraft or 27 percent of Oceana and Fentress operations.

FCLP Operations Only

	F-14 Operations		F/A-18 Operations		
	Day	Night	Day	Night	
Oceania:	5,542	3,290	4,080	370	Per Year
Fentress:	28,110	20,190	24,744	16,720	Per Year
Kalaeloa @ 27%:	9,086	6,340	7,782	4,614	Per Year
Kalaeloa @ 27%:	24.89	17.37	21.32	12.64	Per Day
Kalaeloa Rwy 4R:	21.16	14.76	18.12	10.75	Per Day
Kalaeloa Rwy 22L:	3.73	2.61	3.20	1.90	Per Day

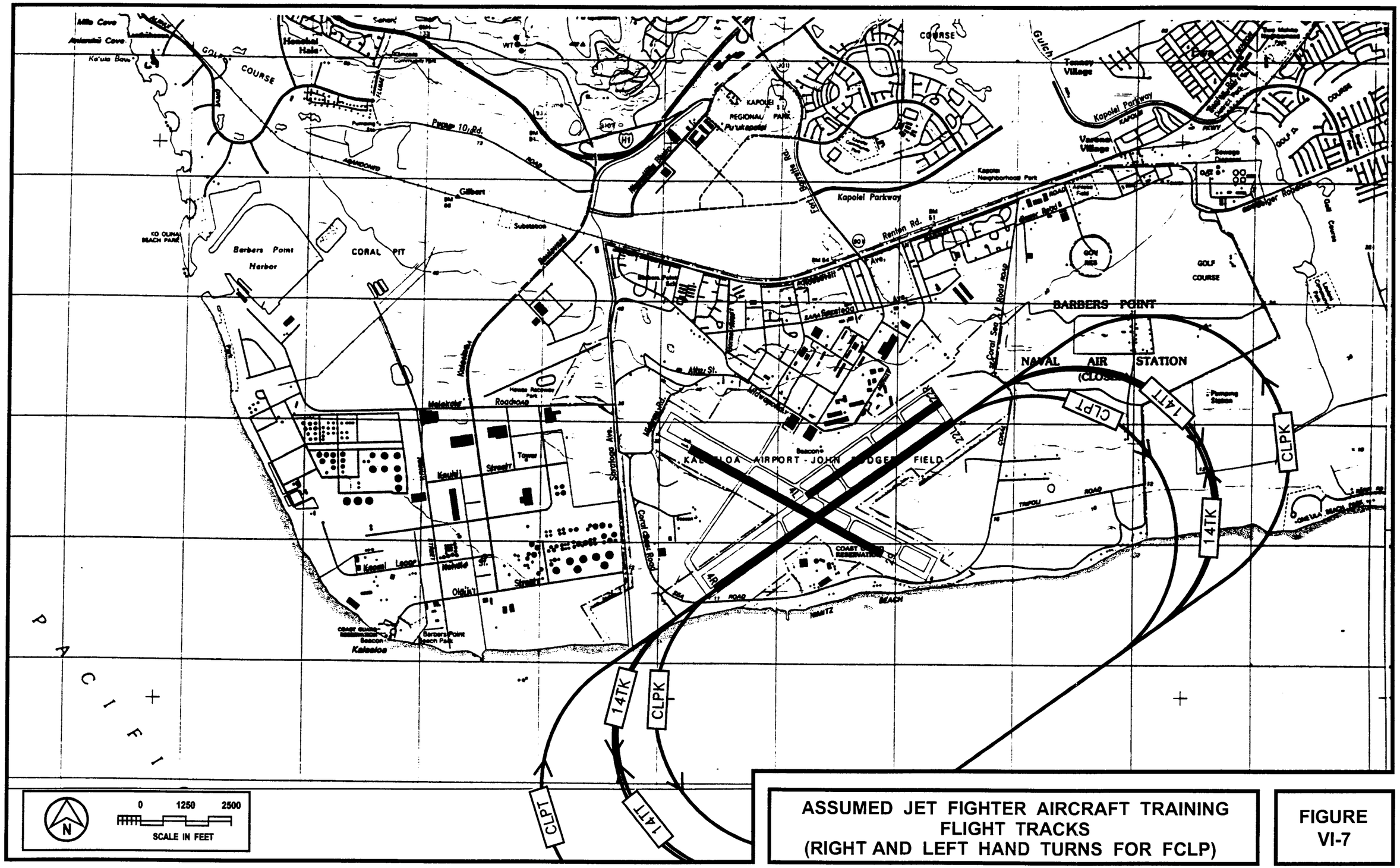
Touch & Go Operations Only

	F-14 Operations		F/A-18 Operations		
	Day	Night	Day	Night	
Oceania:	37,861	3,563	49,662	5,950	Per Year
Fentress:	0	0	0	0	Per Year
Kalaeloa @ 27%:	10,222	962	13,409	1,607	Per Year
Kalaeloa @ 27%:	28.01	2.64	36.74	4.40	Per Day
Kalaeloa Rwy 4R:	23.81	2.24	31.23	3.74	Per Day
Kalaeloa Rwy 22L:	4.20	0.40	5.51	0.66	Per Day



ASSUMED JET FIGHTER AIRCRAFT TRAINING FLIGHT TRACKS (ONLY LEFT HAND TURNS FOR FCLP)

FIGURE VI-6



ASSUMED JET FIGHTER AIRCRAFT TRAINING FLIGHT TRACKS (RIGHT AND LEFT HAND TURNS FOR FCLP)

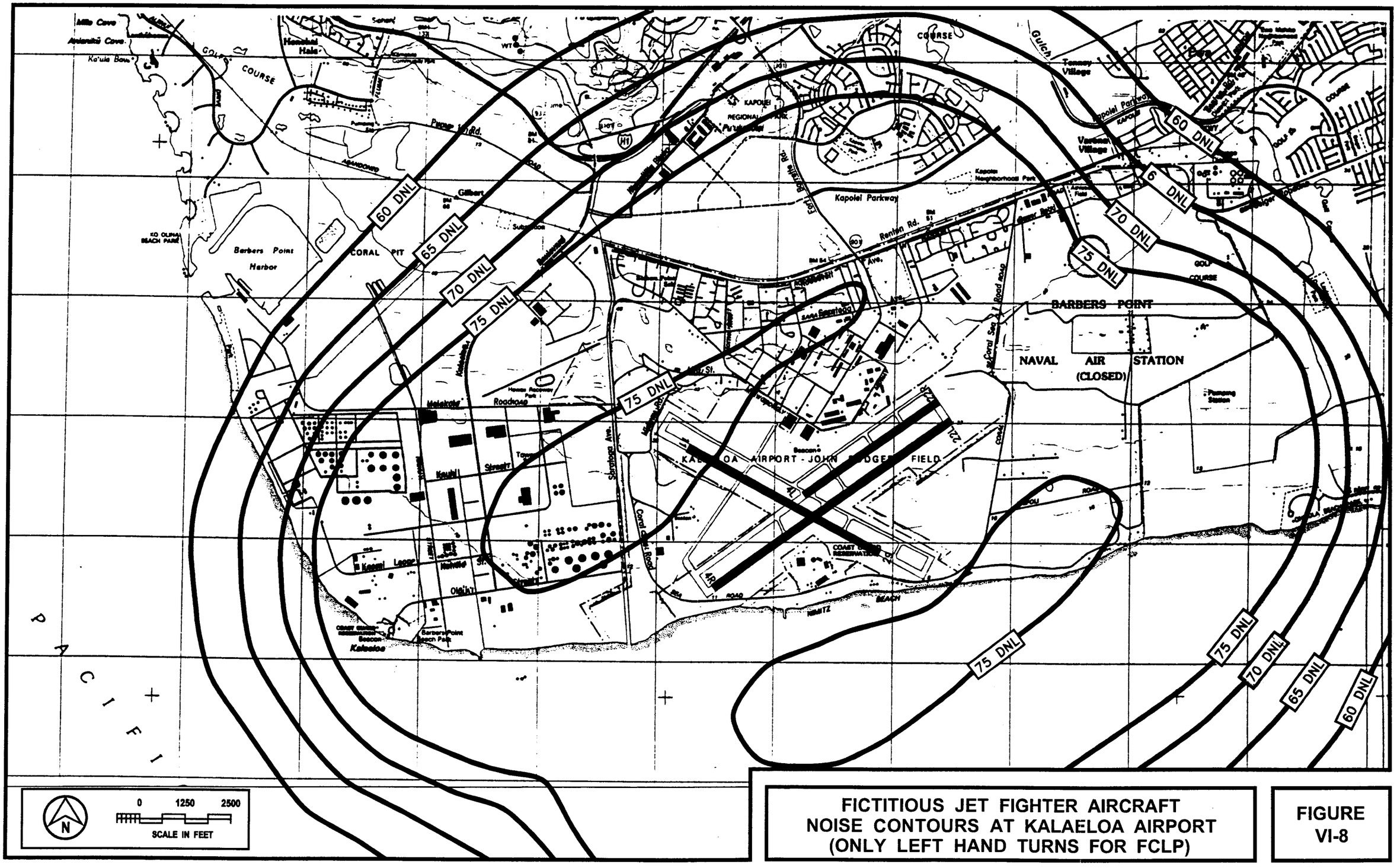
FIGURE VI-7

The resulting noise contours for the two jet fighter scenarios with all FCLP and Touch and Go operations conducted at Kalaeloa Airport are shown in Figures VI-8 and VI-9. From Figure VI-8, the 75 DNL contour will encompass essentially the entire Kalaeloa planning area and portions of the Ocean Pointe development under the worst case scenario of only left hand turns for FCLP. The FAA recommends that all lands within the 75 DNL noise level should be under the control of the airport operator. From Figure VI-9, if all jet fighter training operations are restricted to the makai side of Runway 4R/22L, the Kalaeloa land area contained within the 75 DNL contour is reduced, but the noise contours over the Ocean Pointe development remain.

Due to the large size of the fighter aircraft noise contours shown in Figures VI-8 and VI-9, additional training scenarios for these aircraft were modeled with an alternate airfield assumed available for selected training operations. The first of these "alternate airfield" scenarios is summarized in Table VI-2B, where all FCLP training operations were assumed to be conducted at an alternate airfield, with only Touch and Go training operations conducted at Kalaeloa Airport. Itinerant operations from Kalaeloa Airport to the alternate airfield and to Kalaeloa Airport from the alternate airfield were assumed to total 15 percent of the total number of FCLP training operations at the alternate airfield. The itinerant aircraft flight tracks assumed were T4R5 and T2L3 for departures (see Figure IV-2), and T4RI (Figure IV-5) and T2L2 (Figure IV-1) for arrivals. The resulting Kalaeloa Airport noise contours for this scenario are shown in Figure VI-10.

