



Chapter One

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**INVENTORY**

# INVENTORY

To produce a realistic and adequate plan for future growth at Kona International Airport at Keahole (KOA), it is essential to understand the framework within which the airport exists. An initial task within this master plan update consists of gathering data to provide a clear definition of the airport's aviation environment, including facilities, users, and activity levels. The information that follows formed the baseline for developing this report.

The initial action necessary in updating a master plan is the collection of all pertinent data that relates to the area served by the airport, as well as the airport itself. This inventory was conducted using the following sources of information:

- Previous airport master plan and other planning since then
- On-site visits
- Aerial and ground photography



- Interviews with airport management, tenants, and users
- Federal, state, and local publications
- Project record drawings

This chapter briefly describes the physical facilities at KOA. Aviation-specific information on the airspace, aviation activity, and role of the airport are described. The chapter also describes the environment in which the airport operates, including surrounding land uses and the socioeconomic characteristics of the region.

## *AIRPORT SETTING*

KOA is classified under the National Plan of Integrated Airport Systems



(NPIAS) as a primary commercial service small-hub airport, reporting 1,519,345 total passenger enplanements (boardings) for 2007. This equates to approximately 0.20 percent of the total annual enplanements in the United States. The percentage of annual enplaned passengers for small-hub commercial airports must be at least 0.05 percent, but less than 0.25 percent of the total enplanements for the United States. In 2007, KOA ranked 76<sup>th</sup> out of 575 commercial service airports, and ninth of 73 small-hub airports.

## LOCALE

As shown on **Exhibit 1A**, KOA is located on the western coast of the island of Hawaii. Commonly called the “Big Island” because it is the largest island within the state, it is also the eastern and southernmost island.

The airport is situated on approximately 3,450 acres within the Kailua-Kona CDP (census designated place) of the North Kona District. It is approximately nine miles northwest of the area’s central business district (CBD). **Exhibit 1B** depicts the airport property in its immediate surroundings. Queen Kaahumanu Highway (Route 19) is located along the east side of the airport. State Route 19 is a link in the principal highway system that circles the island. Kea-hole Street provides primary on-airport access from the highway to the passenger terminal as well as other airport landside facilities.

## CLIMATE

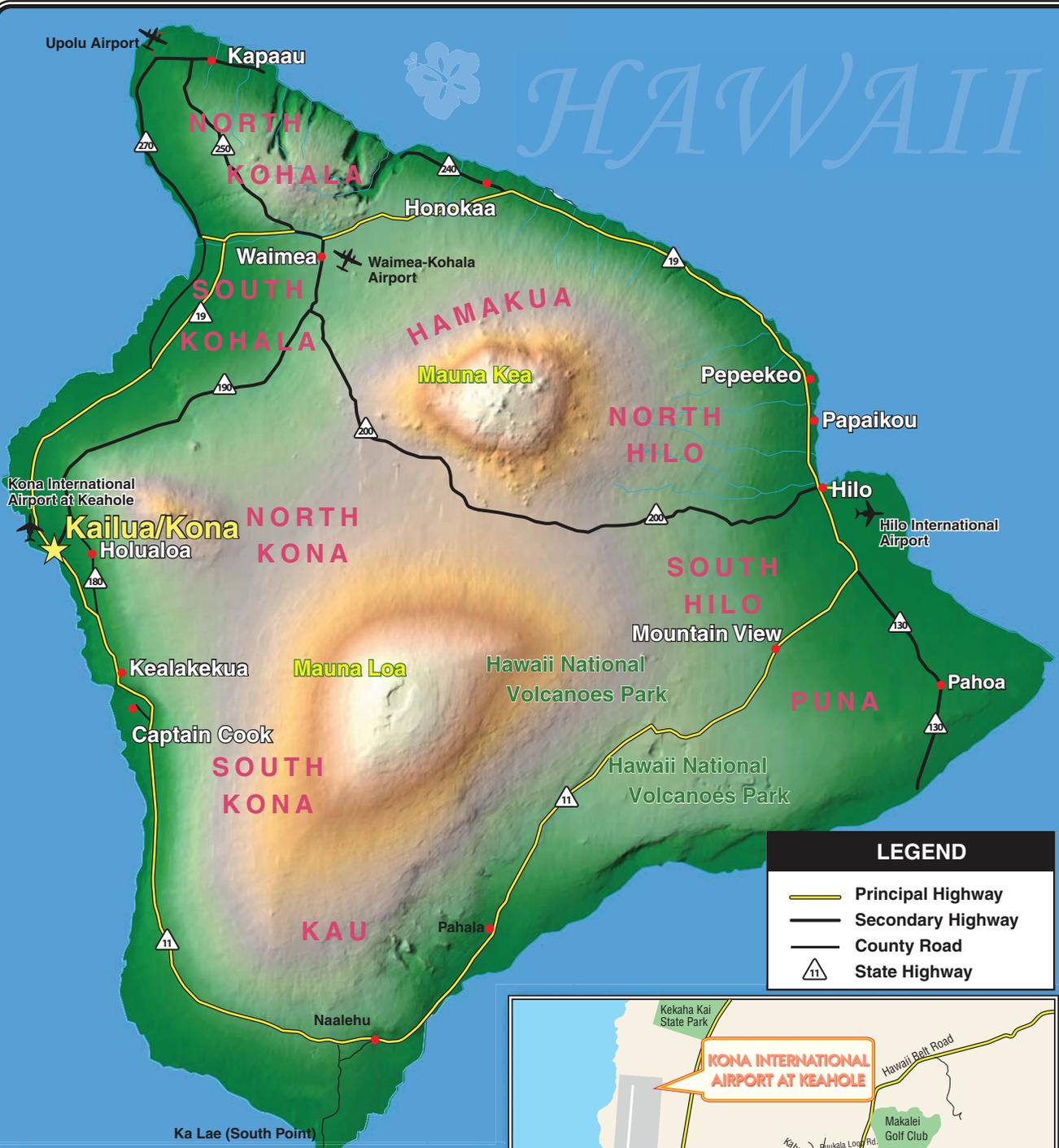
The climate of Hawaii County and the Kailua/Kona area is primarily tropical, consisting of a dry (November to March) and a wet season (April to October). There are local climatic differences across the island due primarily to the mountainous terrain created by Mauna Kea, Mauna Loa, Kilauea, Hualalai, and the Kohala Mountains. The tradewinds that affect the east side of the island are blocked by the mountains, leaving the west side drier and more subject to ground heating and cooling.

As the location of the active Kilauea volcano, the island can be subjected to volcanic smog, or “vog.” Vog is formed when sulfur dioxide emitted by an erupting volcano mixes with oxygen and moisture in the presence of sunlight. Vog creates a haze in the atmosphere that can become thicker or lighter depending upon the level of emissions, the direction and strength of wind, and other weather conditions.

The vog mostly affects the west coast of the island as prevailing trade winds blow the vog to the southwest, where other wind patterns then send it north along the Kona-Kohala coast line.

The Kona coast on the northwest side has a distinctive climate from that of the rest of the island and the state. The area including KOA experiences a diurnal land/sea wind pattern, especially in the summer. The land warms during the day, causing the winds to blow in from the ocean. As the ground

# HAWAII



**LEGEND**

- Principal Highway
- Secondary Highway
- County Road
- State Highway





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cools in the evening, the winds shift to blow from the land to the ocean. Summer rainfall exceeds winter rainfall, with a high frequency of late afternoon or early evening showers. Annual precipitation averages less than 22 inches per year. High temperatures typically range from 80 to 86 degrees Fahrenheit (F), with October being the hottest month.

Although precipitation is low, the west coast can be subject to severe weather conditions. When they do occur, thunderstorms can be very intense with lightning ground strikes, hail, water-

spouts, and damaging winds. Hurricanes are rare but possible. Tropical storms (sustained winds of less than 74 miles per hour) are more frequent, but still occur less than once per year. They usually occur during the months of June through December. These storms generally originate off the coast of Mexico and travel west or northwest toward the Hawaiian Islands. Often times when hurricanes meet the cooler water of the North Pacific near the Hawaiian Islands, they will lose much of their strength before hitting the islands. **Table 1A** summarizes climatic data for KOA.

<b>Month</b>	<b>Monthly Temperature Averages</b>		<b>Precipitation</b>
	<b>Maximum (F)</b>	<b>Minimum (F)</b>	<b>Mean (inches)</b>
January	80.9	65.5	2.40
February	81.3	65.8	1.65
March	81.5	66.8	1.64
April	81.9	68.0	2.19
May	82.3	68.7	2.34
June	82.9	69.9	1.83
July	83.6	70.6	2.31
August	85.2	71.3	1.80
September	85.8	71.3	2.14
October	85.7	70.8	1.43
November	81.5	67.0	0.91
December	80.6	65.7	1.23
Annual	83.0	68.7	21.87

Source: Western Regional Climate Center

## **ISLAND TRANSPORTATION NETWORK**

### **Highway System**

The island of Hawaii is served by a network 1,393 miles of public roads. This includes 394 miles of state high-

ways. As displayed on **Exhibit 1A**, the backbone of the system is the Hawaii Belt Road which circles the island. The Belt Road is comprised of State Highways 11, 19, and 190. Route 11 extends around the southern half of the island between Hilo and Kailua-Kona. Route 19 extends

around the northern portion between Hilo and Waimea. On the west side between Waimea and Kailua-Kona, there are now two routes.

Route 190 (Mamalahoa Highway) is the original link and has been called the “mauka” route since the completion of the “makai” route Queen Kaahumanu Highway (Highway 19) in 1975. The makai route provides access not only to KOA, but also to the Kona/Kohala resorts. While most of the Hawaii Belt Road is two lanes, it widens to four lanes in and around some of the island’s larger communities.

Saddle Road (Route 200) was constructed to more directly connect Hilo to the west side of the island; however, it was once considered the most dangerous road in the state. It is not currently part of the state’s highway system, but it is undergoing a series of realignments and improvements that will make it a safer road and potentially reduce the commute between the east and west sides of the island by 20 to 30 minutes.

Locally, Queen Kaahumanu Highway is a limited-access arterial roadway connecting the South Kohala and North Kona Districts. This road is currently being widened from Kailua/Kona towards the airport. Kaiminani Drive is a collector road that extends east from Queen Kaahumanu Highway through the Kona Palisades Subdivision to Mamalahoa Highway. The *2005 Hawaii County General Plan* recommended the widening of both Queen Kaahumanu and Mamalahoa Highways.

## **Public Transportation**

The Hawaii County Mass Transit Agency provides public transportation around the island on the Hele-On bus system. Service is provided to the major urban centers on the island via the main roadways. There is also shuttle service available in Hilo and the Kona District. The Hele-On uses a fleet of buses with a capacity of 33 to 45 passengers. The bus service stops twice daily (once northbound and once southbound) at the airport terminal.

## **Water Transportation**

As an island state, both air and water transportation are critical to Hawaii and its economy. With 80 percent of the state’s food and merchandise imported, 98.6 percent of those imports arrive by sea. The Hawaii DOT maintains a harbor system on each of the islands. There are two deep draft harbors serving the island of Hawaii. Hilo Harbor is located on the east side of the island at Hilo approximately 95 miles from KOA. Kawaihae Harbor is located on the west side, approximately 29 miles from KOA.

Hilo Harbor is the older harbor and has historically been the main port for the island, having a 35-foot draft and three commercial piers. There is limited loading and back-up space, as well as limited room for expansion of harbor industrial uses. Plans to include expansion within the limited area are available.

Kawaihae Harbor in South Kohala was established to relieve congestion

at Hilo as well as to provide service for the growing west Hawaii communities. The Kawaihae Harbor is not as developed as the Hilo Harbor. It currently has two commercial piers with 14 acres of cargo handling and storage, but has room for expansion. The *Hawaii Commercial Harbors 2020 Master Plan* calls for additional pier construction, an overseas container terminal, an interisland cargo terminal, liquid and dry bulk cargo facilities, military cargo terminal, ocean research accommodations, as well as an alternate cruise ship terminal.

In addition to the deep draft harbors, cruise ships visiting Kailua/Kona anchor off-shore in Kailua Bay and shuttle passengers to the Kailua/Kona Wharf.

### **Other Big Island Airports**

A review of other public-use airports besides KOA has been made to identify and distinguish the type of air service provided on the island. There are three other airports on the island. As with KOA, all are state-owned. Information pertaining to each airport was obtained from FAA records, and each is identified on **Exhibit 1A**.

**Waimea-Kohala Airport (MUE)** is located approximately 26 nautical miles northeast of KOA. The airport has a single northeast-southwest asphalt runway that is lighted. Runway 4-22 is 5,197 feet long and 100 feet wide. The airport has nine based aircraft and an estimated 3,650 annual operations.

**Hilo International Airport (ITO)** is located approximately 56 nautical miles east of KOA. ITO is the other commercial service airport on the island and handled 1.45 million passengers in calendar year (CY) 2006. The airport has two lighted asphalt runways. The east-west Runway 8-26 is the longest at 9,800 feet and 150 feet wide. Northeast-southwest Runway 3-21 is 5,600 feet long and 150 feet wide. There are 50 aircraft based at Hilo International Airport. Avgas, Jet A fuel, flight training, aircraft rentals, charters, and maintenance are available at the airport. Annual operations as counted by the ITO Airport Traffic Control Tower (ATCT) in CY 2006 totaled 97,892.

**Upolu Airport (UPP)** is located approximately 33 nautical miles north of KOA. The airport's lone Runway 7-25 is 3,800 feet long, 75 feet wide, lighted, and constructed of asphalt. The airport bases one aircraft. Annual operations are estimated at 700.

### **AIRPORT HISTORY**

In 1947, the Hawaiian legislature approved state funding to develop the Kailua Airstrip, located along the coast approximately seven miles southeast of the current airport. Up to that time, the airstrip was being used primarily for small aircraft operations. Over the next two years, the runway was upgraded to 3,500 feet by 100 feet and a passenger terminal building was constructed. The new facilities officially opened in July 1949. In February 1951, new runway lights were in-

stalled and a runway extension to 3,800 feet was completed.

The 120-acre airport also included ground transportation, parking lot, aircraft parking apron and hangar, 80 octane fueling facilities, and crash-fire-rescue equipment. Hawaiian Airlines and Trans-Pacific Airlines provided scheduled service.

The need for yet additional runway length continued to grow. In 1953, plans to add another 1,100 feet to the runway met with local opposition and subsequent lawsuits. While the runway extension was being delayed, a developer proposed creating a tourist mecca in the Kona area that would require the relocation of the airport. Feasibility studies began in 1955.

In 1968, all airports in the State of Hawaii were placed under the control of the Hawaii Department of Transportation. A year later, the Department of Transportation made the decision to move forward with the idea to replace the original airport and began construction on the new Keahole Airport, seven miles north of the existing airport. The new airport was completed and dedicated in 1970. The Keahole Airport's FAA ATCT was constructed shortly after the opening of the airport in 1971.

In 1974, the Hawaii State Legislature created the Natural Energy Laboratory of Hawaii (NELH) on 322 acres of land on Keahole Point makai of the new airfield. NELH was mandated to provide a support facility for research on the ocean thermal energy conversion (OTEC) process and its related technologies.