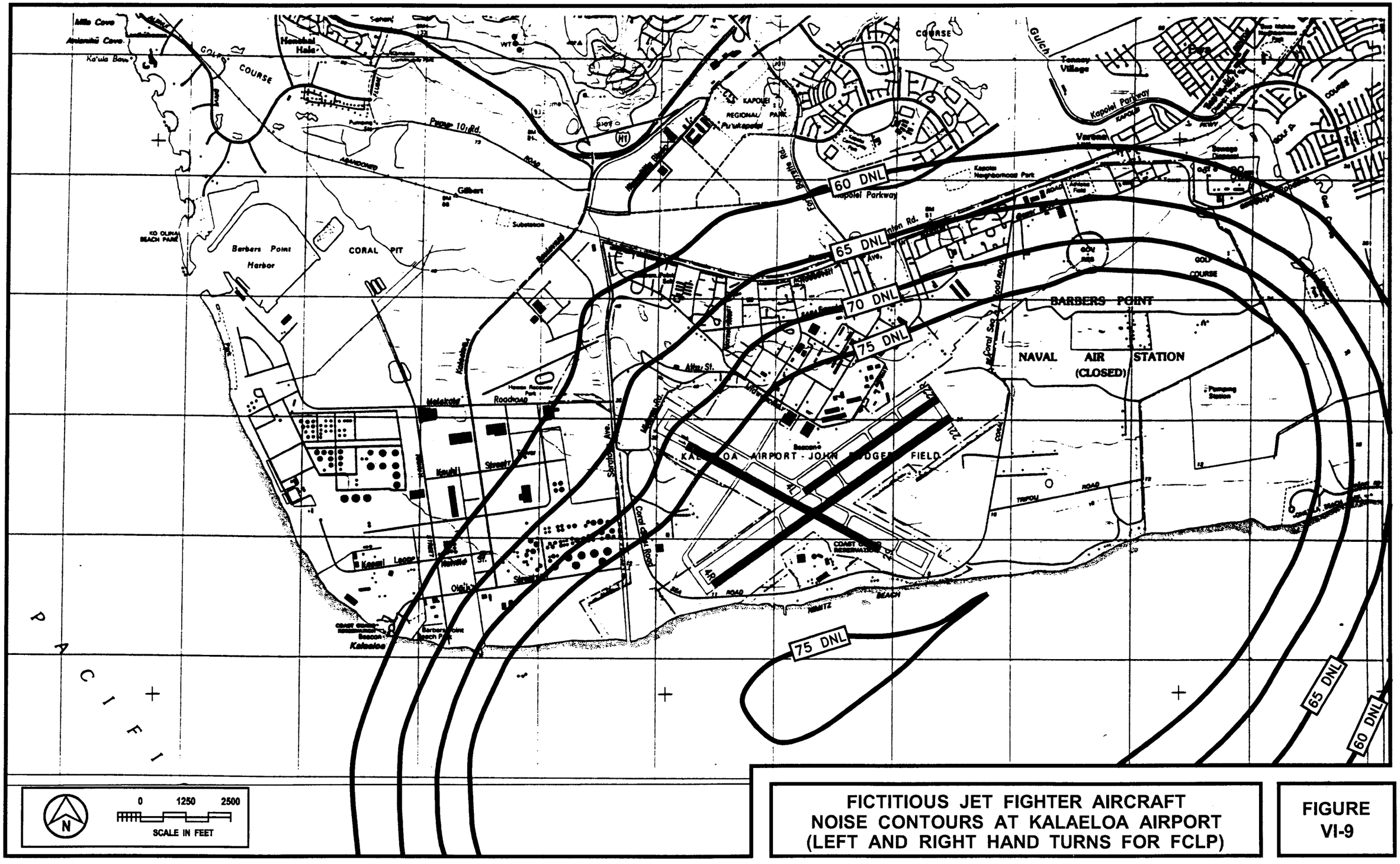
The second of these "alternate airfield" scenarios is summarized in Table VI-2C, where all FCLP training and nighttime Touch and Go operations were assumed to be conducted at an alternate airfield, with only daytime Touch and Go training operations conducted at Kalaeloa Airport. Itinerant operations from Kalaeloa Airport to the alternate airfield and to Kalaeloa Airport from the alternate airfield were assumed to total 15 percent of the total number of FCLP and nighttime Touch and Go training operations at the alternate airfield. The resulting Kalaeloa Airport noise contours for this scenario are shown in Figure VI-11.

The last of these "alternate airfield" scenarios is summarized in Table VI-2D, where all FCLP and all Touch and Go training operations were assumed to be conducted at an alternate airfield. Itinerant operations from Kalaeloa Airport to the alternate airfield and to Kalaeloa Airport from the alternate airfield were assumed to total 15 percent of the total number of FCLP and Touch and Go training operations at the alternate airfield. The resulting Kalaeloa Airport noise contours for this scenario are shown in Figure VI-12. The noise contours shown in Figure VI-12 represent the minimum potential size of the fighter aircraft noise contours at Kalaeloa Airport if 80 fighter aircraft are based at Kalaeloa Airport. The noise contours of Figure VI-12 are slightly larger than those associated with the transfer of all cargo operations from Honolulu International Airport to Kalaeloa Airport (Figure VI-4).



FICTITIOUS JET FIGHTER AIRCRAFT NOISE CONTOURS AT KALAELOA AIRPORT (ONLY LEFT HAND TURNS FOR FCLP)

FIGURE VI-8



FICTITIOUS JET FIGHTER AIRCRAFT NOISE CONTOURS AT KALAELOA AIRPORT (LEFT AND RIGHT HAND TURNS FOR FCLP)

FIGURE VI-9

TABLE VI-2B
ASSUMPTIONS AND DERIVATION OF KALAELOA JET FIGHTER OPERATIONS
(ALL FCLP OPERATIONS CONDUCTED AT ALTERNATE AIRFIELD)

Data Source: NAS Oceana and NALF Fentress Base Year Operations; 2000
Total Number of Based Aircraft: 11 F-14B/D squadrons; 1 F-14B/D FRS; 9 F/A-18C/D squadrons;
1 F/A-18C/D FRS; and 1 F-18C/D adversary squadron
Say 12 aircraft per squadron; 24 aircraft per FRS; and 10 aircraft per adversary squadron.
Total Aircraft: 156 F-14B/D 142 F/A-18C/C

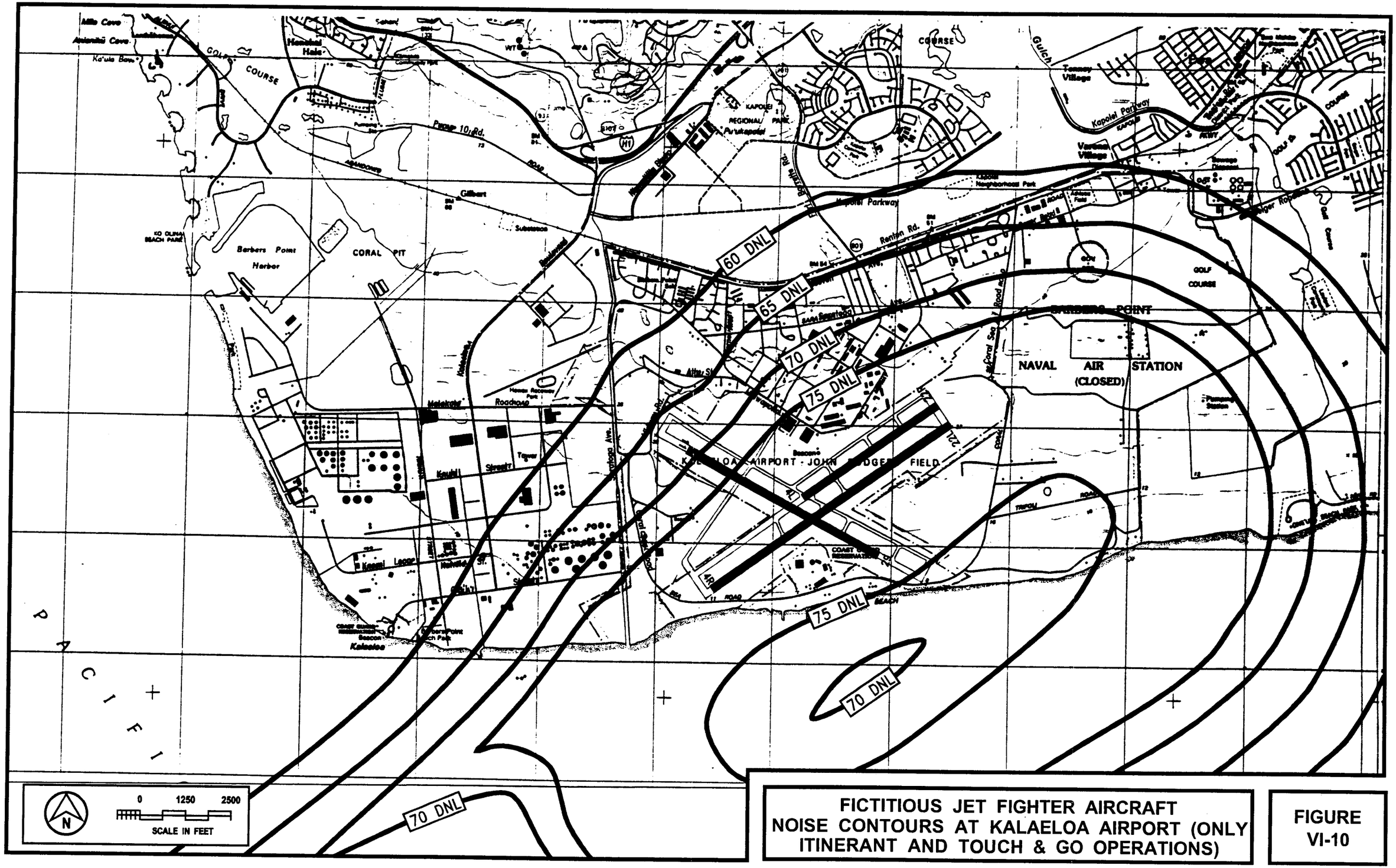
Honolulu Carrier to have 80 based aircraft or 27 percent of Oceana and Fentress operations.
All Touch & Go Operations At Kalaeloa Airport On Runway 4R/22L, and on makai side of runway.
All Hawaii FCLP operations conducted at another airfield, with 15% of total FCLP operations associated with itinerant operations at Kalaeloa Airport (7.5% departures from and 7.5% arrivals to Kalaeloa Airport).

Itinerant Operations Only

	F-14 Operations		F/A-18 Operations		
	Day	Night	Day	Night	
Kalaeloa Ops @ 15%:	1,363	951	1,167	692	Per Year
Kalaeloa Ops @ 15%:	3.73	2.61	3.20	1.90	Per Day
Kalaeloa Rwy 4R:	3.17	2.21	2.72	1.61	Per Day
Kalaeloa Rwy 22L:	0.56	0.39	0.48	0.28	Per Day

Touch & Go Operations Only

	F-14 Operations		F/A-18 Operations		
	Day	Night	Day	Night	
Oceania:	37,861	3,563	49,662	5,950	Per Year
Fentress:	0	0	0	0	Per Year
Kalaeloa @ 27%:	10,222	962	13,409	1,607	Per Year
Kalaeloa @ 27%:	28.01	2.64	36.74	4.40	Per Day
Kalaeloa Rwy 4R:	23.81	2.24	31.23	3.74	Per Day
Kalaeloa Rwy 22L:	4.20	0.40	5.51	0.66	Per Day



FICTITIOUS JET FIGHTER AIRCRAFT NOISE CONTOURS AT KALAELOA AIRPORT (ONLY ITINERANT AND TOUCH & GO OPERATIONS)

FIGURE VI-10

TABLE VI-2C
ASSUMPTIONS AND DERIVATION OF KALAELOA JET FIGHTER OPERATIONS (ALL FCLP AND NIGHTTIME TOUCH & GO OPERATIONS CONDUCTED AT ALTERNATE AIRFIELD)

Data Source: NAS Oceana and NALF Fentress Base Year Operations; 2000

Total Number of Based Aircraft: 11 F-14B/D squadrons; 1 F-14B/D FRS; 9 F/A-18C/D squadrons; 1 F/A-18C/D FRS; and 1 F-18C/D adversary squadron

Say 12 aircraft per squadron; 24 aircraft per FRS; and 10 aircraft per adversary squadron.

Total Aircraft: 156 F-14B/D 142 F/A-18C/C

Honolulu Carrier to have 80 based aircraft or 27 percent of Oceana and Fentress operations.

All Touch & Go Operations At Kalaeloa Airport On Runway 4R/22L, and on makai side of runway.

Only Daytime Touch & Go Operations At Kalaeloa Airport On Runway 4R/22L, and on makai side of runway.

All Hawaii nighttime Touch & Go operations conducted at another airfield, with 15% of total Touch & Go operations associated with itinerant operations at Kalaeloa Airport (7.5% departures from and 7.5% arrivals to Kalaeloa Airport).

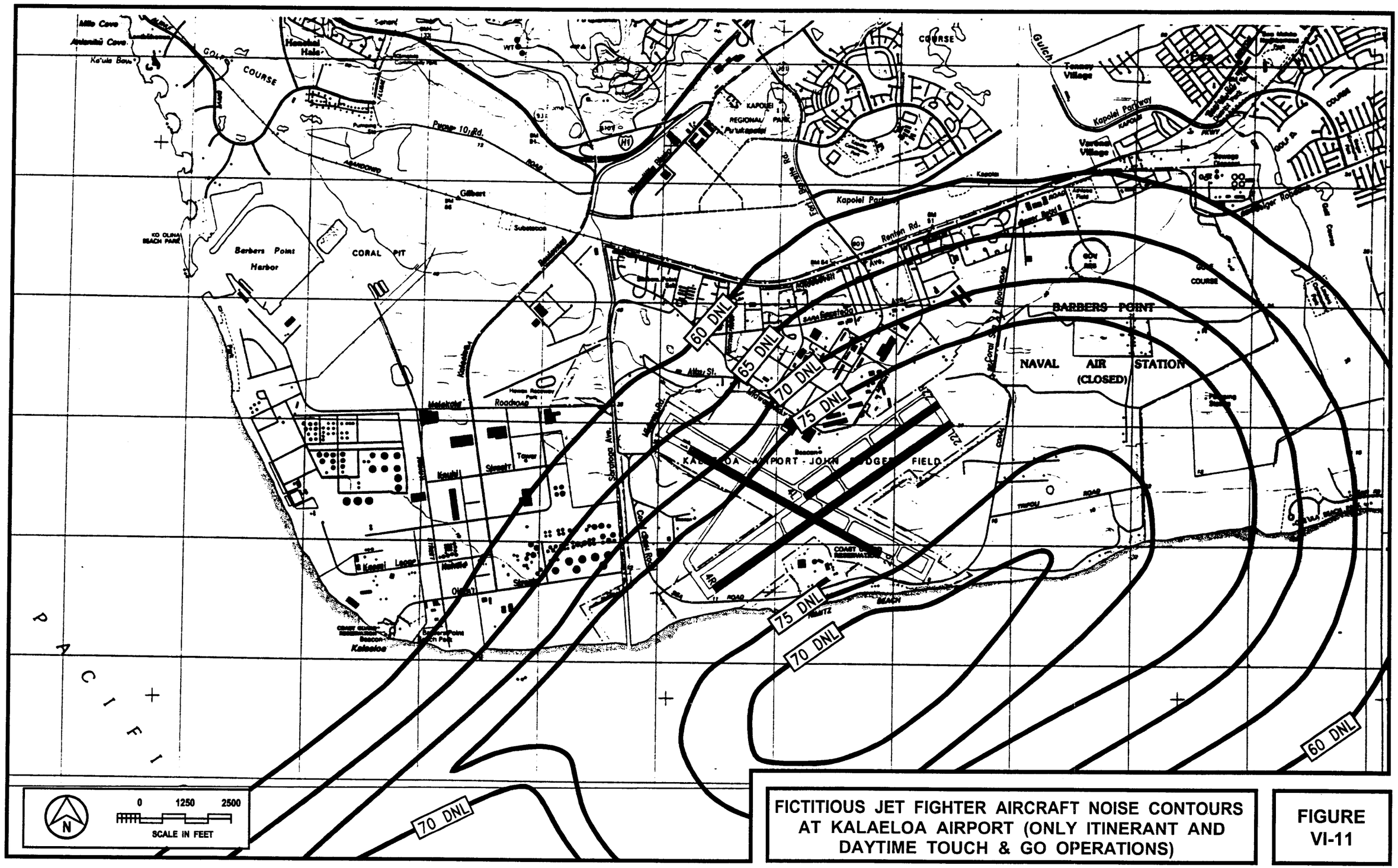
All Hawaii FCLP operations conducted at another airfield, with 15% of total FCLP operations associated with itinerant operations at Kalaeloa Airport (7.5% departures from and 7.5% arrivals to Kalaeloa Airport).

Itinerant Operations Only

	F-14 Operations		F/A-18 Operations		
	Day	Night	Day	Night	
Kalaeloa Ops @ 15%:	1,363	1,095	1,167	933	Per Year
Kalaeloa Ops @ 15%:	3.73	3.00	3.20	2.56	Per Day
Kalaeloa Rwy 4R:	3.17	2.55	2.72	2.17	Per Day
Kalaeloa Rwy 22L:	0.56	0.45	0.48	0.38	Per Day

Touch & Go Operations Only

	F-14 Operations		F/A-18 Operations		
	Day	Night	Day	Night	
Oceania:	37,861	3,563	49,662	5,950	Per Year
Fentress:	0	0	0	0	Per Year
Kalaeloa @ 27%:	10,222	0	13,409	0	Per Year
Kalaeloa @ 27%:	28.01	0.00	36.74	0.00	Per Day
Kalaeloa Rwy 4R:	23.81	0.00	31.23	0.00	Per Day
Kalaeloa Rwy 22L:	4.20	0.00	5.51	0.00	Per Day



FICTITIOUS JET FIGHTER AIRCRAFT NOISE CONTOURS AT KALAELOA AIRPORT (ONLY ITINERANT AND DAYTIME TOUCH & GO OPERATIONS)

FIGURE VI-11

TABLE VI-2D
ASSUMPTIONS AND DERIVATION OF KALAELOA JET FIGHTER OPERATIONS (ALL FCLP OPERATIONS AND TOUCH & GO OPERATIONS CONDUCTED AT ALTERNATE AIRFIELD)

Data Source: NAS Oceana and NALF Fentress Base Year Operations; 2000

Total Number of Based Aircraft: 11 F-14B/D squadrons; 1 F-14B/D FRS; 9 F/A-18C/D squadrons; 1 F/A-18C/D FRS; and 1 F-18C/D adversary squadron

Say 12 aircraft per squadron; 24 aircraft per FRS; and 10 aircraft per adversary squadron.

Total Aircraft: 156 F-14B/D 142 F/A-18C/C

Honolulu Carrier to have 80 based aircraft or 27 percent of Oceana and Fentress operations.

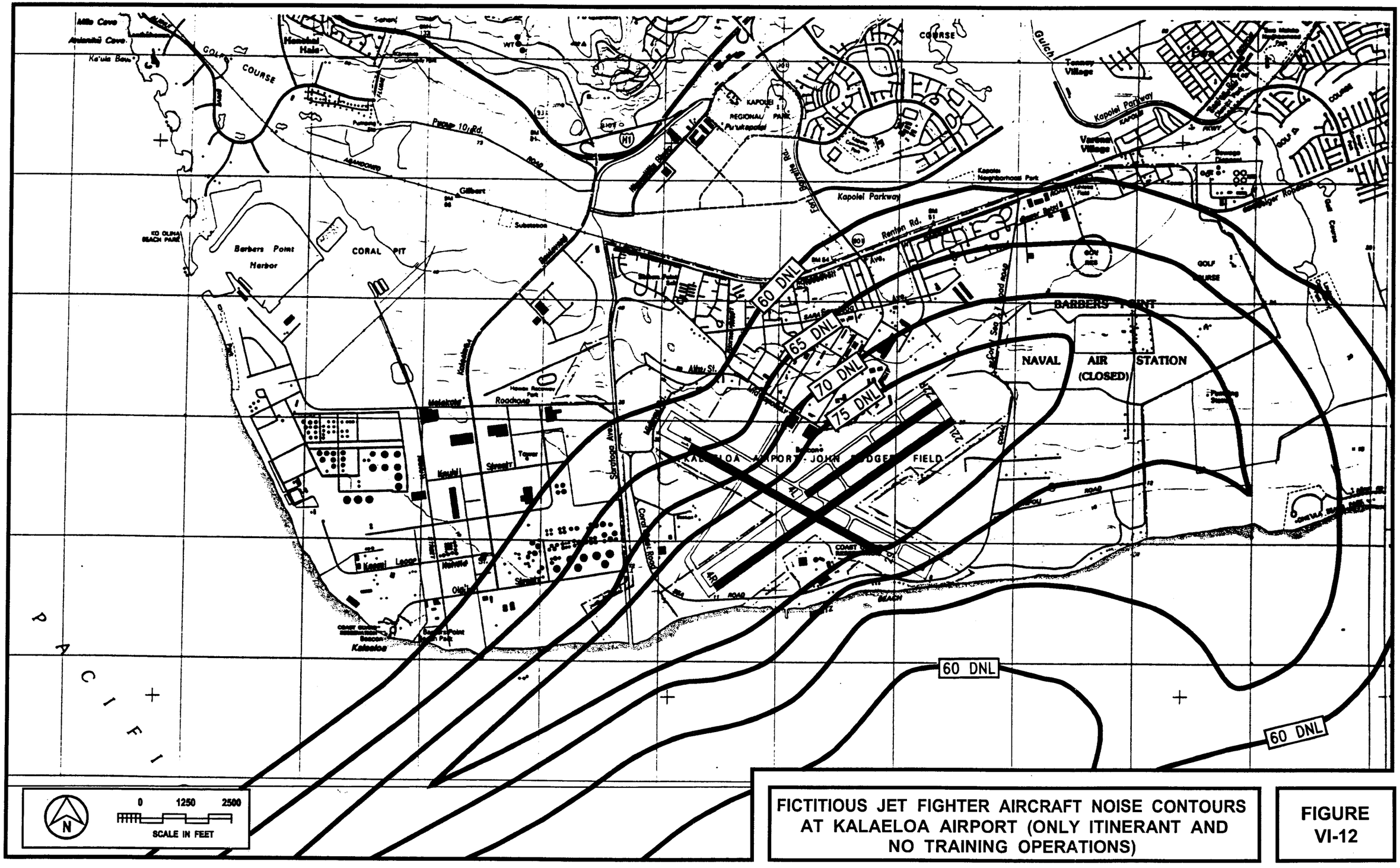
No Touch & Go or FCLP Operations At Kalaeloa Airport.