In 1985, the Legislature created the Hawaii Ocean and Science Technology (HOST) Park on an adjacent 548 acres at Keahole in anticipation of expansion needs of NELH's growing businesses. In 1990, HOST Park and NELH were melded into one agency, the NELH Authority (NELHA), attached to the state's Department of Business, Economic Development & Tourism.

The airport handled interisland traffic almost exclusively until 1983, when United Airlines began direct flights. In 1988, the runway was extended from 6,500 feet to 9,500 feet and the terminal was expanded by three gates.

The name of the airport was officially changed to Keahole-Kona International Airport on April 26, 1993. In 1994, the runway was extended to its current length of 11,000 feet. This provided enough runway length to allow wide-body aircraft to operate fully loaded.

On June 16, 1997, the name of the airport was changed to its current name - Kona International Airport at Keahole.

## **CEDED LANDS**

In the State of Hawaii, there are approximately 1.8 million acres of land that were once the crown lands of the Hawaiian monarchy. After the overthrow of the Hawaiian Kingdom in 1898, the crown lands were ceded to the U.S. government. When Hawaii became a state in 1959, these crown lands now known as ceded lands were

transferred to the state by a federal act. These ceded lands are held in trust for the Native Hawaiians. Lands, proceeds, and revenues generated from the use of these ceded lands are to be managed and disposed of for one or more of the following purposes:

1. Support of public education
2. Betterment of the conditions of Native Hawaiians as defined in the Hawaiian Homes Commission Act of 1920
3. Development of farm and home ownership on as widespread a basis as possible for the making of public improvements
4. Provisions of lands for public use.

At the 1978 Hawaii State Constitutional Convention, the Constitution of Hawaii was amended to create the Office of Hawaiian Affairs (OHA) to better address the second purpose. Through OHA, Native Hawaiians make their own decision as to the investment of ceded lands and collection of revenues from said lands.

Kona International Airport is comprised almost entirely of ceded lands. There is one Ahupua'a that is north of the terminal (Mahele Award) that is not ceded land. In 1997, Public Law 105-66 from the Department of Transportation and Related Agencies Appropriations Act, 1998, ruled that airport revenues for claims related to ceded lands were not subject to payment citing the provisions of 47107 of title 49, United States Code. As this master plan was nearing completion, the United States Supreme Court was hearing the State's appeal on the State's ability to sell or exchange any of the ceded lands.

## **FAA AIRPORT IMPROVEMENT PROGRAM (AIP) PROJECTS**

To assist in funding capital improvements, the Federal Aviation Administration (FAA) has provided funding assistance to KOA through the Airport Improvement Program (AIP). The AIP is funded through the Aviation Trust Fund, which was established in 1970 to provide funding for aviation capital investment programs (aviation development, facilities and equipment, and research and development). The Trust Fund also finances a portion of the operation of the FAA. It is funded by user fees, taxes on airline tickets, aviation fuel, and various aircraft parts.

**Table 1B** summarizes FAA AIP grants for Fiscal Year (FY) 2000 through FY 2008. The FAA has granted \$27.3 million for airport improvements at KOA over the past nine years.

## **AIRPORT ADMINISTRATION**

Like all public airports in the state, KOA is owned by the State of Hawaii. The system of airports is operated by the Airports Division of the Department of Transportation. The mission of the Airports Division is to develop, manage, and maintain a safe and efficient global air transportation organization.

**Exhibit 1C** presents the organization of the Airports Division. The Airports Administrator heads the Division. There are five offices within the division, including the Staff Services Office, Visitor Information Program

Office, Information Technology Office, Airports Operations Office, and the Engineering Branch. The airports and facilities operated by the Airports Division are divided into four districts, including: Oahu District; Maui District; Hawaii District; and Kauai District.

Kona International Airport at Keahole is included in the Hawaii District, which also includes the other airports on the island (Hilo International Airport, Waimea-Kohala Airport, and

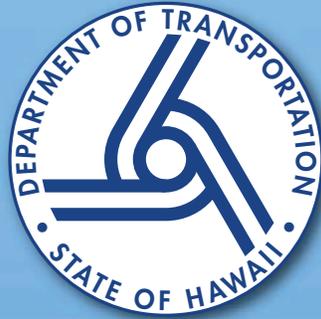
Upolu Airport). The Hawaii District manages, operates, and maintains all State airports on the island of Hawaii in conformity with State and Federal laws, requirements, and rules, as well as established policies and procedures of the Department of Transportation and those of the Airports Division. The District Manager oversees the four district airports from offices at KOA. An Assistant District Manager is located at Hilo International Airport.

<b>Fiscal Year</b>	<b>AIP Grant Number</b>	<b>Project Description</b>	<b>Total Grant Funds</b>
2000	15	Expand General Aviation Apron	\$5,000,000
2001	16	Wastewater Treatment Plant (Ph. II)	\$7,319,586
2001	17	Construct Ramp K	\$1,620,000
2002	18	Security Requirements	\$247,909
2002	19	Perimeter Fence, Perimeter Service Road, GA Lighting	\$1,935,000
2003	20	Security Access Control & CCTV	\$2,371,500
2003	21	Rehab Runway 17-35 Lighting	\$526,050
2004	22	1,500 Gallon ARFF Vehicle	\$712,500
2004	23	Airfield Guidance Sign; Rehab Access and Peripheral Roads	\$558,196
2005	24	Rehab Taxiway B; Access Road	\$1,322,897
2005	25	3,000 Gallon ARFF Vehicle	\$840,500
2006	26	Master Plan and Part 150	\$1,800,000
2006	27	1,500 Gallon ARFF Vehicle	\$599,975
2007	28	Safety Management System Study	\$100,000
2008	29	Rehabilitate Taxiways A and G, portions of Runway 17-35, and portions of the north and south aprons.	\$2,354,287
<b>Total AIP Grant Funds</b>			<b>\$27,308,400</b>
Source: FAA - Honolulu Airports District Office (ADO)			

## **AVIATION ACTIVITY**

Records of airport operational activity are essential for determining required facilities (types and sizes), as well as eligibility for federal funding. Airport

staff and the FAA record key operational statistics, including aircraft operations, enplaned passengers, and cargo shipments. Analysis of historical activity levels aid in projecting future trends which will enhance the



### AIRPORTS DIVISION

**STAFF SERVICES OFFICE**

**VISITOR INFORMATION PROGRAM OFFICE**

**INFORMATION TECHNOLOGY OFFICE**

**AIRPORTS OPERATIONS OFFICE**

**ENGINEERING BRANCH**

**OAHU DISTRICT**  
Honolulu International Airport (HNL)  
Kalaheo Airport (JRF)  
Dillingham Airfield (HDH)

**MAUI DISTRICT**  
Hana Airport (HNM)  
Kalaupapa Airport (LUP)  
Kahului Airport (OGG)  
Kapalua Airport (JHM)  
Lanai Airport (LNY)  
Molokai Airport (MKK)

**HAWAII DISTRICT**  
Kona International Airport at Keahole (KOA)  
Hilo International Airport (ITO)  
Waimea-Kohala Airport (MUE)  
Upolu Airport (UPP)

**KAUAI DISTRICT**  
Lihue Airport (LIH)  
Port Allen Airport (PAK)



airport's ability to plan for facility demands in a timely manner. The following sections outline basic operational activities at KOA. More detailed breakdowns and analyses of aviation activity will be provided and discussed in the next chapter on airport forecasts.

## AIRCRAFT OPERATIONS

Aircraft operational statistics at KOA are recorded by the ATCT that is operated daily between 6:00 a.m. and 10:00 p.m. Among other duties, the ATCT counts aircraft operations, which are defined as either a takeoff or a landing. Aircraft operations are segregated into four general categories:

air carrier, air taxi, military, and general aviation. Air carrier operations are performed by commercial airline aircraft with more than 60 seats. Air taxi operations are generally associated with commuter aircraft, but also include for-hire general aviation aircraft.

Operations are further subcategorized as either itinerant or local. Itinerant operations are those made by aircraft which arrive from or depart to destinations outside the local operating area. Local operations are associated primarily with touch-and-go or pilot training activity. **Table 1C** presents a summary of the ATCT operations count since 1996.

Year	Itinerant					Local			Total
	Air Carrier	Air Taxi	General Aviation	Military	Subtotal	General Aviation	Military	Subtotal	
1996	29,195	16,556	9,485	2,368	57,604	12,106	7,315	19,421	77,025
1997	27,462	14,912	13,250	1,999	57,623	24,299	5,394	29,693	87,316
1998	27,068	9,346	13,987	2,084	52,485	23,150	5,570	28,720	81,205
1999	27,500	8,860	14,853	2,359	53,572	22,666	6,648	29,314	82,886
2000	29,483	9,545	18,011	2,856	59,895	29,010	9,069	38,079	97,974
2001	27,183	10,926	19,570	3,176	60,855	35,544	11,414	46,958	107,813
2002	24,146	15,464	21,170	4,203	64,983	45,310	13,411	58,721	123,704
2003	22,317	14,524	19,894	4,227	60,962	46,904	11,344	58,248	119,210
2004	22,147	20,903	20,122	3,070	66,242	60,105	11,571	71,676	137,918
2005	22,497	22,540	19,737	3,686	68,460	73,055	13,456	86,511	154,971
2006	29,224	21,700	18,340	3,453	72,717	54,650	15,851	70,501	143,218
2007	32,352	19,646	17,766	3,248	73,012	58,000	13,558	71,558	144,570
2008	29,455	20,021	18,783	2,888	71,147	51,489	8,072	59,561	130,708

Source: FAA Airport Policy and Plan Office (APO) Tower Records

## PASSENGER ACTIVITY

KOA is one of the five major commercial service airports in the state and one of two on the Island of Hawaii. KOA serves the West Hawaii region, including the major population center

Kailua/Kona and visitor industry hotel properties along the Kohala Coast and within the Kailua/Kona region. Hilo Airport (ITO) serves the East Hawaii region and its major population center, Hilo.

Three travel sectors define passenger traffic at KOA: interisland, overseas mainland, and overseas international arrivals (flights to international destinations from KOA, currently depart via HNL). The travel sectors appear distinct, though residents of Hawaii and visitors use all for travel between the islands and overseas.

Passenger traffic is collected and analyzed by recording the number of passengers who arrive (deplane) or depart (enplane) commercial service aircraft.

Passenger activity figures are the planning yardstick utilized to determine terminal building space capacities, automobile parking requirements, automobile access capacities, etc. Also, the FAA earmarks annual entitlement funds based upon the annual level of enplanements at each commercial service airport. Passenger levels on each flight are recorded by the airlines and reported to the airport and the FAA on a monthly basis. **Table 1D** presents historical total passenger levels at KOA since 1996.

<b>TABLE 1D</b>				
<b>Annual Passenger and Cargo Activity</b>				
<b>Kona International Airport at Keahole</b>				
<i>Airline Passenger Activity</i>				
<b>Year</b>	<b>Interisland Passengers</b>	<b>Overseas Passengers</b>	<b>Total Passengers</b>	<b>International Arrivals</b>
1996	2,248,511	275,891	2,524,402	29,371
1997	2,257,218	370,939	2,628,157	40,988
1998	2,241,765	411,190	2,652,955	87,521
1999	2,215,953	452,229	2,668,182	80,087
2000	2,271,216	570,881	2,842,097	78,895
2001	2,009,138	631,180	2,640,318	65,141
2002	1,940,181	661,558	2,601,739	66,871
2003	1,824,130	718,436	2,542,566	65,652
2004	1,807,289	846,273	2,653,562	78,918
2005	1,913,344	1,046,383	2,959,727	86,111
2006	1,984,319	1,048,893	3,033,212	69,650
2007	2,185,698	992,780	3,216,642	67,549
2008	1,672,596	857,989	2,530,585	83,879
<i>Air Cargo Activity (U.S. Tons)</i>				
<b>Year</b>	<b>Air Freight</b>	<b>Air Mail</b>	<b>Total Cargo</b>	
1996	22,486	2,448	24,934	
1997	24,636	2,222	26,858	
1998	22,085	2,994	25,079	
1999	23,317	5,889	29,206	
2000	15,223	6,450	21,673	
2001	21,540	5,907	27,447	
2002	27,323	4,038	31,361	
2003	25,836	4,710	30,546	
2004	25,588	5,130	30,718	
2005	24,477	6,290	30,767	
2006	23,878	8,512	32,390	
2007	22,349	8,067	30,416	

With over 3.2 million passengers in 2007, KOA was the third busiest airport in the state behind Honolulu International Airport and Kahului Airport.

As of August 2008, there were nine commercial passenger airline carriers with scheduled service to and from KOA. Aircraft utilized by the commercial airline carriers range from the Canadair Regional Jet CRJ-200 to the Boeing 777. The commercial passenger airlines included: Hawaiian Airlines, Island Air, Go! (Mesa Airlines), American Airlines, Delta Airlines, Japan Airlines (JAL), Northwest Airlines, United Airlines, and US Airways. During the winter season, Air Canada also served the airport.

Interisland airport destinations included Kahului, Honolulu, Lihue, and Molokai. Mainland United States destinations included Los Angeles, San Francisco, Chicago, Oakland, Phoenix, and Seattle. The only scheduled international destination in August of 2008 was Tokyo, which was served by JAL. During the winter, however, Vancouver, Canada was served by Air Canada flights.

## **CARGO ACTIVITY**

Air cargo is an encompassing term used to describe the combined activi-

ties of air mail and air freight operations. The air cargo industry includes a diverse range of businesses providing a variety of different services supporting the movement of air freight. This includes air cargo transported by dedicated cargo airlines, passenger airlines, freight forwarders and custom brokers, and air freight truckers.

Cargo carriers currently conducting operations at KOA include Aloha Air Cargo (FedEx contractor), UPS, and United Cargo. Annual cargo totals handled at KOA since 1996 are shown on **Table 1D**.

## ***AIRFIELD FACILITIES***

Airport facilities can be functionally classified into two broad categories: airfield and landside. The airfield category includes those facilities directly associated with aircraft operations. The landside category includes those facilities necessary to provide a safe transition from surface to air transportation and support aircraft parking, servicing, storage, maintenance, and operational safety. This section describes the airfield facilities, including runways, taxiways, lighting, marking, navigational aids, weather reporting, and the airport traffic control tower (ATCT). Airfield facilities are depicted on **Exhibit 1D**. **Table 1E** summarizes key airfield facility data.