All Hawaii Touch & Go operations conducted at another airfield, with 15% of total Touch & Go operations associated with itinerant operations at Kalaeloa Airport (7.5% departures from and 7.5% arrivals to Kalaeloa Airport).

All Hawaii FCLP operations conducted at another airfield, with 15% of total FCLP operations associated with itinerant operations at Kalaeloa Airport (7.5% departures from and 7.5% arrivals to Kalaeloa Airport).

Itinerant Operations Only

	F-14 Operations		F/A-18 Operations		
	Day	Night	Day	Night	
Kalaeloa Ops @ 15%:	2,896	1,095	3,179	933	Per Year
Kalaeloa Ops @ 15%:	7.94	3.00	8.71	2.56	Per Day
Kalaeloa Rwy 4R:	6.74	2.55	7.40	2.17	Per Day
Kalaeloa Rwy 22L:	1.19	0.45	1.31	0.38	Per Day



FICTITIOUS JET FIGHTER AIRCRAFT NOISE CONTOURS AT KALAELOA AIRPORT (ONLY ITINERANT AND NO TRAINING OPERATIONS)

FIGURE VI-12

APPENDIX A. REFERENCES

(1) "Guidelines for Considering Noise in Land Use Planning and Control;" Federal Interagency Committee on Urban Noise; June 1980.

(2) American National Standard, "Sound Level Descriptors for Determination of Compatible Land Use," ANSI S12.9-1998/ Part 5; Acoustical Society of America.

(3) "Environmental Criteria and Standards, Noise Abatement and Control, 24 CFR, Part 51, Subpart B;" U.S. Department of Housing and Urban Development; July 12, 1979.

(4) "Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety;" U.S. Environmental Protection Agency; EPA 550/9-74- 004; March 1974.

(5) "Mandatory Seller Disclosures in Real Estate Transactions;" Chapter 508D, Hawaii Revised Statutes; July 1, 1996.

(6) "Title 11, Administrative Rules, Chapter 46, Community Noise Control;" Hawaii State Department of Health; September 23, 1996.

(7) "FAA Order 1050.1E, Environmental Impacts: Policies and Procedures;" U.S. Department of Transportation, Federal Aviation Administration; June 8, 2004.

(8) "Kalaeloa Airport Master Plan;" State of Hawaii Department of Transportation, Airports Division; November 1998.

(9) INM data input files for Honolulu International Airport, 2003 and 2008; Edward K. Noda & Associates, Inc.; January 2005.

(10) "Draft Environmental Assessment - Proposed Construction and Operation Of An Instrument Landing System for Runway 04R At Kalaeloa Airport;" U.S. Department of Transportation, Federal Aviation Administration, Western Pacific Region; June 2005.

(11) "Hawaii Aviation Demand Forecasts;" State of Hawaii Department of Transportation, Airports Division; 2004.

(12) Transmittal of 2004 Aircraft Landing Reports from State of Hawaii Department of Transportation, Airports Division; April 28, 2005.

(13) "Noise Study for the Introduction of F/A-18E/F To the East Coast, Volume 1;" Wyle Laboratories; April 2003.

APPENDIX B

EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE

Descriptor Symbol Usage

The recommended symbols for the commonly used acoustic descriptors based on A-weighting are contained in Table I. As most acoustic criteria and standards used by EPA are derived from the A-weighted sound level, almost all descriptor symbol usage guidance is contained in Table I.

Since acoustic nomenclature includes weighting networks other than "A" and measurements other than pressure, an expansion of Table I was developed (Table II). The group adopted the ANSI descriptor-symbol scheme which is structured into three stages. The first stage indicates that the descriptor is a level (i.e., based upon the logarithm of a ratio), the second stage indicates the type of quantity (power, pressure, or sound exposure), and the third stage indicates the weighting network (A, B, C, D, E.....). If no weighting network is specified, "A" weighting is understood. Exceptions are the A-weighted sound level and the A-weighted peak sound level which require that the "A" be specified. For convenience in those situations in which an A-weighted descriptor is being compared to that of another weighting, the alternative column in Table II permits the inclusion of the "A". For example, a report on blast noise might wish to contrast the LCdn with the LAdn.

Although not included in the tables, it is also recommended that "Lpn" and "LepN" be used as symbols for perceived noise levels and effective perceived noise levels, respectively.

It is recommended that in their initial use within a report, such terms be written in full, rather than abbreviated. An example of preferred usage is as follows:

The A-weighted sound level (LA) was measured before and after the installation of acoustical treatment. The measured LA values were 85 and 75 dB respectively.

Descriptor Nomenclature

With regard to energy averaging over time, the term "average" should be discouraged in favor of the term "equivalent". Hence, Leq, is designated the "equivalent sound level". For Ld, Ln, and Ldn, "equivalent" need not be stated since the concept of day, night, or day-night averaging is by definition understood. Therefore, the designations are "day sound level", "night sound level", and "day-night sound level", respectively.

The peak sound level is the logarithmic ratio of peak sound pressure to a reference pressure and not the maximum root mean square pressure. While the latter is the maximum sound pressure level, it is often incorrectly labelled peak. In that sound level meters have "peak" settings, this distinction is most important.

"Background ambient" should be used in lieu of "background", "ambient", "residual", or "indigenous" to describe the level characteristics of the general background noise due to the contribution of many unidentifiable noise sources near and far.

With regard to units, it is recommended that the unit decibel (abbreviated dB) be used without modification. Hence, DBA, PNdB, and EPNdB are not to be used. Examples of this preferred usage are: the Perceived Noise Level (Lpn was found to be 75 dB. Lpn = 75 dB). This decision was based upon the recommendation of the National Bureau of Standards, and the policies of ANSI and the Acoustical Society of America, all of which disallow any modification of bel except for prefixes indicating its multiples or submultiples (e.g., deci).

Noise Impact

In discussing noise impact, it is recommended that "Level Weighted Population" (LWP) replace "Equivalent Noise Impact" (ENI). The term "Relative Change of Impact" (RCI) shall be used for comparing the relative differences in LWP between two alternatives.

Further, when appropriate, "Noise Impact Index" (NII) and "Population Weighed Loss of Hearing" (PHL) shall be used consistent with CHABA Working Group 69 Report Guidelines for Preparing Environmental Impact Statements (1977).

APPENDIX B (CONTINUED)

TABLE I

A-WEIGHTED RECOMMENDED DESCRIPTOR LIST

	TERM	SYMBOL
1.	A-Weighted Sound Level	L_A
2.	A-Weighted Sound Power Level	L_{WA}
3.	Maximum A-Weighted Sound Level	L_{max}
4.	Peak A-Weighted Sound Level	L_{Apk}
5.	Level Exceeded x% of the Time	L_x
6.	Equivalent Sound Level	L_{eq}
7.	Equivalent Sound Level over Time (T) (1)	$L_{eq(T)}$
8.	Day Sound Level	L_d
9.	Night Sound Level	L_n
10.	Day-Night Sound Level	L_{dn}
11.	Yearly Day-Night Sound Level	$L_{dn(Y)}$
12.	Sound Exposure Level	L_{SE}

(1) Unless otherwise specified, time is in hours (e.g. the hourly equivalent level is $L_{eq(1)}$). Time may be specified in non-quantitative terms (e.g., could be specified a $L_{eq(WASH)}$ to mean the washing cycle noise for a washing machine).

SOURCE: EPA ACOUSTIC TERMINOLOGY GUIDE, BNA 8-14-78,

TABLE II

RECOMMENDED DESCRIPTOR LIST

TERM	A-WEIGHTING	ALTERNATIVE[1] A-WEIGHTING	OTHER[2] WEIGHTING	UNWEIGHTED
1. Sound (Pressure)[3] Level	L_A	L_{pA}	L_B, L_{pB}	L_p
2. Sound Power Level	L_{WA}		L_{WB}	L_W
3. Max. Sound Level	L_{max}	L_{Amax}	L_{Bmax}	L_{pmax}
4. Peak Sound (Pressure) Level	L_{Apk}		L_{Bpk}	L_{pk}
5. Level Exceeded x% of the Time	L_x	L_{Ax}	L_{Bx}	L_{px}
6. Equivalent Sound Level	L_{eq}	L_{Aeq}	L_{Beq}	L_{peq}
7. Equivalent Sound Level[4] Over Time(T)	$L_{eq(T)}$	$L_{Aeq(T)}$	$L_{Beq(T)}$	$L_{peq(T)}$
8. Day Sound Level	L_d	L_{Ad}	L_{Bd}	L_{pd}
9. Night Sound Level	L_n	L_{An}	L_{Bn}	L_{pn}
10. Day-Night Sound Level	L_{dn}	L_{Adn}	L_{Bdn}	L_{pdn}
11. Yearly Day-Night Sound Level	$L_{dn(Y)}$	$L_{Adn(Y)}$	$L_{Bdn(Y)}$	$L_{pdn(Y)}$
12. Sound Exposure Level	L_S	L_{SA}	L_{SB}	L_{Sp}
13. Energy Average Value Over (Non-Time Domain) Set of Observations	$L_{eq(e)}$	$L_{Aeq(e)}$	$L_{Beq(e)}$	$L_{peq(e)}$
14. Level Exceeded x% of the Total Set of (Non-Time Domain) Observations	$L_{x(e)}$	$L_{Ax(e)}$	$L_{Bx(e)}$	$L_{px(e)}$
15. Average L_x Value	L_x	L_{Ax}	L_{Bx}	L_{px}

(1) "Alternative" symbols may be used to assure clarity or consistency.

(2) Only B-weighting shown. Applies also to C,D,E,.....weighting.

(3) The term "pressure" is used only for the unweighted level.

(4) Unless otherwise specified, time is in hours (e.g., the hourly equivalent level is Leq(1). Time may be specified in non-quantitative terms (e.g., could be specified as Leq(WASH) to mean the washing cycle noise for a washing machine.

(APPENDIX C)

KALAELOA AIRPORT DAILY OPERATIONS FOR 2004 AND 2025 STUDY YEARS

KALAELOA AIRPORT 2004 BASE YEAR LANDINGS/DAY:

	BASE YR.	TOTAL	RWY 04R							RWY 04L				RWY 22L						RWY 22R				RWY 29	RWY 01
A/C	DAILY OPS.	DAILY LAND'S.	ITIN. T4R1	ITIN. T4R2	ITIN. T4R7	LOCAL T44R	LOCAL T4R4	ITIN. T4L4	ITIN. T4L5	ITIN. T4L6	ITIN. T4L8	LOCAL T4L3	ITIN. T2L1	ITIN. T2L2	ITIN. T2L5	ITIN. T2L9	LOCAL T34	LOCAL T2L4	ITIN. T2R4	ITIN. T2R6	ITIN. T2R8	LOCAL T2R3	ITIN. T29A	ITIN. H6A
DAYTIME:																								
C-130	11.60	5.80	0.00	0.09	0.77	4.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.02	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.02	0.00
C-26	2.32	1.16	0.00	0.02	0.16	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P-3C	13.92	6.96	0.00	0.11	0.95	4.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.02	0.00	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HH-65A	11.60	5.80	0.07	0.21	0.32	0.00	3.24	0.01	0.00	0.05	0.08	0.81	0.01	0.06	0.00	0.04	0.00	0.57	0.01	0.00	0.01	0.14	0.00	0.15
Mil. Helos	2.32	1.16	0.07	0.05	0.02	0.00	0.65	0.01	0.00	0.01	0.01	0.16	0.01	0.00	0.00	0.01	0.00	0.11	0.00	0.00	0.00	0.03	0.00	0.00
PA31/C402	60.45	30.22	0.75	0.82	0.87	0.00	16.78	0.20	0.05	0.27	0.29	5.59	0.13	0.15	0.00	0.14	0.00	2.96	0.05	0.04	0.05	0.99	0.08	0.00
C172/PA28	223.55	111.77	2.30	0.40	0.31	0.00	20.69	6.44	0.46	1.20	0.92	62.06	0.41	0.05	0.00	0.07	0.00	3.65	0.16	1.22	0.21	10.95	0.29	0.00
Robin. Helo	13.69	6.84	0.12	0.02	0.02	0.00	1.01	0.45	0.03	0.06	0.06	4.05	0.02	0.00	0.00	0.00	0.00	0.18	0.01	0.08	0.01	0.72	0.00	0.00
TOT DAY:	339.44	169.72	3.31	1.70	3.40	9.73	42.37	7.11	0.55	1.59	1.35	72.68	0.58	0.60	0.04	0.26	1.72	7.48	0.24	1.35	0.28	12.83	0.39	0.15
NIGHT:																								
C-130	0.36	0.18	0.00	0.00	0.02	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C-26	0.07	0.04	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P-3C	0.43	0.22	0.00	0.00	0.03	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HH-65A	0.36	0.18	0.00	0.01	0.01	0.00	0.10	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Mil. Helos	0.07	0.04	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PA31/C402	1.87	0.93	0.02	0.03	0.03	0.00	0.52	0.01	0.00	0.01	0.01	0.17	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.03	0.00	0.00
C172/PA28	6.91	3.46	0.07	0.01	0.01	0.00	0.64	0.20	0.01	0.04	0.03	1.92	0.01	0.00	0.00	0.00	0.00	0.11	0.01	0.04	0.01	0.34	0.01	0.00
Robin. Helo	0.42	0.21	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.00
TOT NITE:	10.50	5.25	0.10	0.05	0.11	0.30	1.31	0.22	0.02	0.05	0.04	2.25	0.02	0.02	0.00	0.01	0.05	0.23	0.01	0.04	0.01	0.40	0.01	0.00
24-HR TOT	349.93	174.97	3.41	1.76	3.51	10.03	43.68	7.33	0.57	1.64	1.40	74.93	0.60	0.62	0.04	0.27	1.77	7.71	0.25	1.39	0.29	13.22	0.40	0.16

Note:
Runway 01 is the noise model designation for the U.S.C.G. ramp area, and is not an actual airport runway.

KALAELOA AIRPORT 2004 BASE YEAR DEPARTURES/DAY:

A/C	BASE YR. DAILY OPS.	TOTAL DAILY DEPART'S.	RWY 04R ITIN. T4R3	ITIN. T4R5	ITIN. T4R8	ITIN. T4R6	LOCAL T44R	LOCAL T4R4	RWY 04L ITIN. T4L1	ITIN. T4L2	ITIN. T4L7	LOCAL T4L3	RWY 22L ITIN. T31	ITIN. T2L3	ITIN. T2L6	LOCAL T2L4	LOCAL T34	RWY 22R ITIN. T2R1	ITIN. T2R2	ITIN. T2R9	LOCAL T2R3	RWY 11 ITIN. T11D	RWY 19 ITIN. H6B
DAYTIME:																							
C-130	11.60	5.80	0.00	0.77	0.09	0.00	4.05	0.00	0.00	0.00	0.00	0.00	0.02	0.14	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.02	0.00
C-26	2.32	1.16	0.00	0.17	0.01	0.00	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00
P-3C	13.92	6.96	0.00	1.00	0.05	0.00	4.86	0.00	0.00	0.00	0.00	0.00	0.01	0.18	0.00	0.00	0.86	0.00	0.00	0.00	0.00	0.00	0.00
HH-65A	11.60	5.80	0.07	0.39	0.00	0.21	0.00	3.24	0.02	0.05	0.10	0.81	0.04	0.07	0.01	0.57	0.00	0.01	0.00	0.02	0.14	0.00	0.05
Mil. Helos	2.32	1.16	0.07	0.02	0.00	0.05	0.00	0.65	0.02	0.01	0.01	0.16	0.01	0.00	0.01	0.11	0.00	0.00	0.00	0.00	0.03	0.00	0.00
PA31/C402	60.45	30.22	0.75	1.12	0.00	0.57	0.00	16.78	0.25	0.19	0.37	5.59	0.10	0.20	0.13	2.96	0.00	0.03	0.04	0.07	0.99	0.08	0.00
C172/PA28	223.55	111.77	2.30	0.31	0.00	0.40	0.00	20.69	6.90	1.20	0.92	62.06	0.07	0.05	0.41	3.65	0.00	0.21	1.22	0.16	10.95	0.29	0.00
Robin. Helo	13.69	6.84	0.12	0.02	0.00	0.02	0.00	1.01	0.48	0.06	0.06	4.05	0.00	0.00	0.02	0.18	0.00	0.01	0.08	0.01	0.72	0.00	0.00
TOT DAY:	339.44	169.72	3.31	3.78	0.15	1.24	9.73	42.37	7.66	1.51	1.45	72.68	0.25	0.67	0.58	7.48	1.72	0.27	1.35	0.26	12.83	0.39	0.05
NIGHT:																							
C-130	0.36	0.18	0.00	0.02	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
C-26	0.07	0.04	0.00	0.01	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P-3C	0.43	0.22	0.00	0.03	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
HH-65A	0.36	0.18	0.00	0.01	0.00	0.01	0.00	0.10	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mil. Helos	0.07	0.04	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PA31/C402	1.87	0.93	0.02	0.03	0.00	0.02	0.00	0.52	0.01	0.01	0.01	0.17	0.00	0.01	0.00	0.09	0.00	0.00	0.00	0.00	0.03	0.00	0.00
C172/PA28	6.91	3.46	0.07	0.01	0.00	0.01	0.00	0.64	0.21	0.04	0.03	1.92	0.00	0.00	0.01	0.11	0.00	0.01	0.04	0.01	0.34	0.01	0.00
Robin. Helo	0.42	0.21	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.13	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00
TOT NITE:	10.50	5.25	0.10	0.12	0.00	0.04	0.30	1.31	0.24	0.05	0.04	2.25	0.01	0.02	0.02	0.23	0.05	0.01	0.04	0.01	0.40	0.01	0.00
24-HR TOT	349.93	174.97	3.41	3.90	0.15	1.28	10.03	43.68	7.90	1.56	1.50	74.93	0.25	0.69	0.60	7.71	1.77	0.27	1.39	0.26	13.22	0.40	0.05

Note:
Runway 19 is the noise model designation for the U.S.C.G. ramp area, and is not an actual airport runway.

KALAELOA AIRPORT CY 2025 LANDINGS/DAY:

A/C	BASE YR. DAILY OPS.	TOTAL DAILY LAND'S.	RWY 04R ITIN. T4R1	RWY 04R ITIN. T4R2	RWY 04R ITIN. T4R7	RWY 04R LOCAL T44R	RWY 04R LOCAL T4R4	RWY 04R LOCAL T4RI	RWY 04R ITIN. T4L4	RWY 04L ITIN. T4L5	RWY 04L ITIN. T4L6	RWY 04L ITIN. T4L8	RWY 04L LOCAL T4L3	RWY 22L ITIN. T2L1	RWY 22L ITIN. T2L2	RWY 22L ITIN. T2L5	RWY 22L ITIN. T2L9	RWY 22L LOCAL T34	RWY 22L LOCAL T2L4	RWY 22R ITIN. T2R4	RWY 22R ITIN. T2R6	RWY 22R ITIN. T2R8	RWY 22R LOCAL T2R3	RWY 29 ITIN. T29A	RWY 01 ITIN. H6A
DAYTIME:																									
C-130	26.91	13.46	0.00	0.14	1.26	6.19	0.00	4.48	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.03	0.00	1.09	0.00	0.00	0.00	0.00	0.00	0.03	0.00
C-26	4.30	2.15	0.00	0.03	0.26	1.24	0.00	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.01	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P-8A	25.83	12.91	0.00	0.17	1.55	7.42	0.00	2.15	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.03	0.00	1.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HH-65A	26.91	13.45	0.11	0.34	0.52	0.00	3.71	4.48	0.02	0.01	0.09	0.13	2.48	0.02	0.09	0.00	0.06	0.00	0.87	0.02	0.01	0.02	0.22	0.00	0.25
Mil. Helos	4.30	2.15	0.11	0.08	0.03	0.00	0.74	0.36	0.02	0.01	0.02	0.01	0.49	0.02	0.01	0.00	0.01	0.00	0.18	0.00	0.01	0.00	0.04	0.00	0.00
PA31/C402	175.51	87.75	1.49	1.64	1.74	0.00	23.92	29.90	0.40	0.10	0.55	0.58	18.61	0.26	0.31	0.00	0.29	0.00	5.63	0.10	0.09	0.10	1.88	0.16	0.00
C172/PA28	476.84	238.42	4.61	0.80	0.61	0.00	29.49	24.46	12.90	0.92	2.40	1.84	127.79	0.81	0.11	0.00	0.14	0.00	6.94	0.32	2.44	0.42	20.82	0.58	0.00
Robin. Helo	31.44	15.72	0.24	0.03	0.03	0.00	1.44	2.62	0.90	0.06	0.12	0.12	8.19	0.04	0.00	0.00	0.00	0.00	0.34	0.02	0.17	0.02	1.36	0.00	0.00
TOT DAY:	772.05	386.02	6.57	3.24	6.01	14.85	59.31	68.82	14.25	1.10	3.17	2.68	157.56	1.16	1.06	0.06	0.51	2.62	13.96	0.47	2.71	0.56	24.32	0.77	0.25
NIGHT:																									
C-130	0.83	0.41	0.00	0.00	0.04	0.19	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C-26	0.13	0.06	0.00	0.00	0.01	0.04	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
P-8A	0.80	0.40	0.00	0.01	0.05	0.23	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HH-65A	0.83	0.41	0.00	0.01	0.02	0.00	0.12	0.14	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.01	0.00	0.01
Mil. Helos	0.13	0.06	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
PA31/C402	5.42	2.71	0.05	0.05	0.05	0.00	0.74	0.93	0.01	0.01	0.02	0.02	0.58	0.01	0.01	0.00	0.01	0.00	0.18	0.00	0.00	0.00	0.06	0.00	0.00
C172/PA28	14.76	7.38	0.14	0.02	0.02	0.00	0.91	0.76	0.40	0.03	0.07	0.06	3.95	0.02	0.00	0.00	0.00	0.00	0.22	0.01	0.07	0.01	0.65	0.02	0.00
Robin. Helo	0.97	0.49	0.01	0.00	0.00	0.00	0.04	0.08	0.03	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.04	0.00	0.00
TOT NITE:	23.87	11.93	0.20	0.10	0.18	0.46	1.83	2.13	0.44	0.03	0.10	0.08	4.87	0.03	0.03	0.00	0.01	0.08	0.43	0.02	0.08	0.02	0.75	0.02	0.01
24-HR TOT	795.92	397.96	6.78	3.34	6.19	15.31	61.15	70.95	14.69	1.13	3.27	2.77	162.43	1.19	1.09	0.06	0.52	2.70	14.39	0.49	2.79	0.57	25.07	0.79	0.26

Note:
Runway 01 is the noise model designation for the U.S.C.G. ramp area, and is not an actual airport runway.