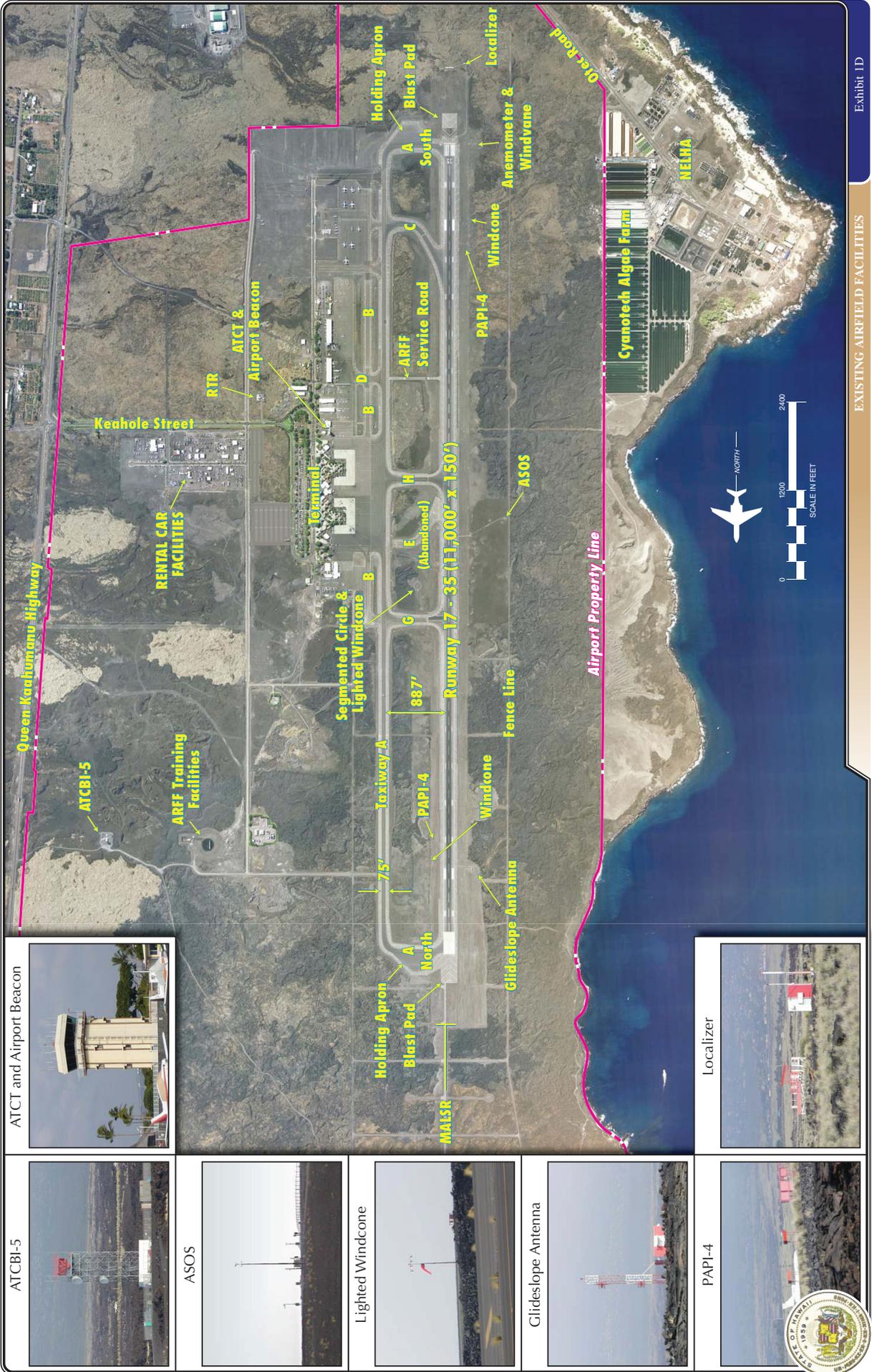
**TABLE 1E**  
**Airfield Facility Data**  
**Kona International Airport at Keahole**

	Runway 17-35	
Length (feet)	11,000	
Width (feet)	150	
Surface Material	Asphalt/Grooved	
Load Bearing Strength		
Single Wheel Loading (SWL)	75,000 lbs.	
Double Wheel Loading (DWL)	200,000 lbs.	
Dual Tandem Wheel Loading (DTL)	400,000 lbs.	
Dual Double Tandem Wheel Loading (DDTL)	850,000 lbs.	
Instrument Approach Procedures	ILS/DME CAT I LOC, RNAV (GPS) VOR/DME or TACAN	
Approach Aids	<b><u>RW 17</u></b> PAPI-4 MALSR	<b><u>RW 35</u></b> PAPI-4
Pavement Markings	Precision	
Pavement Lighting	HIRL	
Weather Reporting	ASOS	
Airport Traffic Control Tower	Federal Contract Tower (0600 to 2200 hrs)	
Radar	ATCBI-5	
Fixed Wing Aircraft Traffic Pattern	Left	Left
Abbreviations: ASOS: Automated Surface Observing System ATCBI-5 Airport Traffic Control Beacon Interrogator CAT: Category DME: Distance Measuring Equipment GPS: Global Positioning System HIRL: High Intensity Runway Lighting ILS: Instrument Landing System LOC: Localizer MALSR: Medium Intensity Approach Lighting System w/Runway Alignment Indicator Lights PAPI: Precision Approach Path Indicators RNAV: Area Navigation VOR: Very-High Frequency Omni-Directional Range Source: Airnav.com		

The following section will then outline the landside facilities, including the passenger terminal, air cargo, general aviation, military, support, and utilities.

## **RUNWAYS**

KOA has a single runway, as shown on **Exhibit 1D**. Runway 17-35 is 11,000 feet long by 150 feet wide; it is



ATCBI-5



ATCT and Airport Beacon



ASOS



Localizer



Lighted Windcone



Glideslope Antenna



PAPI-4



oriented north-south and is constructed of grooved asphalt. The runway is equipped with 35-foot wide paved shoulders, and 400-foot overruns off each end. The north runway overrun includes a 300-foot concrete blast pad.

The load bearing strength of the runway is shown in **Table 1E**. Single wheel loading (SWL) refers to the design of certain aircraft landing gear which has a single wheel on each main landing gear strut. Dual wheel loading (DWL) refers to the design of certain aircraft landing gear which has two wheels on each main landing gear strut. Dual tandem wheel loading (DTL) refers to the aircraft landing gear struts with a tandem set of dual wheels (four wheels) on each main landing gear strut. Dual Double Tandem Wheel Loading (DDTL) refers to the aircraft landing gear struts with double tandem sets of dual wheels (eight wheels) on each main landing gear strut.

The runway gradient describes the average slope of a runway. The gradient is determined by dividing the runway's high and low points by its length. Runway 17-35 has a 0.086 percent gradient.

## TAXIWAYS

Taxiways on the airfield are identified by a single letter and include the following:

- Taxiway A – Parallel taxiway to Runway 17-35.

- Taxiway B – Abandoned taxiway now used as ramp.
- Taxiway C– High-speed exit taxiway for Runway 17-35.
- Taxiway D – Connecting taxiway for south general aviation ramp to Taxiway A.
- Taxiway E – Abandoned taxiway.
- Taxiway G – Exit taxiway for Runway 17-35.
- Taxiway H – Exit/connecting taxiway from terminal apron to Runway 17-35.

The airfield taxiways are all at least 75 feet wide with 35-foot wide paved shoulders. The centerline separation between the runway and the parallel taxiway is 887 feet.

## AIRFIELD LIGHTING

Airfield lighting systems extend an airport's usefulness into periods of darkness and/or poor visibility. A variety of lighting systems are installed at the airport for this purpose. They are categorized by function as follows:

### **Airport Identification Lighting:**

The location of the airport at night or during low-visibility weather is universally identified by a rotating beacon. A rotating beacon projects two beams of light, one white and one green, 180 degrees apart. The airport beacon is located on top of the ATCT.

**Runway Pavement and Edge Lighting:** Pavement edge lighting utilizes light fixtures placed near the edge of the pavement to define the lateral limits of the pavement. This lighting is essential for safe operations during night and/or times of low visibility in order to maintain safe and efficient access to and from the runway and aircraft parking areas. Runway 17-35 is equipped with a high intensity runway lighting (HIRL) system.

**Taxiway Lighting:** All airfield taxiways, the apron edge taxilanes, as well as associated connector taxiways, are equipped with blue medium intensity taxiway lights (MITL).

**Obstruction Lighting:** Objects which obstruct the Federal Aviation Regulation (FAR) Part 77 imaginary surfaces are marked with red lights. Obstructions marked at KOA include: wind cones, weather reporting, navigation and approach aid systems, and the airport control tower.

**Visual Approach Lighting:** Visual approach aids have been installed at the airport to assist pilots in determining the correct descent path to the runway end during an approach to the airport. Precision approach path indicators (PAPI-4s) are available on both Runways 17 and 35. The PAPIs provide approach path guidance with a series of light units. The four-unit PAPIs give the pilot an indication of whether their approach is above, below, or on-path, through the pattern of red and white light visible from the light units.

**Instrument Approach Lighting:** Runway 17 is equipped with a medium intensity approach lighting system with runway alignment indicator lights (MALSR). The medium intensity approach light system (MALS) begins at the runway end and extends into the approach for 1,400 feet with stations every 200 feet along the runway centerline. The runway alignment indicator lights (RAIL) begins at the end of the MALS and extends another 1,000 feet into the approach with light stations every 200 feet, for a total distance of 2,400 feet. Runway 35 has no approach light system.

## **AIRFIELD SIGNAGE**

Airfield identification signs assist pilots in identifying runways, taxiway routes, and critical areas. All runways are identified with lighted signs located at each taxiway intersection. Taxiways are identified using lighted location, directional, and informational signs. Lighted signs are installed at all taxiway and runway intersections. These signs also identify the aircraft holding position.

The glide slope critical area at the approach end to Runway 17 is protected from signal disruption through the installation of a set-back Category I hold line and an "ILS" sign displayed adjacent to Taxiway A North. Signs are located at runway safety areas (RSAs) adjoining the critical area to service operators against inadvertent entry.

## AIRPORT MARKINGS

Pavement markings aid in the movement of aircraft along airport surfaces and identify closed or hazardous areas on the airport. KOA provides and maintains marking systems in accordance with Part 139.311(a) and Advisory Circular 150/5340-1, *Standards for Airport Marking*.

Runway 17-35 has precision instrument runway (PIR) markings that identify the runway centerline, threshold, designation, touchdown point, and aircraft holding positions.

In addition to pavement markings, wind cones are available at the approach end of each runway.

All taxiways at KOA are marked with yellow centerline and taxiway hold markings. Centerline markings assist pilots in maintaining proper clearance from pavement edges and objects near the taxiway edges. A continuous, double yellow taxiway line is used to the taxiway edge from the shoulder or other contiguous paved surface not for aircraft use. A dashed, double yellow taxiway line is used where there is an operational need to define the edge of a taxiway or taxilane where a contiguous paved surface is intended for use by aircraft, such as an aircraft apron or run-up pad.

Aircraft hold positions are also marked at each runway/taxiway intersection. All holding position markings are located 280 feet from the runway centerline and are yellow, glass-beaded, highlighted in black, and

double-sized in accordance with FAA standards.

## NAVIGATIONAL AIDS

Navigational aids are electronic devices that transmit radio frequencies, which pilots of properly equipped aircraft translate into point-to-point guidance and position information. The types of electronic navigational aids available for aircraft flying to or from KOA include the VOR, the non-directional beacon (NDB), and global positioning system (GPS).

The VOR provides azimuth readings to pilots of properly equipped aircraft by transmitting a radio signal at every degree to provide 360 individual navigational courses. Frequently, distance measuring equipment (DME) is combined with a VOR facility to provide distance as well as direction information to the pilot. Military tactical air navigation aids (TACANs) and civil VORs are commonly combined to form a VORTAC. A VORTAC provides distance and direction information to civil and military pilots.

The Kona VORTAC serves the Kona area, including KOA. The Kona VORTAC is located approximately five nautical miles south of KOA. The FAA has plans in place to relocate the facility to a new site within the south airport boundary in the 2011-2012 timeframe.

The NDB transmits non-directional radio signals, whereby the pilot of a properly equipped aircraft can deter-

mine the bearing to or from the NDB facility and then “home” or track to or from the station. Pilots flying to or from the airport can utilize the Bradshaw NDB located approximately 25 nautical miles east of KOA.

GPS was initially developed by the United States Department of Defense for military navigation around the world. However, GPS is now used extensively for a wide variety of civilian uses, including the civil aircraft navigation.

GPS uses satellites placed in orbit around the globe to transmit electronic signals, which pilots of properly equipped aircraft use to determine altitude, speed, and navigational information. This provides more freedom in flight planning and allows for more direct routing to the final destination. The present GPS provides for enroute navigation and instrument approaches with both course and vertical navigation. KOA has GPS approaches available to both runway ends.

## **WEATHER REPORTING**

KOA is served by an automated surface observing system (ASOS). The ASOS provides automated aviation weather observations 24 hours per day. The system updates weather observations every minute, continuously reporting significant weather changes as they occur. The ASOS system reports cloud ceiling, visibility, temperature, dew point, wind direction, wind speed, altimeter setting (barometric pressure), and density altitude (airfield elevation corrected for temperature). The ASOS is located on the

west side of the runway near the perimeter fence.

## **AIRPORT TRAFFIC CONTROL TOWER**

The KOA ATCT is currently located east of the runway along the flight line south of the airline terminal. It is operated as a federal contract tower daily from 6:00 a.m. to 10:00 p.m.

The current tower is a multi-level wood structure with a cab height of approximately 50 feet. The tower cab does not meet current standards, is undersized, and has line-of-sight issues with northern portions of Taxiway A. A new ATCT has been programmed by the FAA for KOA to be in service by 2012-13. The siting of this tower is discussed in later chapters of this Master Plan.

An airport traffic control beacon interrogator (ATCBI-5) is located on the airport. This facility is located mauka (east) of the north end of the airfield. The ATCBI-5 is a long-range radar used in enroute air traffic control.

## **LANDSIDE FACILITIES**

### **PASSENGER TERMINAL**

Kona International Airport at Keahole was relocated from its original site to the current airport location on July 1, 1970. The existing KOA terminal buildings were built at that time, and their design character has been celebrated as unique architecture – expressive of Hawaii, connected to the

natural environment of the region, and thus successfully representing West Hawaii. The airport terminals were designed to accommodate inter-island travelers arriving on smaller sized jet aircraft such as the Boeing 737 and McDonald Douglas DC9 (now Boeing 717).

In December of 1990, a memorial building was added to the center of the terminal buildings in remembrance of Col. Ellison Onizuka, son of West Hawaii and NASA astronaut, who perished aboard the space shuttle Challenger on January 28, 1986.

The terminal facilities were expanded in 1996. This project included the addition of gate holdroom areas. The airport now serves passengers on direct overseas flights from the mainland United States as well as international passengers from Japan. They arrive on aircraft that are much larger – such as Boeing 747 – than the airport terminals were designed to handle. Consequently, processing of passengers and the boarding of aircraft has led to capacity, safety, and convenience issues. The events of September 11, 2001, have also changed airport requirements which have affected the operation of KOA. Airport capacity, level of service, safety, and security issues requires KOA to plan for current changes and future needs.

### **Terminal Area Overview**

The passenger terminal area at KOA is depicted on **Exhibit 1E**. This includes the aircraft parking apron, passenger terminal facilities, terminal

curbs and drives, terminal roadways, and public parking within the terminal roadway loop. Generally, all terminal area facilities are on one level, beginning with the apron on the airside, through the terminals, to the parking and roads on the landside.

The aircraft apron at KOA is linear, parallel to the runway, and begins adjacent to the General Aviation area to the south and continues to the international arrivals buildings to the north. Passenger terminal facilities at KOA are located in two areas. The main terminal facilities are for interisland and overseas (mainland and international) travel sectors and are centrally located. Directly adjacent to the north are airport administration buildings, and north of those are temporary sprung structure type facilities for international arrivals processing of passengers.

The terminal area includes 358,901 square feet divided as shown in **Exhibit 1F**.

The main terminal facilities are divided into a north terminal and south terminal, each serving both interisland and overseas travel sectors. Approximately equal in size, the north and south terminals are separated by the Ellison S. Onizuka Space Center. Though the terminals each have a linear pier layout, the individual buildings comprising each terminal are turned on a grid 45 degrees to the aircraft apron and terminal drives.

The terminal curbs are linear from north to south and form the western edge of the counterclockwise travel

terminal roadway loop. There are two parallel drives with inner and outer curbs; the inner curb is used for private vehicle drop-off and pick-up of passengers, and the outer for use by commercial vehicles such as rental car shuttle vehicles.

Public parking is located within the terminal roadway loop and includes revenue control systems. Entrance is on the approach located along the northeast side of the roadway loop, and exit is to the airport departures drive on the southwest side of the roadway loop.

The terminal roadway loop is connected to regional access, Queen Kaahumanu Highway via Keahole Airport Road, the airport entrance/exit roadway.

Employee parking is located directly adjacent to and east of the terminal roadway loop and is currently being expanded. The rental car facilities are located between the employee parking areas and the highway. The following subsections discuss each of these areas in more detail.

### **Aircraft Apron**

The air carrier aircraft apron at KOA is designed for 10 aircraft positions of various sizes from turboprop to B-747. Some interisland “narrowbody” type aircraft operate in a “power-in/power-out” mode. Other interisland aircraft and most of the overseas aircraft power-in, but use aircraft tugs to push-back.

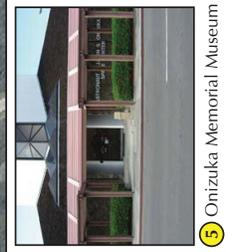
Aircraft are serviced by vehicles; there are no in-ramp services such as hydrant fueling. All aircraft are ground-boarded using air stairs (lifts are used for wheel chair access); there are no passenger loading bridges at the airport. As such, passengers are exposed to the weather elements as they walk between the terminal and aircraft.

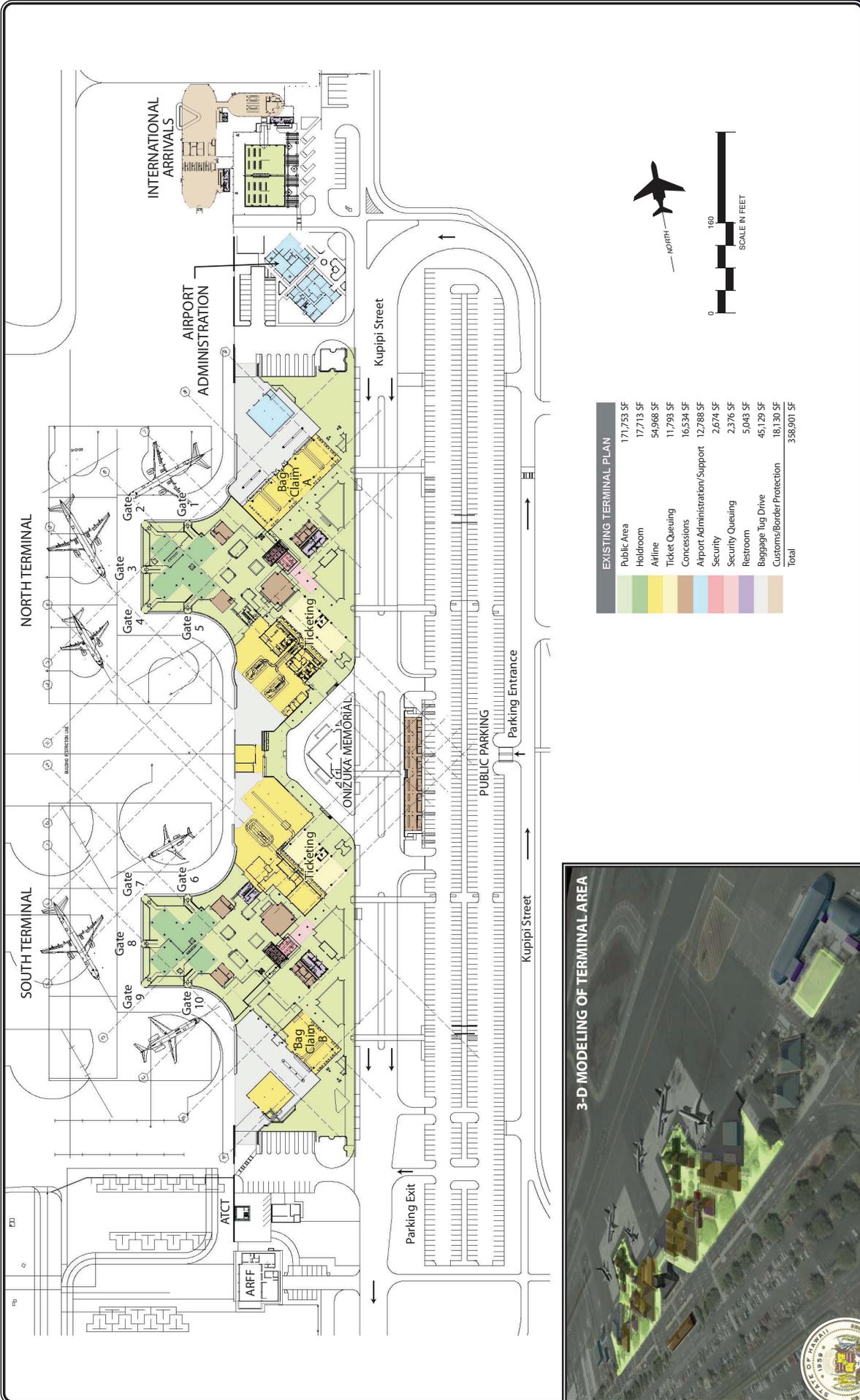
- **Apron Operations**

**Aircraft Movement on Apron:** Commercial passenger aircraft landing at KOA either to the north or south exit the runway to Taxiway A then proceed to the terminal apron. While the apron is continuous on the west side of the terminal area, it is divided into two functional areas, North and South, corresponding to the two terminals. The North Terminal apron is open to the north. Consequently, international and wide-bodied aircraft park to the north as well as to the west of the North Terminal. Airlines include Japan Airlines, United, US Airways, and Go!. The smaller interisland aircraft park to the west and south and power in/power out.

Aircraft using the South Terminal are somewhat constrained as all wide-bodied aircraft must park to the west of the terminal. Airlines include American, Northwest, Delta, Hawaiian, and Island Air. Interisland aircraft use Gate 6 as well as the apron west and south of the terminal for power in/power out operations.

At peak hours, the aprons can become quite congested with maneuvering air-





craft, ramp equipment, and passengers boarding or leaving their aircraft. Rain and lightning make this situation more difficult. Security of the apron area is also an issue.

In addition, seasonal peaks of general aviation corporate air can also congest aircraft parking.

**Passenger Safety:** There is a passenger safety issue whenever traversing an operating aircraft apron. Ground service vehicles operate on the apron and some transfer fuel to aircraft as well as service aircraft lavatories. Also of concern is use of air stair boarding versus level access type boarding provided by aircraft boarding bridges. Some of the aircraft that are ground boarded using stairs have very high aircraft sill heights. Boarding passengers in wheelchairs requires use of mechanical lifts.

**Weather Exposure:** Although KOA receives very small amounts of annual rainfall, when rain occurs it tends to be heavy and becomes an issue for boarding passengers. The open-air architecture is especially vulnerable to wind-borne rain, which can only be prevented with enclosures. Heavy deluges and wind-borne rain often produce significant roof leaks and ponding in customer service areas. Curb-side drainage structures are unable to handle the volume, resulting in significant street flooding. On occasion, passengers have departed with damp clothes on air-conditioned aircraft for long haul flights. The storms are frequently accompanied by lightning that can create other safety issues for passengers.

**Aircraft noise and Jet-A fumes:** Passengers are exposed directly to aircraft engine noise when in the holdroom areas and as they traverse the apron during arrival or departure. The open-air holdrooms can also subject passengers to fuel fumes from ramp operations.

## North Terminal

The North Terminal is first on approach from the terminal drives with air carrier passenger service provided by United Airlines, US Airways, Japan Airlines, Island Air, and Go! Airlines. In 2006, the north terminal also included Aloha Airlines and accommodated 58 percent of the airline passenger traffic.

The North Terminal serves Gates 1 – 5. Gates are numbered (i.e., 1A and 1B) and configured to allow two simultaneous passenger flows.

The terminal is comprised of separate small sloped peaked roof structures, some connected by flat-roofed walkways and infill covered areas. **Exhibit 1F** depicts the floor plan for the terminals. The first buildings on approach are baggage claim areas, followed by ticketing areas.

Departing passengers approach ticketing areas from the terminal curbs or from public parking. Within the ticketing areas there is the U.S. Department of Agriculture (USDA) screening stations (all checked baggage leaving the State must be USDA screened and tagged prior to check-in) with one x-ray unit. There are 110 linear feet

available for check-in counters with space for 18 to 20 agent positions. Ticketing includes standard check-in counters and automated self-service check-in stations. Checked baggage security screening is done after check-in. Beyond ticketing is a TSA passenger screening checkpoint with two lanes and two sets of magnetometers and x-rays. Beyond the checkpoint is a courtyard with restrooms and concessions. There are five holdrooms serving the five gates. Gates 1 – 4 can be secured for overseas departures to the mainland after passengers clear the single USDA station for screening hand-carried bags prior to entering the seating area.

Arriving passengers walk alongside the holdroom seating areas on their way through the courtyards, passing beyond the security exit control point and out to the baggage claim buildings. Greeters gather outside the security exit control point in areas that include visitor information booths, lei stands, and restrooms. The baggage claim area has two claim areas with one claim device each. Once baggage is claimed, passengers proceed to the terminal arrivals curb for pick-up or for boarding rental car shuttles or they proceed to public parking. **Exhibit 1G** presents some of the survey photos of the terminals.

- **North Terminal Operations**

***Departures:***

**Departure Lobby: United/US Airways/Island Air/Go!** - A mid-day peak was observed during the period of 11:30am to 12:30pm. Dur-

ing the observation period in November 2006, both Aloha and United Airlines passengers arrived to check in for their flights. In the departure lobby, which is open unprotected space in front of ticketing, passengers were queuing for security checkpoint processing. At this time, the queue extended to the edge of the curb where other passengers were unloading from vehicles. As a result, the effective curb area for passenger unloading was reduced. In addition to security checkpoint queuing, there was also another queue for agricultural check that also extended into the lobby. When these queues merge there is confusion for passengers who don't know which line they were supposed to be in. Queues also extend beyond the roof line causing discomfort for passengers standing in the sun and heat.

**United States Department of Agriculture Screening**

**(Checked Baggage)** – The location of the agricultural check station with regards to visibility is good in the north terminal. Passengers who are flying to the mainland at this terminal are checking in at the United Airlines counters, which are located past the agricultural check. As a result, the passengers walk past the agricultural check and the agents can alert those who are not aware of this processing requirement and advise them to check their bags. On average, the time spent processing per passenger was relatively low at 0.3 minutes (18 seconds).

**KOA TERMINAL ROOF STRUCTURE**



**NORTH TERMINAL DEPARTURES COURTYARD**



**DEPARTURE FACILITIES FOR AMERICAN/ISLAND AIR**



**NORTH TERMINAL: UNITED AIRLINES CHECK-IN QUEUING**



**BAGGAGE CLAIM A-1: UNITED AIRLINES FLT 55 FROM SAN FRANCISCO INTERNATIONAL AIRPORT**



**BAGGAGE CLAIM A-1: PASSENGERS CROWDING BETWEEN CLAIM DEVICE AND RAILING**



**KOA AIRCRAFT APRON**



**TERMINAL DRIVES AND CURBS**



**Ticketing** – During the observation time, both Aloha (which has since ceased operation) and United ticket lobbies were full with passengers queuing for check-in. At the United lobby, there was one lane for first class passengers and one lane for coach class passengers. There were eight check-in counters, each with an electronic kiosk in front, and four airline agents servicing passengers. For the first class lane, the average time spent per passenger in queue was 1.7 minutes. In the coach class lane, it was 0.6 minutes (36 seconds). Most passengers were carrying large suitcases for check-in.

**United States Department of Agriculture Screening (Hand Carried Baggage)** – There is one x-ray unit for USDA screening of departing mainland passengers' hand-carried baggage. This screening point serves Gates 1A, 2, and 3B. The queue was not observed to be extensive, less than four minutes. First time passengers were often unaware that they would be required to undergo a second USDA screening, this time for carry-on baggage, and were not aware of the regulations regarding fruits they had carried for eating on the plane.

**Gate Holdrooms** - The holdrooms are arranged so that Gates 1A, 2, and 3B can be secure following USDA carry-on baggage inspection. The combined holdroom can become very crowded when multiple mainland flight departures are scheduled close to each other.

When mainland flights are not scheduled, these gates are used for interisland departures, as are Gates 1B, 3A, 4, and 5. The railing at the middle of each gate allows simultaneous departures through one half and arrivals through the other at the same gate. Flight announcements for boarding provide this information.

### ***Arrivals:***

**Baggage Claim A1 and A2** – The baggage claim areas were observed during peak arrivals for the day of the visual survey. It should be noted, however, that the month of the survey (November 2006) was not the peak month. Claim device A-1 was used by United Airlines and Go! Airlines, and claim device A-2 was used by Aloha Airlines. The walking distance to baggage claim is relatively short, as was delivery time of the first bags to arrive at the claim device, approximately eight minutes from arrival of the aircraft. The baggage claim devices are flat-plate type laid out in a typical “T” shape with the long stem of the “T” as the main claim frontage. Each device has 30 feet of stripping belt and 160 feet of claim frontage. Claim devices are adequately sized for smaller “narrow-body” aircraft though they are substantially under-sized for the larger “wide-body” type aircraft that serve the overseas mainland market. Floor space around the devices (observed during off-peak time of year) would be very inadequate to serve large aircraft during peak travel periods. Part of Claim A-1 is

cordoned off to stage unclaimed bags resulting in decreased device frontage for active claiming of bags. Baggage information is provided above the claim device on CRT screens. The perimeter claim railings that deter theft limit available floor space and free movement within the claim area. Passengers who have claimed their bags cannot leave the claim area due to the choke point at the head of the device, and they also do not move to the far side of the device for same reason. Seating benches are provided within the claim area as are baggage cart rental stands.

**Arrivals Courtyards** – The courtyard spaces are located between the baggage claim buildings and the terminal arrivals curbs and are formed by the geometry of the linear curb and diagonal placed buildings. The spaces include landscaping and seating both at curb pick-up and for baggage claim. The trees provide shade, and the courtyard spaces are pleasant places to wait and are valuable amenities for passengers.