KALAELOA AIRPORT CY 2025 DEPARTURES/DAY:

A/C	BASE YR. DAILY OPS.	TOTAL DAILY DEPART'S.	RWY 04R ITIN. T4R3	ITIN. T4R5	ITIN. T4R8	ITIN. T4R6	LOCAL T44R	LOCAL T4R4	LOCAL T4R9	LOCAL T4R0	RWY 04L ITIN. T4L1	ITIN. T4L2	ITIN. T4L7	LOCAL T4L3	RWY 22L ITIN. T31	ITIN. T2L3	ITIN. T2L6	LOCAL T2L4	LOCAL T34	RWY 22R ITIN. T2R1	ITIN. T2R2	ITIN. T2R9	LOCAL T2R3	RWY 11 ITIN. T11D	RWY 19 ITIN. H6B
DAYTIME:																									
C-130	26.91	13.45	0.00	1.26	0.14	0.00	6.19	0.00	0.00	4.48	0.00	0.00	0.00	0.00	0.03	0.22	0.00	0.00	1.09	0.00	0.00	0.00	0.00	0.03	0.00
C-26	4.30	2.15	0.00	0.27	0.01	0.00	1.24	0.00	0.00	0.36	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00
P-8A	25.83	12.91	0.00	1.63	0.09	0.00	7.42	0.00	0.00	2.15	0.00	0.00	0.00	0.00	0.02	0.29	0.00	0.00	1.31	0.00	0.00	0.00	0.00	0.00	0.00
HH-65A	26.91	13.46	0.11	0.63	0.00	0.34	0.00	3.71	4.48	0.00	0.03	0.09	0.16	2.48	0.06	0.11	0.02	0.87	0.00	0.02	0.01	0.03	0.22	0.00	0.08
Mil. Helos	4.30	2.15	0.11	0.04	0.00	0.08	0.00	0.74	0.36	0.00	0.03	0.02	0.01	0.49	0.01	0.01	0.02	0.17	0.00	0.00	0.01	0.00	0.04	0.00	0.00
PA31/C402	175.51	87.76	1.49	2.24	0.00	1.15	0.00	23.92	29.90	0.00	0.50	0.38	0.75	18.61	0.20	0.40	0.26	5.63	0.00	0.07	0.09	0.13	1.88	0.16	0.00
C172/PA28	476.84	238.42	4.61	0.61	0.00	0.80	0.00	29.49	24.46	0.00	13.83	2.40	1.84	127.79	0.14	0.11	0.81	6.94	0.00	0.42	2.44	0.32	20.82	0.58	0.00
Robin. Helo	31.44	15.72	0.24	0.03	0.00	0.03	0.00	1.44	2.62	0.00	0.96	0.12	0.12	8.19	0.00	0.00	0.04	0.34	0.00	0.02	0.17	0.02	1.36	0.00	0.00
TOT DAY:	772.05	386.03	6.57	6.72	0.24	2.40	14.85	59.31	61.82	7.00	15.34	3.01	2.88	157.56	0.47	1.19	1.16	13.96	2.62	0.53	2.71	0.51	24.32	0.77	0.08
NIGHT:																									
C-130	0.83	0.41	0.00	0.04	0.00	0.00	0.19	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
C-26	0.13	0.07	0.00	0.01	0.00	0.00	0.04	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
P-8A	0.80	0.40	0.00	0.05	0.00	0.00	0.23	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00
HH-65A	0.83	0.41	0.00	0.02	0.00	0.01	0.00	0.12	0.14	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Mil. Helos	0.13	0.07	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PA31/C402	5.42	2.71	0.05	0.07	0.00	0.04	0.00	0.74	0.93	0.00	0.02	0.01	0.02	0.58	0.01	0.01	0.01	0.17	0.00	0.00	0.00	0.00	0.06	0.00	0.00
C172/PA28	14.76	7.38	0.14	0.02	0.00	0.02	0.00	0.91	0.76	0.00	0.43	0.07	0.06	3.95	0.00	0.00	0.03	0.22	0.00	0.01	0.07	0.01	0.65	0.02	0.00
Robin. Helo	0.97	0.48	0.01	0.00	0.00	0.00	0.00	0.04	0.08	0.00	0.03	0.00	0.00	0.25	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.04	0.00	0.00
TOT NITE:	23.87	11.93	0.20	0.21	0.01	0.07	0.46	1.83	1.91	0.22	0.47	0.09	0.09	4.87	0.01	0.04	0.04	0.43	0.08	0.02	0.08	0.02	0.75	0.02	0.00
24-HR TOT	795.92	397.96	6.78	6.93	0.25	2.47	15.31	61.15	63.74	7.21	15.82	3.10	2.97	162.43	0.48	1.22	1.19	14.39	2.70	0.54	2.79	0.52	25.07	0.79	0.09

Note:
Runway 19 is the noise model designation for the U.S.C.G. ramp area, and is not an actual airport runway.

Appendix F

Carrier Strike Group Assessment

Carrier Strike Group Assessment

TABLE OF CONTENTS

List of Figures

Carrier Strike Group Assessment

1. Background

The preparation of the Kalaeloa Master Plan comes at a time when the U.S. Department of Defense (DOD) is considering, but has not yet decided upon, the possible homeporting of an aircraft carrier strike group (CSG) at Pearl Harbor. The DOD has been considering this option as a part of the overall National defense strategy in responding to current and emerging threats.

In 2004, the DOD initiated a study to review Navy fleet operations and expenditures. The following year, in a report to Congress, the Overseas Basing Commission recommended stationing a CSG in the Pacific to increase naval presence in the region. Hawaii was acknowledged as a likely site for the CSG; Guam has also been mentioned as a potential CSG homeport.

In 2005, an announcement of the CSG homeporting was expected to be included as part of the 2005 Base Realignment and Closure (BRAC) process. However, the BRAC Commission's report in September 2005 did not include any such actions.

In February 2006, the DOD released the 2005 Quadrennial Defense Review (QDR) which outlines the DOD's plans for transforming the military to better respond to existing and emerging threats to the U.S. and its allies. Part of QDR notes the importance of having an increased presence in the Pacific, including adjustments to Naval force posture and basing to provide "at least" six operationally available and sustainable carriers and 60 percent of its submarines in the Pacific. However, the QDR stops short of stating where these aircraft carriers will be located.

Corresponding to the QDR, the President also released to Congress in February 2006, the Fiscal Year 2007 Department of Defense Budget. In review of the DOD's budget, particularly the sections pertaining to the Navy, there appears to be no affirmative statement for the relocation of a CSG to Pearl Harbor or funding for such an action for Fiscal Year 2007.

The absence of such information or funding, however, does not necessarily preclude such a relocation from occurring in future years. Therefore, an assessment of relocating of one of the Navy's 12 aircraft carriers to Pearl Harbor is included as part of the Kalaeloa Master Plan.

At the outset of this assessment, the planning team was aware of an ongoing Navy study of infrastructure and other facilities required to homeport a CSG at Pearl Harbor however, the findings of this Navy study have not been released.

In the absence of specific facility requirements or needs, the planning team proceeded with a preliminary analysis of how an air wing stationed at Kalaeloa would impact redevelopment, based on available data and on specific assumptions. The study approach and assumptions are described in the following sections.

2. Study Approach

To prepare an alternative "with-CSG" scenario, the planning team carried out the following tasks:

- Planning assumptions:
  - Agreed upon a set of aircraft operational and support facility assumptions to guide the analysis.
- Aircraft noise analysis:
  - Reviewed the existing aircraft noise environment at Kalaeloa.
  - Developed noise contours for the base year (2004)
  - Developed noise contours for the future or forecast year (2025), with and without carrier air wing operations at Kalaeloa.
- Facility requirements:
  - Estimated Navy facility requirements at Kalaeloa.
- Prepared a master plan overlay to describe modifications to the Kalaeloa Master Plan (presented in the main body of this document) necessary to accommodate the CSG homeporting.

3. Study Assumptions

3.1 Aircraft Operational Assumptions

Available reports and data were reviewed to define expected operational requirements of a carrier air wing. Planning assumptions were as follows:

- Fixed-wing aircraft will require a runway suitable for day and night Field Carrier Landing Practice (FCLP). These are one of the most frequent training operations of a carrier aircrew, required for qualifications to land aboard an aircraft carrier. FCLP training consists of several aircraft, each conducting multiple touch-and-go landings to complete a sortie. Ideally, the runway should be at least 6,500 feet in length, near sea level, with a parallel runway, control tower, and ramp space, as well as prevailing winds favoring a left-turn pattern.

Given the very high aircraft noise levels generated during FCLPs and close proximity of the airfield to noise-sensitive residential areas, the planning team assumed that this type of training would not be feasible at Kalaeloa. The aircraft noise modeling confirmed the validity of this assumption, showing that noise contours from FCLPs—exceeding federal standards for exterior noise levels—would encompass the entire Kalaeloa planning area and offsite residential areas as well.

3.2 Support Facility Assumptions

- The CSG air wing will require a land-side operations base, including hangar space, maintenance and refueling facilities, and a headquarters building. The planning team assumed joint use of aviation-related facilities at Kalaeloa currently occupied by DOT Airports, Hawaii National Guard, the Coast Guard, and Pacific Aerospace, and that

Guard, and Pacific Aerospace, and that adequate space is available to accommodate the air wing.

- The CSG air wing will require land-side space at Kalaeloa for ordnance storage.
- The CSG will require housing for approximately 5,000 Navy families on Oahu. Under the Kalaeloa Master Plan, most or all of those families could be accommodated in onsite housing.

4. Aircraft Noise Analysis

Y. Ebisu & Associates conducted a study to identify the potential aircraft noise contours associated with future operations at Kalaeloa Airport. The study described and evaluated the following scenarios, using 2004 as the base year and 2025 as the forecast year for comparison purposes:

- Future noise environment based on currently available forecasts for Kalaeloa Airport.
- Potential future noise environment, assuming transfer of existing (2004) cargo aircraft operations from Honolulu International to Kalaeloa Airport, and also assuming an extended 11,000-foot runway at Kalaeloa.
- Potential future noise environment, assuming Navy jet fighter aircraft operations at Kalaeloa

The noise contours associated with cargo and jet fighter aircraft operations are considered to be speculative. They were developed to describe the potential, rather than forecast, future noise environment associated with the scenarios. Findings of the noise analysis are summarized here; the complete report is presented in Appendix E.