### **Ellison S. Onizuka Space Center**

Centrally located between the North and South Terminal is the Astronaut Ellison S. Onizuka Space Center. The space center is a two-story facility which is completely handicapped accessible. It has a prominent central tower including a large skylight. A roadway behind the space center provides access to American Airlines and Island Air check-in counters.

### **South Terminal**

The South Terminal is second on approach from the terminal drives after passing the Ellison S. Onizuka Space Center at the center of the terminal area. Air carrier passenger service is provided by Hawaiian Airlines, Northwest Airlines, Delta Airlines, and American Airlines. The South Terminal serves Gates 6 – 10.

South Terminal structures are identical to those in the North Terminal and appear to be symmetrical in layout about the airport center, though not exactly. The first buildings on approach are ticketing areas followed by baggage claim areas.

Departing passengers approach ticketing areas from the terminal curbs or from public parking. Within the ticketing areas are two TSA screening stations, each with a single Explosives Detection System (EDS). One is located at the center of the ticketing lobby, the other on the south side of the roadway behind the Ellison S. Onizuka Space Center.

There is linear frontage for twelve agent positions. Ticketing includes check-in counters and automated self-service check-in stations. The USDA screening of checked baggage occurs adjacent to the ticketing area. Beyond ticketing is a TSA passenger screening checkpoint. Beyond the checkpoint is a courtyard with restrooms and concessions. There are five holdrooms serving the five gates. Gates 7 and 8 can be accessed after clearing the single USDA station for screening hand-carried bags prior to entering the seating area.

Arriving passengers walk alongside the holdroom seating areas on their way through the courtyards, passing beyond the security exit control point and out to the baggage claim buildings. Greeters gather outside the security exit control point in areas that include a visitor information booth, lei stand, and restrooms. Additionally, there is a ground transportation area to the south of baggage claim used for taxi, limo, and shuttle bus staging. The single baggage claim area has one claim device. Once baggage is claimed, passengers proceed to the terminal arrivals curb for pick-up or for boarding rental car shuttles or to the public parking area.

- **South Terminal Operations**

***Departures:***

**Departures Lobby: Hawaiian/Northwest/Delta/ Japan Airlines** - The departures lobby at the South Terminal is identical in area to the North Terminal. During observation of a peak time, queuing from ticketing or security operations did not overflow into the departures lobby. Generally, there was adequate space for passengers to unload from vehicles with their baggage and walk directly to ticketing.

**Departures Lobby American Airlines** - The ticketing lobby for American is located directly behind the Ellison S. Onizuka Space Center. The vehicle drive splits at the space center, allowing vehicles to

unload passengers in front of the American departures lobby. Because there is inadequate depth overall between the ticket counters and the curb, the lobby area currently measures six feet in depth. When ticket queuing extends out to the lobby, vehicles need to unload passengers a distance before or after the ticket lobby.

**United States Department of Agriculture Screening (Checked Baggage)**

**(Checked Baggage)** - At the South Terminal, there are two locations for agricultural check. One of them is in the main ticket lobby where Hawaiian, Northwest, Delta, and Japan Airlines are located. At this location, the station is situated in the queuing area between Hawaiian and Japan Airlines. Their visibility is an issue since Hawaiian Airlines passengers do not pass by the agricultural check before queuing for ticketing. Many of the mainland bound passengers do not know that they have to screen their bags. The reason is partly due to lack of adequate signage and station configuration. The other agriculture check location is behind the Ellison S. Onizuka Space Center and south of the American ticket lobby. It is not located within the American departures courtyard, and therefore is not visible to passengers who unload in front of ticketing. Despite some signage, most mainland bound passengers do not know that they have to screen their bags until they are told by the airline agent at check-in.

**Ticketing** – Hawaiian, Northwest, and Delta Airlines check-in operations are located in the South Terminal ticketing area. There are 110 lineal feet available for check-in with space for 18 to 20 agent positions. Hawaiian Airlines occupies half of the check-in frontage in this terminal. They are further subdivided into interisland and mainland check-in with queuing to match. There is a bank of electronic check-in kiosks perpendicular to and south of the counters. Japan Airlines has six check-in positions with one of them dedicated to executive class passengers. Delta has one check-in counter and four electronic kiosks located perpendicular to and south of the counters. At the time of observation, the Delta electronic kiosks were out of service. Northwest operates with two check-in counters - one electronic kiosk in front of the counters and two against the side wall. During peak departure times, passenger processing at the counters was efficient, and queuing remained relatively short. Ticket lobby space appeared adequate for queuing.

Centrally located between the terminals and behind the Ellison S. Onizuka Space Center is the ticketing area for American. Covered lobby depth in this area is inadequate. When the queues extend beyond the tensile barriers, passengers are exposed to rain and sun. American has six check-in counters and no electronic kiosks. During a mainland departure, there were a total of six agents. Queuing was divided into two

lanes: one for first class and another for coach class. On average, the processing time per passenger for check-in was approximately 1.43 minutes, and queuing time was 1.47.

**United States Department of Agriculture Screening (Hand Carried Baggage)** – There is one x-ray unit for USDA screening of departing mainland passengers hand carried baggage. This screening point serves Gates 7 and 8. The queue was not observed to be extensive, less than four minutes. Some passengers may be unaware that they are required to undergo a second USDA screening, this time for carry-on baggage, and were not aware of the regulations.

**Gate Holdrooms** - The holdrooms are arranged so that Gates 7 and 8 can be secured following USDA carry-on baggage inspection. The combined holdroom can become very crowded when multiple mainland flight departures are scheduled close to each other. When mainland flights are not scheduled, these gates are used for interisland departures as are Gates 6, 9 and 10. The railing at the middle of each gate allows simultaneous departures through one half and arrivals through the other at the same gate. Flight announcements for boarding provide this information.

**Arrivals:**

**Baggage Claim B** – As with the North Terminal, the baggage claim

area was observed during peak arrivals for day and time of day of the survey and not during peak airport operations time of year. The walking distance to baggage claim is similar to the North Terminal as was delivery time of the first bags to the claim device, approximately eight minutes from arrival of aircraft. The single baggage claim device is a flat-plate type approximately 136 feet in actual claim length and is sized for small “narrow-body” aircraft similar to Baggage Claim A1/A2. Floor space around the devices would be very inadequate to serve larger aircraft during peak travel periods. Part of the device frontage is cordoned off for storage of unclaimed bags. Perimeter railings around the bag claim area limit both floor space and free movement within and out of the claim area. The Hawaiian Airlines baggage office is easily accessible and outside of the claim area.

**Arrivals Courtyards** – The arrivals courtyard spaces are similar to those at the North Terminal. They provide a convenient and pleasant place for waiting at the curb for pick-up after arrival.

### **International Arrivals Building**

At KOA, passengers arriving on international originating flights proceed through Customs and Border Protection (CBP) processes within a temporary type building structure. The building is a metal arched “sprung type” structural frame that is covered in fabric material for enclosure, in-

cludes air-conditioning, and has adequate lighting for functions. The building currently occupies an area of approximately 18,000 square feet. There are two connected buildings of this type, as well as other ancillary temporary wood-framed small structures. There is a fabric-covered metal arch open-aired structure where passengers are greeted upon exit that is also used for tour bus staging and boarding.

Japan Airlines provides direct service to KOA from Narita International Airport. Departing passengers on Japan Airlines flights process through ticketing in the North Terminal and board the aircraft from Gate 1. This flight is considered an interisland departure to Honolulu International Airport, where it will pick up additional passengers prior to departing for Japan.

### **Passenger Services**

**Concessions** – Post-security concessions include basic food and beverage restaurant, gift shop, and news/sundries shop. The concessions are located at the edges of the open air courtyard with good exposure to passengers. Concessions are small and, consequently, the size and variety of offering is limited. Circulation within the spaces is very tight and inconvenient when several passengers are within shops. Larger floor area would help increase inventory offering as well as improve movement within the stores. The concessions are air-conditioned.

Pre-security concessions are located immediately after passing from the secure departure areas on the path to baggage claim. They have good visibility and include lei stands and visitor industry greeter's services. Vending machines are also available, though not highly visible. A food and beverage concession is located across the terminal drives in the center of the airport within the former rental car building.

**Restrooms** – There are five pairs of public restrooms – two each in the North and South Terminal areas, one each in the non-secure and secure areas, and a single pair in the International Arrivals area. The restrooms have serviceable layouts and during the times observed, appear to be in good condition and adequately sized. The restrooms would benefit from modernization that would increase their size and improve layout to meet current travel needs such as larger stalls with out-swinging doors, increased number of towel dispensers located between sinks, and family restroom. Post-security restrooms are also located at the edge of the courtyard and are visible to the public. Pre-security restrooms are located on the path to security between ticketing and baggage claim, though visibility is not adequate. It is difficult to find these restrooms on approach to the baggage claim area.

## **TERMINAL PARKING AND ACCESS**

### **Terminal Access Roadways**

The airport is afforded regional access via Queen Kaahumanu Highway that

runs along the east property boundary. The terminal entrance is at a signalized intersection of the highway. Keahole Street is the airport entrance road. As shown on **Exhibit 1E**, it is a two-lane paved roadway that extends west towards the terminal area. The two 12-foot lanes with 10-foot wide shoulders have a design speed of 45 miles per hour and extends for 3,050 feet to the terminal loop where the two-way lanes splits to form a one-way loop road that flows counterclockwise around the parking lot.

The loop or periphery road is named Kupipi Street. It begins with a two-lane road on the east side of the parking lot that widens to four lanes in the curve around the north end. After the road turns to the south to approach the North Terminal, it widens to six lanes with a median curb.

The median curb and the outside lanes are dedicated to commercial transportation providers (e.g., rental car and hotel shuttle buses, taxis, and limousines). The outer drive is 23 feet wide (one thru lane and one loading lane). The median curb is 11 feet wide with a canopy cover and bench seating. The three sections of median curb provide 850 feet of frontage for loading and unloading passengers, as well as for staging taxis.

The three inside lanes are reserved for private automobiles dropping off or picking up passengers and baggage. The inner drive is 42 feet wide (two thru lanes, one maneuver lane, and one loading lane). The curb is 20 feet wide and includes seating along landscaped area walls. The inner curb

does not have a continuous canopy for shade or protection from rain.

The North and South Terminals each have approximately 690 feet of curb front available. This includes a section of curb front that branches off behind the Ellison S. Onizuka Space Center. Taxis are permitted to drop off departing passengers at the terminal curb, but must return to the median curb to await arriving passengers.

Landscaping along the drives and curbs is extensive and includes large trees, creating a pleasant experience and needed shade.

At the south end of the terminals, the roadway gradually begins to reduce in the number of available 12-foot lanes. One lane continues directly south to the air cargo and general aviation facilities, turning into U'u Street. The remaining loop roadway continues to narrow down to two lanes around the south curve. One then continues east bound to tie back into Keahole Street to exit the airport while the other turns to the north to return to the terminal.

### **Vehicle Parking**

**Exhibits 1E** and **1F** also depict the locations of the vehicle parking related to the passenger terminal. There are 760 spaces located in the public parking lot within the terminal loop road. Access to this parking lot is available from the Kupipi Street loop road through the ticket booth on the east side of the lot. A toll booth exit is located on the west side near the south

end of the lot. Exiting vehicles turn left out of the lot then proceed on the loop road to return to the terminal or exit the airport.

An additional 366 new stalls are available mauka (east) and accessible from Kupipi Street loop road. 263 spaces are available for employees at the Pao'o Street lot.

Parking for the staging of tour buses is available at all three terminals. There are five loading spaces located at the International Arrivals area. There are an additional four spaces farther north for storage or staging of buses. The North Terminal bus parking is located at the north end and has six spaces available. A similar lot is available off the south end of the South Terminal.

### **Rental Car Facilities**

There are no longer rental car counters or ready/return spaces available at the terminal. As depicted on **Exhibit 1D**, all rental car facilities are remote and are located on the north side of the airport entrance road between Queen Kaahumanu Highway and the terminal. Arriving rental car customers proceed from the terminal to the median curb where they are picked up by shuttles operated by each of the eight rental car companies on the airport. These currently include Alamo, Avis, Budget, Dollar, Enterprise, Hertz, National, and Thrifty.

All rental car transactions are conducted on the leasehold of the respective rental car companies. The leasehold not only includes the rental car

counter, offices, and ready/return, but also all service and storage. There are approximately 14 acres currently leased to the rental car companies.

### **AIR CARGO FACILITIES**

In 2006, KOA handled over 30,000 tons of air cargo (freight and mail). FedEx (contracted through Aloha Air Cargo), United Parcel Service (UPS), and United Cargo serve the airport as cargo carriers. Air cargo is also handled as belly freight by several of the other passenger airlines serving the airport. Freight forwarders located on the airport include Big Island Parcel, Commodity Freight Forwarders, and Direct Freight Services.

Two air cargo buildings are located south of the terminal between the general aviation facilities, as shown on **Exhibit 1H**. The northernmost building is 19,828 feet and the southernmost is 20,482 feet. Truck docks and parking are provided on the land side of the buildings. This space is approximately 850 feet long and 125 feet deep.

A parking apron approximately 280 feet deep is available on the airside of the buildings. This is used primarily by Boeing 737 aircraft, smaller cargo aircraft, and for ground service equipment storage. The cargo apron is not sufficient to handle larger widebody aircraft. Widebody cargo aircraft are currently handled and serviced at the terminal apron. The only regular widebody aircraft cargo service as of early 2007 was by UPS, which operates one flight six days a week using either a Boeing 767 or Boeing 747 aircraft.

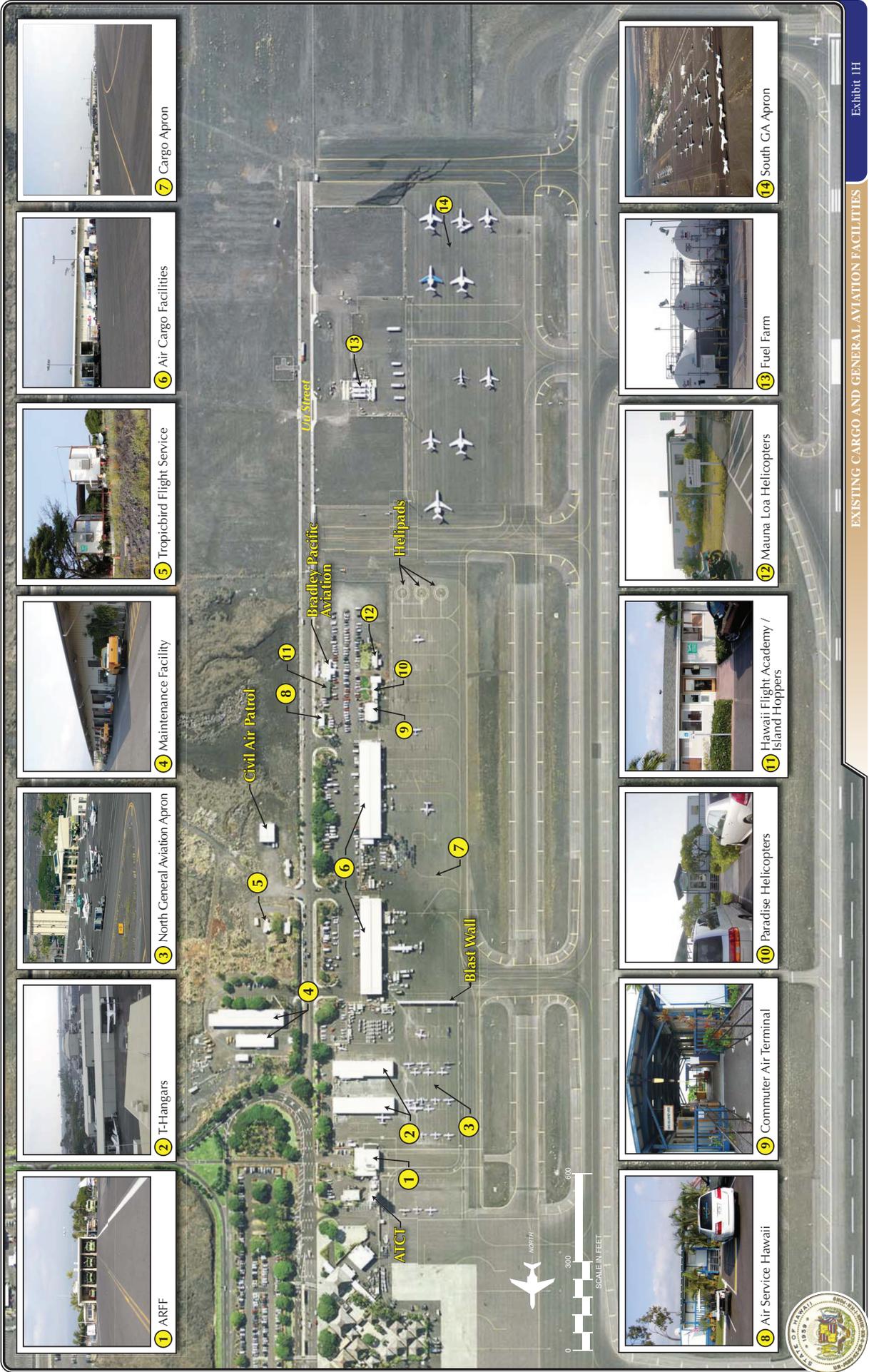
### **GENERAL AVIATION FACILITIES**

While designated a commercial service airport, KOA remains a vital link to general aviation on the island. General aviation operations account for approximately half of the airport's annual operations. The general aviation facilities at KOA are located along the south flight line, as depicted on **Exhibit 1H**.

Based general aviation aircraft are primarily stored on the ramp and in the two 48-foot wide by 203-foot long T-hangars immediately south of the ARFF. There are seven tie-down spaces on the ramp immediately in front of the ATCT, and 36 spaces in front of and immediately south of the T-hangars.

Additional ramp for general aviation uses is located to the south of the air cargo area. There are 15 parking positions on the ramp in front of the Commuter Air Terminal that are used primarily by air tour, charter, rental, flight training, and other aircraft associated with the general aviation/air taxi businesses on the airport. There are also three helipads at the south end of this ramp.

Further to the south is the newest section of apron known as the South General Aviation Ramp. This pavement encompasses approximately 37,000 square yards and is utilized primarily to park and service transient corporate aircraft visiting the island.



7 Cargo Apron



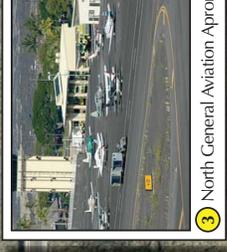
6 Air Cargo Facilities



5 Tropicbird Flight Service



4 Maintenance Facility



3 North General Aviation Apron



2 T-Hangars



1 ARFF



14 South GA Apron



13 Fuel Farm



12 Mauna Loa Helicopters



11 Hawaii Flight Academy / Island Hoppers



10 Paradise Helicopters



9 Commuter Air Terminal



8 Air Service Hawaii



There are nine general aviation/air taxi service operators located on the airport. All utilize building space in the 2,240 square foot Commuter Air Terminal and/or surrounding buildings, as identified on **Exhibit 1H**. These operators and the basic services they provide are outlined in **Table 1F**.

## SUPPORT FACILITIES

Several support facilities serve as critical links in providing the necessary efficiency to aircraft ground operations, such as aircraft rescue and fire-fighting (ARFF), airport administration, airport maintenance, and fuel storage.

	<b>Air Tours</b>	<b>Charter</b>	<b>Flight Training</b>	<b>Fuel</b>	<b>Ground Handling</b>	<b>Parts/ Supplies</b>	<b>Rentals</b>
Air Service Hawaii	X			X	X		X
Big Island Air	X	X					
Bradley Pacific				X	X		
Hawaii Flight Academy		X	X				X
KOAA – Service		X	X			X	X
Mauna Loa Helicopters	X	X	X				
Mokulele Flight Service	X	X					
Paradise Helicopters	X						
Tropicbird Flight Service	X						

Sources: Airnav; Operators' websites; Interviews November 2006

### **Aircraft Rescue and Firefighting Facilities (ARFF)**

Part 139 airports are required to provide aircraft rescue and fire fighting (ARFF) services during air carrier operations. Each airport certificated under CFR Part 139 maintains aircraft rescue and fire fighting (ARFF) equipment and personnel. There are five indices, A through E, with E the largest based on aircraft length. KOA maintains ARFF Index D.

The 6,034 square-foot ARFF facility is centrally located on the airfield to the south of the ATCT. The major equipment stored and maintained at the fa-

cility includes one 3,000-gallon storage capacity fire fighting vehicle and two 1,500-gallon storage capacity fire fighting vehicles. Each of these vehicles is new within the past three years. Other vehicles on-site include: a chief vehicle, a captain truck, and a reserve 1,500-gallon Oshkosh T-series vehicle. A mobile incident command post vehicle is programmed to be added to the fleet in fiscal year 2008.

An ARFF training facility is located on airport property to the northeast of the terminal area and is used for live-fire exercises. This facility currently meets the Index D requirements.

## **Airport Administration**

The airport administrative offices are located in two buildings between the passenger terminal and the international arrivals building. Each 2,674 square-foot building is designed in the architecture of the adjacent terminal. The southernmost building includes the office of the District Airport Manager and other related administrative personnel as well as the airport security badging and ID (identification) office. The adjacent building includes a training room as well as the office of the District Airport Engineer.

## **Maintenance Facilities**

The airport field maintenance facilities are located mauka (east) of the general aviation and cargo area of the airfield. Security gates permit access to the airside of the airport. This building has approximately 15,000 square feet which provides office space and storage of some equipment. A 7,800 square-foot shade hangar also provides additional equipment storage.

## **Fuel Storage**

There is currently one active fuel farm on the airport. As depicted on **Exhibit 1H**, the 2.8-acre fuel farm located south of the terminal area has a total storage capacity of 90,000 gallons of Jet A fuel and 12,000 gallons of Avgas (100LL).

The Jet A fuel storage is owned by Hawaii Fuel Facilities Corporation and operated by Bradley Pacific Avia-

tion. Fuel is distributed to aircraft using several fuel trucks by Bradley Pacific Aviation and Air Service Hawaii.

The Avgas storage is part of a self-service fuel facility. It is owned and operated by Douglas Aviation.

## **UTILITIES**

The availability and capacity of the utilities serving the airport are factors in determining the development potential of the airport property, as well as the land immediately adjacent to the facility. As part of the Master Plan update, an inventory of the current utility infrastructure was conducted. Some of the information was found through a review of existing drawing documents and studies. The information gathered was insufficient; therefore, it is recommended that the DOT-A conduct an infrastructure master plan study. This study is crucial for the terminal expansion and future airport development.

Of primary concern in the inventory investigation is the availability of water, gas, sewer, and power sources. **Exhibit 1J** depicts the utilities in the core of the terminal area.

### **Electric Power**

Electricity is provided to the airport by Hawaiian Electric Light Company (HELCO) via two 1,247 kilovolt (kV) feeder lines from the Keahole substation located east of Queen Kaahumanu Highway. The power lines extend along Keahole Street and enter the



electrical control building located adjacent to the ATCT to the east and distributed to the various airside and landside facilities. A 175 kilowatt (KW) diesel engine emergency generator is located in the electrical control building. A 1,000-gallon diesel storage tank located adjacent to the control building supplies the emergency generator with fuel. A second 23 kilowatt diesel engine generator provides a separate emergency power system to the airfield.

### **Telecommunications**

The main telephone line was originally brought to the site through the same underground duct bank as the HELCO feeder lines. Switching was then accomplished in the electrical control building. The main line was later relocated and connected to the electrical control building. There are 14 public telephones, with seven in each terminal. A public address system is utilized in the terminal for paging and flight announcements.

### **Water**

In June 1995, the State of Hawaii, Department of Land and Natural Resources, Division of Water and Land Development, prepared a North Kona Water Master Plan. In conjunction with the Water Master Plan Study, a Memorandum of Understanding (MOU) for water allocation by State agencies was prepared. This MOU was approved by all the affected State agencies.

The MOU outlined water allocations from 1990 to 2010, with scheduled increases every five years. Per the MOU, the airport's initial allocation was 330,000 gallons per day (GPD). In 2007, the airport used approximately 145,000 GPD or about 44 percent of its allocation. Today the airport's usage continues to be around 50 percent of the allocation. Presently, the airport is looking at several alternatives to reduce its use of potable water. Proposed upgrades to airport facilities will probably require around four times the current airport allocation. In order to develop the vacant lands on airport property, as indicated in Exhibit 5A, about another 1-1.2 million GPD would be required. Discussions have begun in 2009 on the development of new water wells, water availability, water allocation and other alternative resources.

The airport's water supply is maintained in two storage reservoirs. The airport's original 0.5 million gallon tank is connected to a newer one million gallon tank that also serves the NELHA facilities to the south of the airport. A 12-inch municipal water main along Queen Kaahumanu Highway supplies the tank. A 12-inch line follows the airport access road in from the highway and then extends north along the periphery road to feed the airport's distribution system. An eight-inch line extends south along the U'u Street to serve the air cargo and general aviation facilities. Pressure for fire flows in the areas are created by a 0.5 million gallon storage reservoir at 280 feet above mean sea level mauka (east) of Queen Kaahumanu Highway.

## Sanitary Sewer

Wastewater is collected and transferred via a collection line which runs parallel to Kupipi Street to an on-site wastewater treatment plant located north of the terminal area. The wastewater treatment plant has the capacity to handle 100,000 gallons per day and is maintained under contract. Secondary treatment is provided through an extended aeration operation followed by clarification and chlorination. Wastewater at KOA is treated to an R-1 level and re-used as landscape irrigation along the airport access roadways. When treatment is not able to attain an R-1 classification, the effluent is disposed through 20-foot deep injection wells into the porous lava rock at an on-site lagoon. Maintenance of the treatment facility is provided under contract.

**Drainage System** - Storm runoff in the airfield and parking areas is collected using a system of swales, ditches, and concrete bridge culverts. A system of pipelines (18-inch and 30-inch) and intake boxes provide drainage for the terminal facility. The water runoff is then injected into dry wells or porous depressions on property for disposal. This is regulated by State of Hawaii Department of Health Underground Injection Control permits.

The airport is not located within a 100-year floodplain. Due to the extremely porous lava rock surrounding the airport facilities, large scale flooding is rarely a problem. During heavy downpours, short term ponding can occur on the ramp and some gate loca-

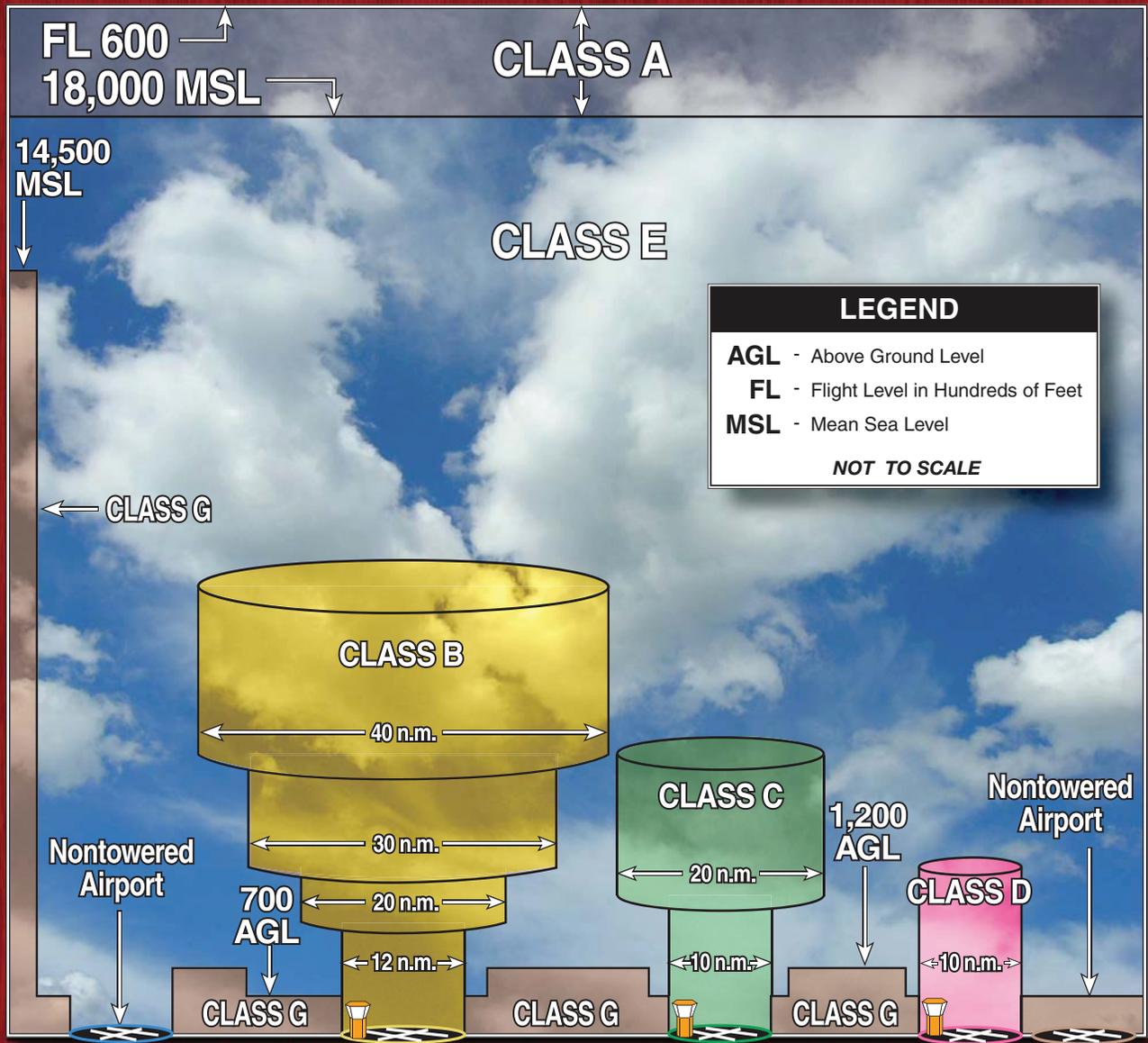
tions; however, the present drainage system is adequate for its purposes.