4.1 Noise Standards

To evaluate potential noise levels associated with each scenario, Ebisu & Associates used the current version (6.1) of the Federal Aviation Administration's Integrated Noise Model (INM). The study used the day-night average sound level (DNL) metric to describe noise exposure and to relate its acceptability to various land uses. The DNL represents the 24-hour average sound level for an average day, with nighttime noise levels (10:00 pm to 7:00 am) increased by 10 decibels prior to computing the 24-hour average. Current noise standards which associate land use compatibility or adverse health and welfare effects with various noise levels are normally described in terms of DNL rather than single-event noise descriptors.

For the purposes of determining noise acceptability for funding assistance from federal agencies (FAA, Federal Housing Administration, Veterans Administration), an exterior noise level of 65 DNL is considered acceptable. This standard is applied nationally. In Hawaii, due to the predominance of naturally ventilated dwellings, a lower level of 55 DNL is considered as the "unconditionally acceptable" (or near zero risk) level of exterior noise. However, after considering the cost and feasibility of applying the lower level of 55 DNL, federal agencies have selected 65 DNL as the regulatory standard.

For aircraft noise, the State of Hawaii Department of Transportation, Airports Division, recommends that 60 DNL be used to determine land use compatibility with respect to noise-sensitive uses near airports, such as homes, schools, daycare centers, libraries, and churches.

For commercial, industrial, and other non-noise-sensitive land uses, exterior noise levels as high as 75 DNL are generally considered acceptable. Exceptions occur when naturally ventilated offices and other establishments are exposed to exterior levels exceeding 65 DNL.

Noise levels as low as 60 DNL are considered "compatible" for lands with "extensive natural wildlife and recreation areas." For beach parks and active playgrounds, such as those existing or planned at Kalaeloa, noise levels as high as 75 DNL are considered "compatible." Neighborhood parks and golf courses are considered "marginally compatible" at levels as high as 70 and 75 DNL, respectively.

4.2 Study Methodology

Base year aircraft operations data were inputs to the INM. These included aircraft flight tracks and altitude profiles, types and frequency of aircraft operations, types of aircraft using the airport, and runway use by various aircraft types during day and night periods. Data was derived from Kalaeloa tower reports and adjusted downward to account for (1) aircraft that communicate with the tower but do not land at or depart from Kalaeloa, and (2) mid-year changes in the methods of counting and categorizing operations.

Aircraft operations forecasts for 2010 developed in a recent study of the Instrument Landing System (ILS) installation at Kalaeloa were used to adjust the 2025 forecasts. The revised 2025 airport operations forecasts assumed that the new ILS would attract more instrument training flights. Another adjustment was made to account for the expected replacement of existing P-3C antisubmarine warfare (ASW) patrol aircraft with the P-8A jet aircraft, assumed to have noise characteristics similar to the B-737 (700) commercial passenger aircraft.

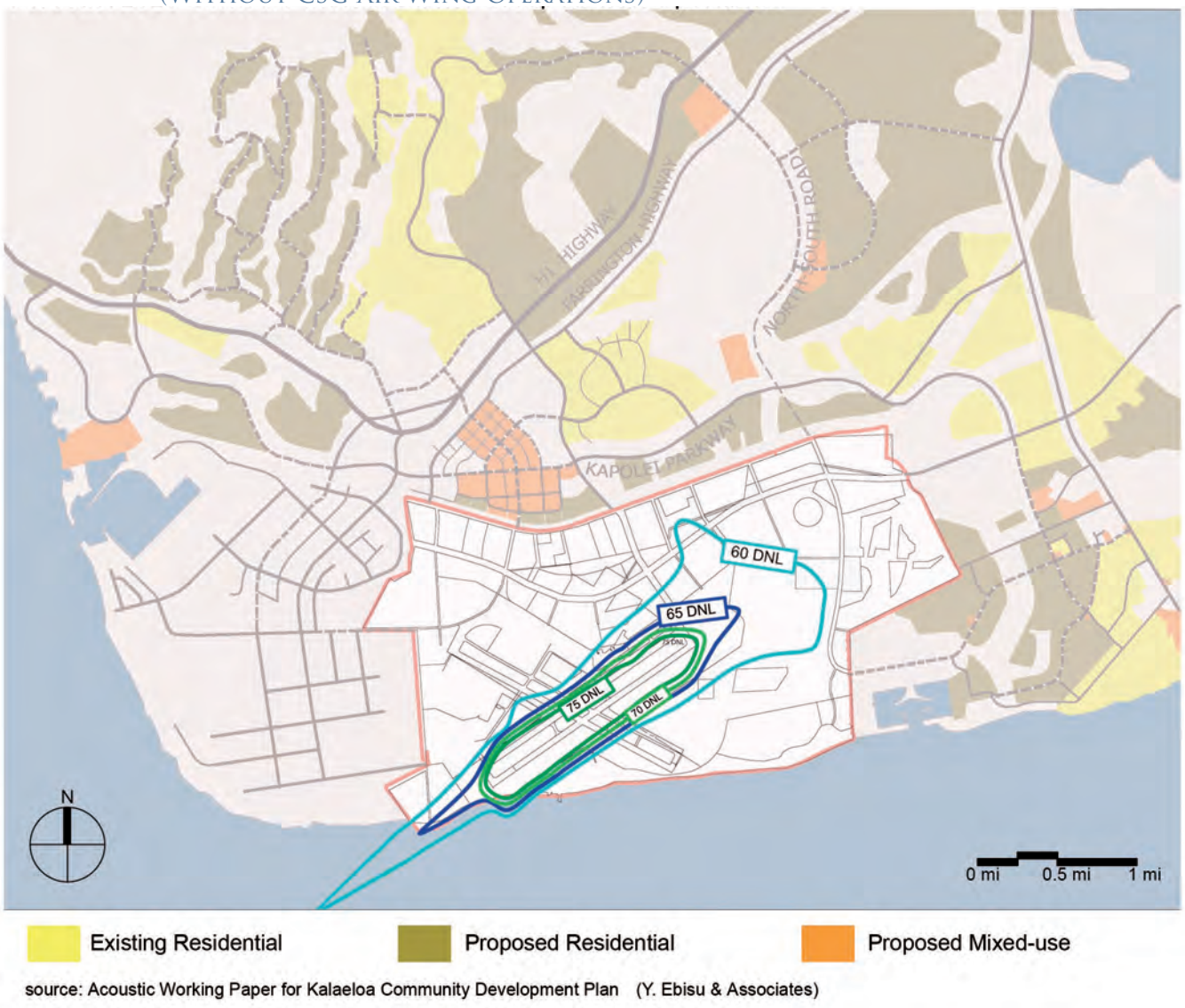
Noise levels associated with landings at Honolulu International Airport during tradewind conditions were included in the development of the base year and future airport noise contours for Kalaeloa.

Aircraft noise measurements taken as part of the recent ILS study provided the basis for describing existing background ambient and aircraft noise levels.

4.3 Base Year Aircraft Noise Contours

The 2004 noise contours for Kalaeloa Airport are relatively small, with Honolulu International Airport operations having a negligible effect on the Kalaeloa noise contours (see Figure F-1). These contours do not enclose residential or other noise-sensitive land uses and are considered compatible with land uses in the immediate environs of the airport. Beach and recreation areas south of the airport are exposed to single-event aircraft noise, but the number of these flybys is relatively low, and the 60 DNL contour does not encompass these areas.

Figure F-1 Forecast 2025 Noise Contours (Without CSG Air Wing Operations)



source: Acoustic Working Paper for Kalaeloa Community Development Plan (Y. Ebisu & Associates)

4.4 Future Aircraft Noise Contours Without CSG Air Wing Based at Kalaeloa

Using the 2025 State DOT Airports forecasts for Kalaeloa with adjustments for additional operations associated with the ILS, the forecasted aircraft noise levels for Kalaeloa Airport in 2025 would remain relatively small. Noise contours would not enclose residential or other noise sensitive land uses. Beach and recreation areas south of the airport would continue to be exposed to single-event aircraft noise. (Refer to Figure F-1)

With the addition of cargo operations at Kalaeloa, including nighttime operations, the 60 and 65 DNL noise contours would extend beyond the east boundary of the study area, and the 60 DNL contour would enclose all but the northwest corner of Kalaeloa. With the deletion

but the northwest corner of Kalaeloa. With the deletion of Aloha Airlines air cargo operations, only the 60 DNL contour would extend beyond the east boundary, and the 60 DNL contour would enclose a much smaller portion of Kalaeloa. The reason for this large reduction in the potential noise contours is the high noise level associated with Aloha Airlines' B-737 (200) aircraft when compared with the modern overseas jet aircraft.

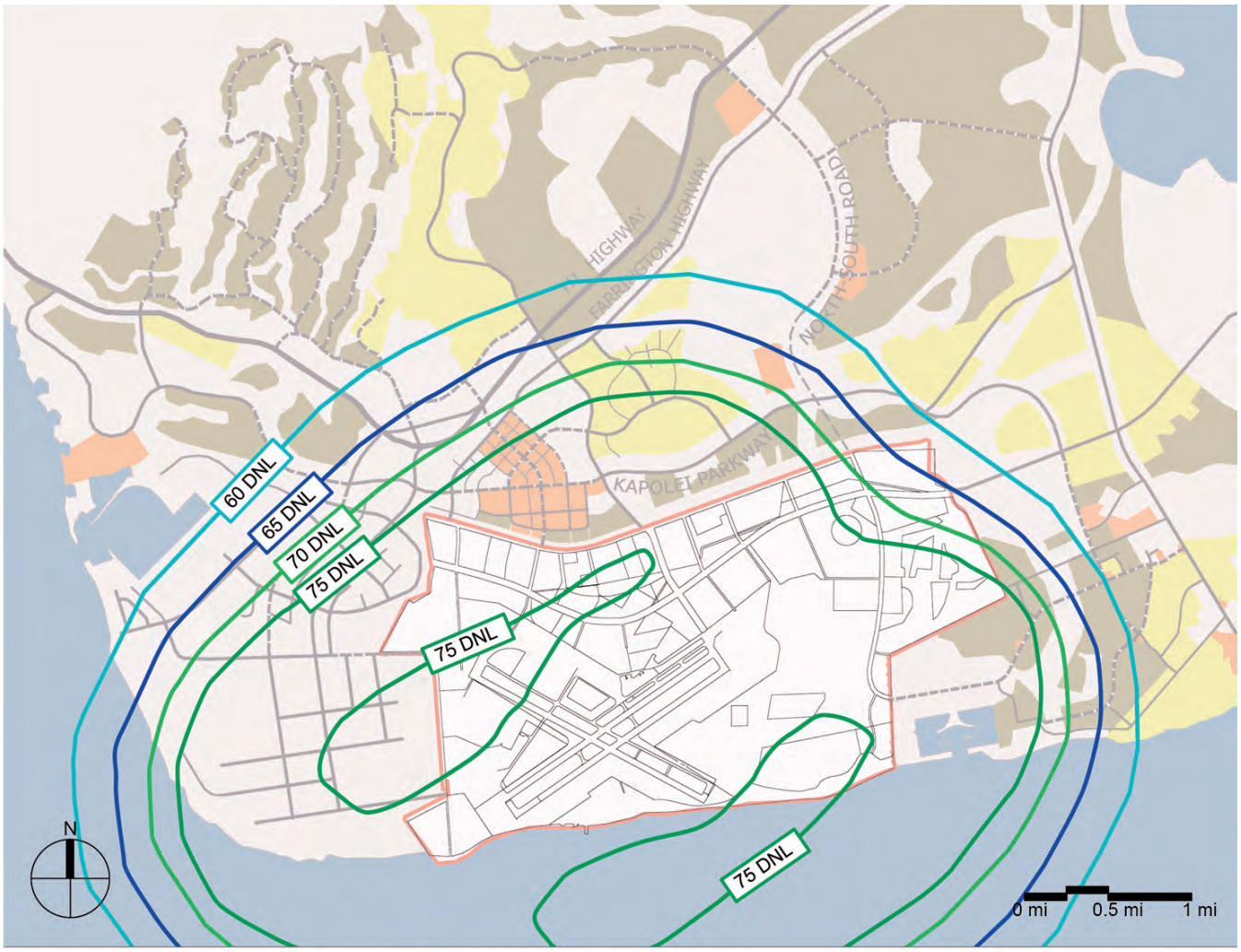
4.5 Future Aircraft Noise Contours With CSG Air Wing Based at Kalaeloa