## **AREA AIRSPACE AND AIR TRAFFIC CONTROL**

The *Federal Aviation Administration (FAA) Act of 1958* established the FAA as the responsible agency for the control and use of navigable airspace within the United States. The FAA has established the National Airspace System (NAS) to protect persons and property on the ground and to establish a safe and efficient airspace environment for civil, commercial, and military aviation. The NAS covers the common network of U.S. airspace, including air navigation facilities; airports and landing areas; aeronautical charts; associated rules, regulations, and procedures; technical information; and personnel and material. The system also includes components shared jointly with the military.

## **AIRSPACE STRUCTURE**

Airspace within the United States is broadly classified as either "controlled" or "uncontrolled." The difference between controlled and uncontrolled airspace relates primarily to requirements for pilot qualifications, ground-to-air communications, navigation and air traffic services, and weather conditions. Six classes of airspace have been designated in the United States, as shown on **Exhibit 1K**. Airspace designated as Class A, B, C, D, or E is considered controlled airspace. Aircraft operating within controlled airspace are subject to vary-



**CLASSIFICATION**

**DEFINITION**

- CLASS A** Generally airspace above 18,000 feet MSL up to and including FL 600.
- CLASS B** Generally multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports.
- CLASS C** Generally airspace from the surface to 4,000 feet AGL surrounding towered airports with service by radar approach control.
- CLASS D** Generally airspace from the surface to 2,500 feet AGL surrounding towered airports.
- CLASS E** Generally controlled airspace that is not Class A, Class B, Class C, or Class D.
- CLASS G** Generally uncontrolled airspace that is not Class A, Class B, Class C, Class D, or Class E.



"Airspace Reclassification and Charting Changes for VFR Products," National Oceanic and Atmospheric Administration, National Ocean Service. Chart adapted by Coffman Associates from AOPA Pilot, January 1993.

ing requirements for positive air traffic control.

The KOA Class D airspace is effective only during the time the ATCT is operational, which is from 6:00 a.m. to 10:00 p.m. daily. At all other times, the airport is in Class E airspace. Airspace in the vicinity of KOA is depicted on **Exhibit 1L**.

**Class A Airspace:** Class A airspace includes all airspace from 18,000 feet mean sea level (MSL) to flight level (FL) 600 (approximately 60,000 feet MSL) over the contiguous 48 states and Alaska. There is no Class A airspace over Hawaii. This airspace is designated in Federal Aviation Regulation (F.A.R.) Part 71.33, for positive control of aircraft. All aircraft must be on an instrument flight rules (IFR) clearance to operate within Class A airspace.

**Class B Airspace:** Class B airspace has been designated around some of the country's major airports, such as Honolulu International Airport, to separate all aircraft within a specified radius of the primary airport. Each Class B airspace is specifically tailored for its primary airport. All aircraft operating within Class B airspace must have an ATC clearance. Certain minimum aircraft equipment and pilot certification requirements must also be met. This airspace is the most restrictive controlled airspace routinely encountered by pilots operating under visual flight rules (VFR) in an uncontrolled environment. There is no Class B airspace in the vicinity of KOA.

**Class C Airspace:** The FAA has established Class C airspace at approximately 120 airports around the country that have significant levels of IFR traffic. Class C airspace typically consists of a five nautical mile (nm) radius shelf extending from 1,200 feet AGL to 4,000 feet AGL. In order to fly inside Class C airspace, the aircraft must have a two-way radio, an encoding transponder, and have established communication with an ATC facility. Aircraft may fly below the floor of the Class C airspace or above the Class C airspace ceiling without establishing communication with ATC. Kahului Airport on Maui has Class C airspace. There is no Class C airspace at KOA or any of the other Big Island airports.

**Class D Airspace:** Class D airspace is controlled airspace surrounding airports with an ATCT. The Class D airspace typically constitutes a cylinder with a horizontal radius of four or five nautical miles (NM) from the airport, extending from the surface up to a designated vertical limit, typically set at approximately 2,500 feet above the airport elevation. If an airport has an instrument approach or departure, the Class D airspace sometimes extends along the approach or departure path. KOA (as indicated earlier) and Hilo International Airport both operate in Class D airspace. The Class D airspace extends for approximately four nautical miles around the airport, from the surface to 2,500 feet MSL. When the ATCT at KOA is closed, the airspace reverts to Class G or E.

**Class E Airspace:** Class E airspace consists of controlled airspace de-

signed to contain IFR operations near an airport and while aircraft are transitioning between the airport and enroute environments. Unless otherwise specified, Class E airspace terminates at the base of the overlying airspace. Only aircraft operating under IFR are required to be in contact with air traffic control when operating in Class E airspace. While aircraft conducting visual flights in Class E airspace are not required to be in radio communications with air traffic control facilities, visual flight can only be conducted if minimum visibility and cloud ceilings exist.

Airports with Class E airspace in the vicinity of KOA include Waimea-Kohala, Upolu, and Hilo International.

**Class G Airspace:** Airspace not designated as Class A, B, C, D, or E is considered uncontrolled, or Class G, airspace. Air traffic control does not have the authority or responsibility to exercise control over air traffic within this airspace. Class G airspace lies between the surface and the overlying Class E airspace (700 to 1,200 feet above ground level). Class G airspace extends below the floor of the Class E airspace at KOA.

While aircraft may technically operate within this Class G airspace without any contact with ATC, it is unlikely that many aircraft will operate this low to the ground. Furthermore, federal regulations specify minimum altitudes for flight. F.A.R. Part 91.119, *Minimum Safe Altitudes*, generally states that except when necessary for takeoff or landing, pilots must not operate an aircraft over any congested area of a city, town, or settlement, or over any open-air assembly of persons,

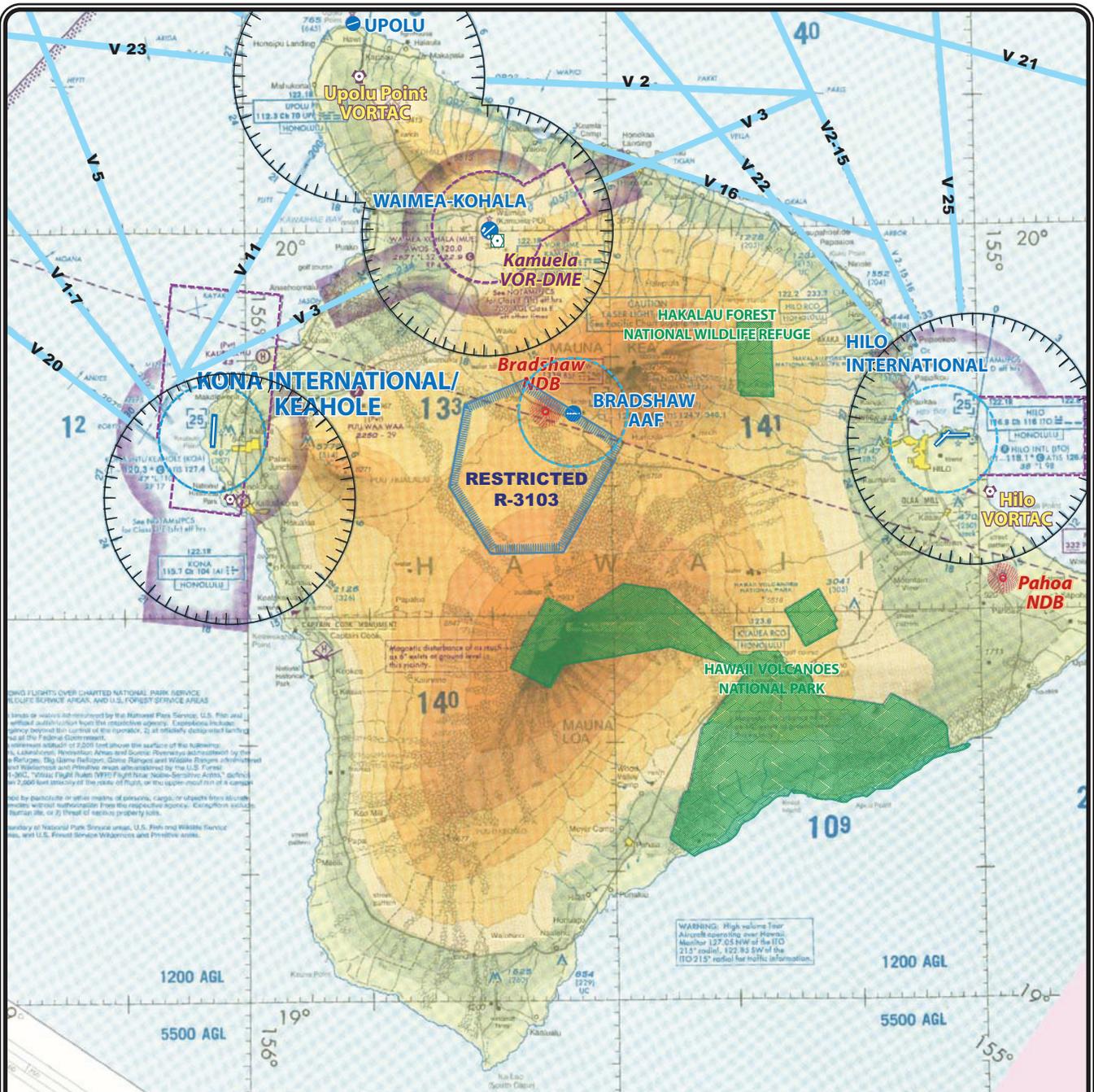
at an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.

Over less congested areas, pilots must maintain an altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure. Finally, this section states that helicopters may be operated at less than the minimums prescribed above if the operation is conducted without hazard to persons or property on the surface. In addition, each person operating a helicopter shall comply with any routes or altitudes specifically prescribed for helicopters by the FAA.

### **Special Use Airspace**

Special use airspace is defined as airspace where activities must be confined because of their nature or where limitations are imposed on aircraft not taking part in those activities. These areas are depicted on **Exhibit 1L** with the use of green shading.

**State Park/Wilderness Areas:** As depicted on **Exhibit 1K**, the Hakalau Forest National Wildlife Refuge and the Hawaii Volcanoes National Park are located east of KOA. Hakalau Forest National Wildlife Refuge encompasses 32,733 acres and is home to many endangered forest birds and plant species. Hawaii Volcanoes National Park encompasses 323,431 acres and features two of the world's most active volcanoes (Mauna Loa and Kilauea). Aircraft are requested to maintain a minimum altitude of 2,000 feet above the surface of designated



**LEGEND**

- Airport with hard-surfaced runways 1,500' to 8,069' in length
- Airports with hard-surfaced runways greater than 8,069' or some multiple runways less than 8,069'
- VORTAC
- VOR-DME
- Non-Directional Radiobeacon (NDB)

- Compass Rose
- Wilderness Area
- Class D Airspace
- Class E Airspace
- Class E Airspace with floor 700 ft. above surface
- Victor Airways
- Restricted Area

- 12,000 - 13,796
- 9,000 - 12,000
- 7,000 - 9,000
- 5,000 - 7,000
- 3,000 - 5,000
- 2,000 - 3,000
- 1,000 - 2,000
- 0 - 1,000



NOT TO SCALE



Source: Hawaiian Islands Sectional Charts, US Department of Commerce, National Oceanic and Atmospheric Administration 06/08/2006

National Park areas, which includes wilderness areas and designated breeding grounds. FAA Advisory Circular 91-36C defines the “surface” as the highest terrain within 2,000 feet laterally of the route of flight or the uppermost rim of a canyon or valley.

**Victor Airways:** For aircraft arriving or departing the regional area using very high frequency omnidirectional range (VOR) facilities, a system of Federal Airways, referred to as Victor Airways, has been established. Victor Airways are corridors of airspace eight miles wide that extend upward from 1,200 feet AGL to 18,000 feet MSL and extend between VOR navigational facilities. Victor Airways are shown with solid blue lines on **Exhibit 1L**.

For aircraft enroute or departing the Kona area, there are several Victor Airways available. The Kona VORTAC, located approximately five nautical miles (nm) south of the airport at the Old Kona Airport State Park, is the converging point for Victor Airways in the Kona area.

**Restricted Airspace:** Restricted areas are depicted on **Exhibit 1L** with blue hatched lines. There is a single restricted area (R-3103) on the island to the east of KOA. Restricted airspace is off-limits for public-use unless granted permission from the controlling agency.

## **AIRSPACE CONTROL**

The FAA has established 21 Air Route Traffic Control Centers (ARTCC) throughout the continental United States to control aircraft operating

under IFR within controlled airspace and while enroute. An ARTCC assigns specific routes and altitudes along federal airways to maintain separation and orderly traffic flow. The Honolulu Control Facility (HCF) controls IFR airspace enroute over KOA and areas west. The HCF performs some of the functions associated with an ARTCC, but primarily serves as an Approach Control Facility.

The HCF delegates certain airspace to local terminal facilities which assume responsibility for the orderly flow of air traffic arriving and departing major terminals. The HCF is also charged with radar approach and departure control in the KOA terminal area. The KOA ATCT is responsible for providing aircraft with proper separation and guidance for landing and departure stages. As discussed in the airfield section, the current ATCT at KOA is located to the east of the runway, south of the terminal. The KOA tower operates daily from 6:00 a.m. to 10:00 p.m.

## **Instrument Approach Procedures**

Instrument approach procedures are a series of predetermined maneuvers established by the FAA using electronic navigational aids that assist pilots in locating and landing at an airport, especially during instrument flight conditions. There is currently one published precision instrument approach and seven published non-precision instrument approaches into KOA. Precision instrument approaches provide vertical descent information and course guidance information to the pilot. Non-precision approaches

only provide course guidance to the pilot.

The capability of an instrument is defined by the visibility and cloud ceiling minimums associated with the approach. Visibility minimums define the horizontal distance the pilot must be able to see in order to complete the approach. Cloud ceilings define the

lowest level a cloud layer (defined in feet above the ground) can be situated for the pilot to complete the approach. If the observed visibility or ceilings are below the minimums prescribed for the approach, the pilot cannot complete the instrument approach. **Table 1G** summarizes instrument approach minima for KOA.