Noise contours were developed to estimate noise levels associated with approximately 80 jet aircraft home based at Kalaeloa. Estimates of the number and type of aircraft and their annual training operations were made using historical data from NAS Oceana in Virginia Beach, Virginia, and Naval Auxiliary Landing Field (NALF) Fentress in Chesapeake, Virginia. It is acknowledged that the exact composition of a CSG potentially based in Hawaii has not been determined, and the exact number and type of jet aircraft could vary.

To assess the impact of Field Carrier Landing Practices, noise contours were developed for two scenarios: (1) left turns only (as indicated at NALF Fentress), and (2) left and right turns to remain south of Runway 4R/22L. Touch and go operations were assumed to remain south of Runway 4R/22L for both scenarios. The flight tracks and noise contours for these scenarios are shown.

Under the worst case scenario of FCLP left turns only, the 75 DNL contour would encompass essentially all of Kalaeloa and portions of the neighboring Ocean Pointe development to the east (see Figure F-2). The FAA recommends that all lands within the 75 DNL contour should be under the control of the airport operator. If all jet fighter training operations are restricted to the makai side of Runway 4R/22L, the onsite area within the 75 DNL contour would be reduced, but the noise contours over Ocean Pointe would remain. (Refer to Figure F-2)

Figure F-2 Forecast 2025 Noise Contours (Worst Case Scenario for CSG Air Wing Operations)



source: Acoustic Working Paper for Kalaeloa Community Development Plan (Y. Ebisu & Associates)

Figure F-3 Fictitious Jet Fighter Aircraft Noise Contours at Kalaeloa Airport (Only Itinerant and Touch & Go Operations)

source: Acoustic Working Paper for Kalaeloa Community Development Plan (Y. Ebisu & Associates)

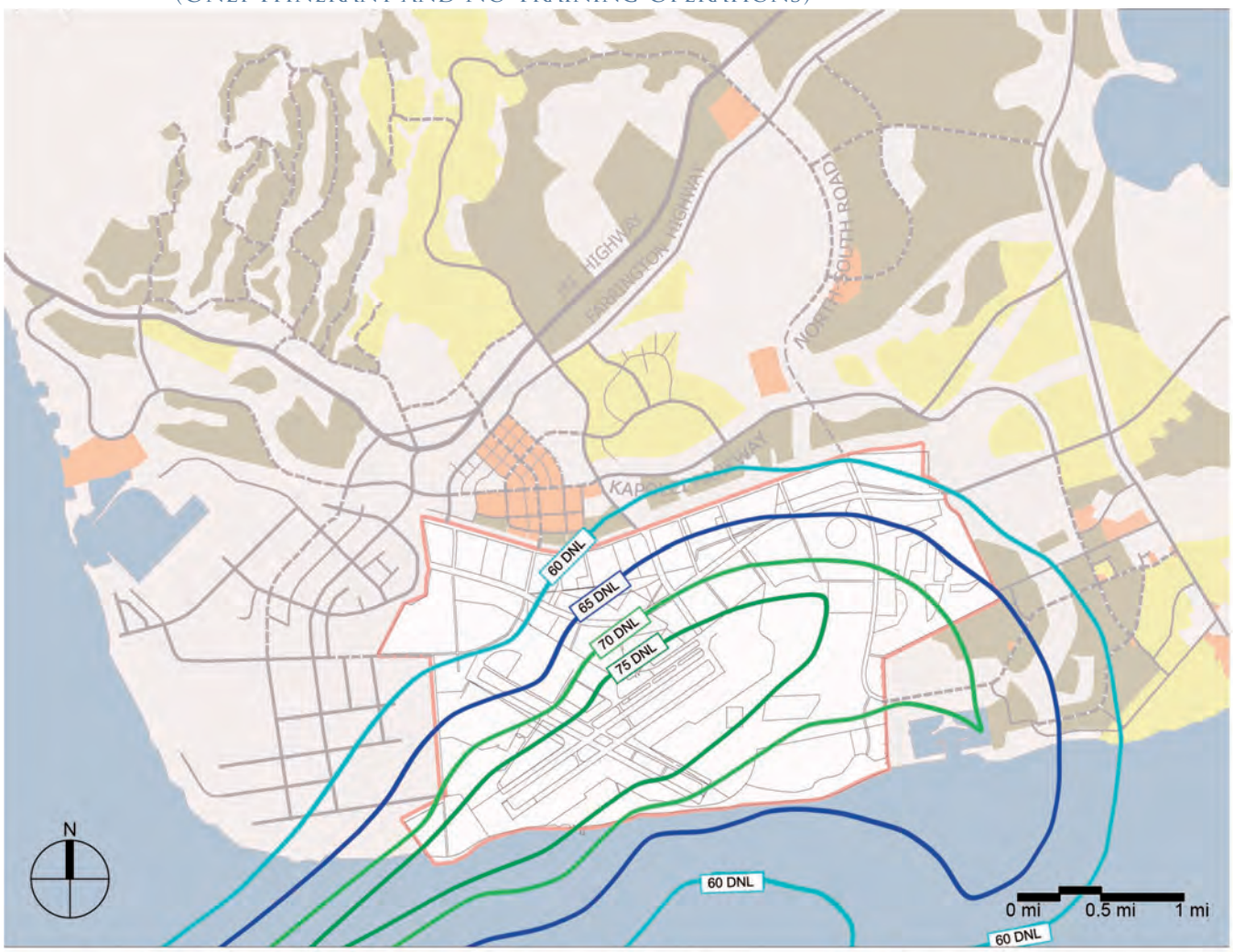
- The air wing would conduct all FCLPs at an alternate airfield, with only touch and go training occurring at Kalaeloa. Itinerant operations between Kalaeloa and the alternate airfield were assumed to total 15 percent of the total number of FCLPs at the alternate airfield. With only itinerant and touch and go operations, the 75 DNL contour would still encompass part of Ocean Pointe (see Figure F-3). (Refer to Figure VI-10 in Appendix E)

Figure F-4 Fictitious Jet Fighter Aircraft Noise Contours at Kalaeloa Airport (Only itinerant and Daytime Touch & Go Operations)

source: Acoustic Working Paper for Kalaeloa Community Development Plan (Y. Ebisu & Associates)

- The air wing would conduct all FCLPs and nighttime touch and go training at an alternate airfield, with only daytime touch and go operations conducted at Kalaeloa. Itinerant operations between Kalaeloa and the alternate airfield were assumed to total 15 percent of the total number of FCLP and nighttime touch and go training operations at the alternate airfield. With only itinerant and daytime touch and go operations, the 75 DNL contour would still encompass part of Ocean Pointe (see Figure F-4). (Refer to Figure VI-11 in Appendix E)

Figure F-5 Fictitious Jet Fighter Aircraft Noise Contours at Kalaeloa Airport (Only Itinerant and No Training Operations)



source: Acoustic Working Paper for Kalaeloa Community Development Plan (Y. Ebisu & Associates)

- The air wing would conduct all FCLPs and touch and go training at an alternate airfield. Assumptions regarding itinerant operations were the same as for the scenarios described above. With only itinerant and no training operations at Kalaeloa, the 75 DNL contour would remain onsite, although the 70 DNL contour would encompass part of Ocean Pointe (see Figure F-5). (Refer to Figure VI-12 in Appendix E).

5. Land Use and Facility Impacts

One of the key planning assumptions is that adequate aviation-related facilities exist at Kalaeloa to accommodate the Navy if a CSG is homeported in Hawaii. Kalaeloa would be a joint-use military-civilian airport. Given a greater military presence at Kalaeloa, plans for redevelopment may be affected in the following ways:

- Noise constraints described above would preclude or restrict noise-sensitive uses at Kalaeloa. Assuming no training and only itinerant aircraft operations, the northern part of the base would be outside the 65 DNL contour and suitable for housing and schools. With training, the potential for these types of uses would be severely restricted.
- Addition of a large military population at Kalaeloa would have a substantial impact on schools in the region, which are already experiencing overcrowding. The siting of schools at Kalaeloa would have to be reviewed, given the noise contours.
- A small commercial area would be required to serve the day-to-day requirements of military families. A candidate site is the area west of Fort Barrette Road, immediately south of the main gate.
- Parcels described as brokered lands would be retained by the Navy for future development of family housing. The Kalaeloa Master Plan calls for housing in excess of the estimated requirement of 5,000 units.
- Space would be required onsite for ordnance storage, including a buffer area circumscribed by an Explosive Safety Quantity Distance (ESQD) arc. Navy-retained and DHHL parcels west of the runways are potential sites for this facility. Development of the proposed Hawaii Raceway Park facility may no longer be feasible.
- The long-term potential of establishing a military complex west of the runways would no longer be possible, leaving the Hawaii National Guard at their existing site.
- The long-term potential of relocating the U.S. Coast Guard to a mutually agreeable location north of the runways may no longer be achievable.
- Expansion of general aviation and other aviation-related activities at Kalaeloa would be limited.
- The primary east-west access connection from Geiger Road to Kalaeloa Boulevard would need to be diverted north of the Hawaii National Guard complex, thereby substantially retaining Saratoga Road's existing alignment.
- All potential industrial and high-intensity mixed use zones would not be feasible, and as such, would be removed from the master plan.

- Eco-industrial areas would be retained as shown in the master plan, as there is continued potential for sustainable energy generation, and the number of people required to operate and maintain these facilities would be comparatively low.
- With an expansion of military facilities at Kalaeloa, development at Kalaeloa would be affected by additional antiterrorism/force protection (AT/FP) requirements. New buffers may preclude development in certain areas. Public access to Nimitz Beach and particularly White Plans Beach may be rescinded due to security concerns at the end of the runways. Likewise, public access to archaeological sites may have to be re-evaluated.
- Significant infrastructure improvements would be required to support the CSG air wing and military families. The Kalaeloa Master Plan proposes a collaborative approach and a mix of funding mechanisms to achieve infrastructure improvements. Having the Navy involved would increase the availability of funds for this purpose.