<b>TABLE 1G Instrument Approach Data</b>										
	<b>WEATHER MINIMUMS BY AIRCRAFT TYPE</b>									
	<b>Category A</b>		<b>Category B</b>		<b>Category C</b>		<b>Category D</b>		<b>Category E</b>	
	<b>CH</b>	<b>VIS</b>	<b>CH</b>	<b>VIS</b>	<b>CH</b>	<b>VIS</b>	<b>CH</b>	<b>VIS</b>	<b>CH</b>	<b>VIS</b>
<b>ILS RWY 17</b>										
Straight-In ILS	200	0.5	200	0.5	200	0.5	200	0.5	200	0.5
Straight- In Localizer	400	0.5	400	0.5	400	0.5	400	0.75	400	0.75
Circling	500	1.0	500	1.0	500	1.5	600	2.0	600	2.0
<b>RNAV (GPS) RWY 17</b>										
LNAV/VNAV DA	500	1.25	500	1.25	500	1.25	500	1.25	N/A	N/A
LNAV MDA	600	0.5	600	0.5	600	1.0	600	2.0	N/A	N/A
Circling	600	1.75	600	1.75	600	1.75	600	2.0	N/A	N/A
<b>RNAV (GPS) Y RWY 35</b>										
LNAV MDA	400	1.0	400	1.0	400	1.0	400	1.25	400	1.25
Circling	500	1.0	500	1.0	500	1.25	600	2.0	600	2.0
<b>RNAV (GPS) Z RWY 35</b>										
LNAV/VNAV DA	500	1.75	500	1.75	500	1.75	500	1.75	500	1.75
LNAV MDA	600	1.0	600	1.0	600	1.75	600	2.0	600	2.25
Circling	600	1.75	600	1.75	600	1.75	600	2.0	600	2.25
<b>LOC RWY 17</b>										
Straight-In	600	0.5	600	0.5	600	1.5	600	1.75	600	2.0
Circling	600	1.0	600	1.0	600	1.5	600	2.0	600	2.0
<b>LOC BC RWY 35</b>										
Straight-In	400	1.0	400	1.0	400	1.0	400	1.25	N/A	N/A
Circling	500	1.0	500	1.0	500	1.25	600	2.0	N/A	N/A
<b>VOR/DME or TACAN RWY 17</b>										
Straight-In	600	1.0	600	1.0	600	1.5	600	1.75	600	2.0
Circling	600	1.0	600	1.0	600	1.5	600	2.0	600	2.0
<b>VOR or TACAN RWY 35</b>										
Straight-In	600	1.0	600	1.0	600	1.5	600	1.75	600	1.75
Circling	600	1.0	600	1.0	600	1.5	600	2.0	600	2.0
Aircraft categories are based on the approach speed of aircraft, which is determined by 1.3 times the stall speed in landing configuration. The approach categories are as follows: Category A      0-90 knots (Cessna 172) Category B      91-120 knots (Beechcraft KingAir) Category C      121-140 knots (Canadair Challenger) Category D      141-165 knots (Gulfstream IV) Category E      Speed greater than 166 knots (F-16)										
Abbreviations: CH:      Cloud Height (in feet above ground level)      RNAV: Area Navigation GPS:      Global Positioning System      VIS:      Visibility (in statute miles) ILS:      Instrument Landing System      VNAV: Vertical Navigation LNAV:      Lateral Navigation      VOR:      Very High Frequency Omni-directional Range LOC:      Localizer      TACAN: Tactical Air Navigation MDA:      Minimum Descent Altitude N/A:      Not Available NDH:      No Decision Height Source:      U.S. Terminal Procedures										

## Visual Flight Procedures

Most flights at KOA are conducted under visual flight rules (VFR). Under VFR flight, the pilot is responsible for collision avoidance. Typically, the pilot will make radio calls announcing the position of the aircraft relative to the airport and the intentions of the pilot.

In most situations, under VFR and basic radar services, the pilot is responsible for navigation and choosing the arrival and departure flight paths to and from the airport. The results of individual pilot navigation for sequencing and collision avoidance are that aircraft do not fly a precise flight path to and from the airport. Therefore, aircraft can be found flying over a wide area around the airport for sequencing and safety reasons.

While aircraft can be expected to operate over most areas of the airport, the density of aircraft operations is higher near the airport. This is the result of aircraft following the established traffic patterns for the airport. The traffic pattern is the traffic flow that is prescribed for aircraft landing or taking off from an airport. The components of a typical traffic pattern are upwind leg, crosswind leg, downwind leg, base leg, and final approach.

- a. Upwind Leg - A flight path parallel to the landing runway in the direction of landing.
- b. Crosswind Leg - A flight path at right angles to the landing runway off its upwind end.
- c. Downwind Leg - A flight path parallel to the landing runway in the

direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg.

- d. Base Leg - A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline.
- e. Final Approach - A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway.

Essentially, the traffic pattern defines which side of the runway aircraft will operate on. For example, at KOA, Runway 17 has an established right-hand traffic pattern. For this runway, aircraft make a right turn from base leg to final for landing. Therefore, aircraft operating to Runway 17 remain west of the runway. When landing to Runway 35, aircraft make left-hand turns. This also allows aircraft to remain west of Runway 17-35.

While the traffic pattern defines the direction of turns that an aircraft will follow on landing or departure, it does not define how far from the runway an aircraft will operate. The distance laterally from the runway centerline an aircraft operates or the distance from the end of the runway is at the discretion of the pilot, based on the operating characteristics of the aircraft, number of aircraft in the traffic pattern, and meteorological conditions. The actual ground location of each leg of the traffic pattern varies from aircraft operation to aircraft operation for the reasons of safety, navi-

gation, and sequencing described above. The distance that the downwind leg is located laterally from the runway will vary based mostly on the speed of the aircraft. Slower aircraft can operate closer to the runway as their turn radius is smaller.

The FAA has established that small piston-powered aircraft operating in the KOA traffic pattern fly at 800 feet MSL when on the downwind leg. Larger turbine-powered aircraft fly the downwind leg at 1,500 feet MSL. The traffic pattern altitude is established so that aircraft have a predictable descent profile on base leg to final for landing.

## **SOCIOECONOMIC PROFILE**

The following sections will analyze the population, employment, and income of the island as it compares to state and national figures. Historical so-

cioeconomic figures were obtained from the U.S. Census, the U.S. Department of Labor, the Bureau of Economic Analysis, the *County Social, Business and Economic Trends in Hawaii: 1990 – 2005*, and the *State of Hawaii Data Book, 2006*.

## **POPULATION**

Historical population information for the Kona/Kohala Districts, Hawaii County, and the State of Hawaii is summarized in **Table 1H**. As indicated in the table, the western districts of Hawaii County comprised of North Kona, South Kona, North Kohala, and South Kohala have experienced growth steadily over the past 25 years. The Kona/Kohala Districts have grown in each decade and experienced a higher average annual growth percentage than both Hawaii County and the State of Hawaii.

<b>Year</b>	<b>Kona/Kohala Districts</b>	<b>% Change</b>	<b>Hawaii County</b>	<b>% Change</b>	<b>State of Hawaii</b>	<b>% Change</b>
1980	27,518	N/A	92,900	N/A	968,500	N/A
1990	43,373	57.6%	121,572	14.8%	1,113,491	7.1%
2000	56,301	29.8%	149,261	6.2%	1,212,670	1.3%
2005	63,001	11.9%	163,000	9.2%	1,277,950	5.4%
Average Annual % Change		3.4%		2.3%		1.1%

Source: *The State of Hawaii Data Book, 2006*  
Kona/Kohala Districts: Comprised of the western Hawaii County Districts of North Kona, South Kona, North Kohala, and South Kohala.

## **EMPLOYMENT**

The major industries on the island of Hawaii area include retail trade, accommodation, and state government. Total employment in Hawaii County

has experienced an average annual growth rate of 1.9 percent since 1990. A breakdown of employment by sector for Hawaii County is presented in **Table 1J**.

**TABLE 1J**  
**Employment By Sector**  
**Hawaii County**

Sector	1990	1995	2000	2005	% Change	Avg. Annual % Change
Natural Resources/Mining/Construction	3,600	2,800	3,100	4,850	34.7%	2.0%
Manufacturing	2,400	1,700	1,600	1,450	-39.6%	-3.3%
Wholesale Trade	1,300	1,200	1,300	1,650	26.9%	1.6%
Retail Trade	6,900	7,600	7,900	8,900	29.0%	1.7%
Transportation/Warehousing/Utilities	2,400	2,200	2,200	2,850	18.8%	1.2%
Information	600	700	700	650	8.3%	0.5%
Finance/Insurance/Real Estate	2,300	2,300	2,200	2,600	13.0%	0.8%
Professional/Business Services	2,500	3,200	4,100	4,750	90.0%	4.4%
Educational Services	300	400	600	950	216.7%	8.0%
Health Care/Social Assistance	2,500	3,500	4,900	5,850	134.0%	5.8%
Arts/Entertainment/Recreation	600	900	1,100	1,550	158.3%	6.5%
Accommodation	6,200	5,500	7,100	7,100	14.5%	0.9%
Food Service/Drinking Places	3,900	3,700	4,200	5,250	34.6%	2.0%
Other Services	1,300	1,300	1,300	2,000	53.8%	2.9%
Federal Government	800	900	1,000	1,250	56.3%	3.0%
State Government	5,600	7,100	7,600	8,000	42.9%	2.4%
Local Government	2,000	2,100	2,300	2,350	17.5%	1.1%
Agriculture	3,500	2,450	2,700	2,450	-30.0%	-2.3%
<b>Total Employment</b>	<b>48,700</b>	<b>49,550</b>	<b>55,900</b>	<b>64,450</b>	<b>33.3%</b>	<b>1.9%</b>

Source: *County Social, Business and Economic Trends In Hawaii 1990 – 2005*, (2006)

Unemployment rates are also a good indicator of the state of the local economy. Hawaii County has experienced a lower than average unemployment rate when compared to the United States in recent years. However, the

county unemployment has historically been higher than that of the state as a whole. The historical unemployment rate comparisons since 1990 can be found in **Table 1K**.

**TABLE 1K**  
**Historical Unemployment Rate (Percentage of Labor Force)**  
**Hawaii County, State of Hawaii, United States**

Year	Hawaii County	State of Hawaii	U.S.
1990	3.5	2.4	5.6
1991	4.5	2.8	6.9
1992	7.5	4.2	7.5
1993	7.6	4.4	6.9
1994	9.2	5.1	6.1
1995	9.6	5.5	5.6
1996	9.2	5.9	5.4
1997	9.3	5.8	4.9
1998	8.7	5.7	4.5
1999	7.8	5.0	4.2
2000	4.7	4.0	4.0
2001	5.0	4.2	4.7
2002	4.6	4.1	5.8
2003	4.6	3.9	6.0
2004	3.9	3.3	5.5
2005	3.3	2.8	5.1

Source: Hawaii County and State of Hawaii, *County Social, Business and Economic Trends in Hawaii: 1990 - 2005*, (2006)

U.S., U.S. Department of Labor, Bureau of Labor Statistics

## INCOME

**Table 1L**, Historical Per Capita Personal Income, compares the per capita income (PCPI) for Hawaii County, the State of Hawaii, and the United States between 1990 and 2004. As illustrated in the table, Hawaii County's PCPI has grown at a faster pace than

that of the State of Hawaii. However, both the County and the State are growing at a slower pace than the United States. The Hawaii County PCPI was approximately 76 percent of the national average, while the State of Hawaii was approximately 99 percent of the national average.

<b>Year</b>	<b>Hawaii County</b>	<b>State of Hawaii</b>	<b>U.S.</b>
1990	\$16,477	\$22,186	\$19,477
1991	\$17,032	\$22,895	\$19,892
1992	\$17,478	\$24,089	\$20,854
1993	\$17,903	\$24,555	\$21,346
1994	\$18,134	\$24,777	\$22,172
1995	\$18,166	\$25,004	\$23,076
1996	\$18,505	\$25,024	\$24,175
1997	\$18,650	\$25,587	\$25,334
1998	\$19,648	\$26,132	\$26,883
1999	\$20,324	\$26,937	\$27,939
2000	\$21,404	\$28,422	\$29,845
2001	\$22,217	\$28,748	\$30,574
2002	\$23,020	\$29,464	\$30,810
2003	\$23,771	\$30,536	\$31,484
2004	\$25,096	\$32,625	\$33,050
<b>Avg. Annual % Change</b>	<b>3.1%</b>	<b>2.8%</b>	<b>3.8%</b>

Source: Hawaii County and State of Hawaii, *County Social, Business and Economic Trends in Hawaii: 1990 – 2005* (2006)  
U.S., Regional Economic Information System, Bureau of Economic Analysis, Table CA 1-3

## REGIONAL LAND USE

### EXISTING AREA LAND USE

The area surrounding the airport is largely undeveloped with scattered industrial and governmental uses. To the north, the land is owned by the State of Hawaii. East of Queen Kaahumanu Highway, the land uses include residential, agricultural, and conservation/open space. Directly

west of the airport is the Natural Energy Laboratory of Hawaii and the Pacific Ocean. Directly south of the airport, the land uses include light industrial uses as well as government and conservation lands. **Exhibit 1M** displays the existing land use classifications for the areas surrounding the airport. A more specific description of existing and planned developments in the airport area is provided in **Appendix D**.



## LAND USE DISTRICTS

Land use planning in Hawaii County occurs through regulatory and non-regulatory means. Land within Hawaii County is regulated by a two-tiered system that includes regulation at the state and county levels. All lands within the county have been assigned one of four state land use designations: Conservation, Agricultural, Rural, or Urban. These designations are established by the State Land Use Commission, a body which is appointed by the Governor. The State Land Use District designations on and around the airport are presented on **Exhibit 1M**.

An additional classification, Special Management Area (SMA), was created to protect environmental resources along the coast. Projects within this area receive additional scrutiny to ensure that they do not impact coastal resources. The SMA exists between the shoreline and the SMA line as delineated on **Exhibit 1M**. The width of the area varies along the coast and is no wider than one mile.

## GENERAL PLAN

Future land use guidance in Hawaii County is provided by the *Hawaii County General Plan*, which was adopted by the Hawaii County Council in February 2005. The general plan consists of a text portion which outlines the overall development goals for the County, and the map portion identifies the areas in which development should occur. The zoning ordinance governs the manner in which land is

developed by providing specific criteria for each zoning district. Recommendations on land use planning issues typically originate from the County's Planning Commission and are approved by the County Council.

The goals, policies, and courses of action included in the current Hawaii County General Plan support airport land use compatibility planning in airport environs. Adhering to the plan's guidance will promote airport land use compatibility in the future.

In addition to the goals and policies outlined in the General Plan, the Land Use Pattern Allocation Guide (LUPAG) Map included in the plan identifies the areas where development will occur. **Exhibit 1N** shows the future land use map from the *Hawaii County General Plan*. In many cases, the lines demarcating land use boundaries are not exact, but are meant to show the general location and distribution of land uses.

As shown on the map, much of the airport as well as the areas immediately south and west are identified for industrial development. Preferred land uses for these areas include manufacturing and processing, wholesaling, large storage and transportation facilities, power plants, and government baseyards.

The east side of the airport's property, as well as land to the north, is designated for conservation uses. Conservation uses are defined as forest and water reserves, natural and scientific preserves, and open lands within the State Land Use Conservation District.

Portions of land east of the airport are designated for agricultural uses. Typical agriculture uses include raising livestock and growing crops and nursery products. In addition to agriculture uses, these lands may also be used as open space or as a green belt to provide a buffer between uses or to preserve areas as undeveloped.

Areas south of the industrial designation, as well as portions of the area east of Queen Kaahumanu Highway, are designated for Urban Expansion. According to the plan, the Urban Expansion areas could include “a mix of high density, medium density, low density, industrial, industrial-commercial and/or open designations in areas where new settlements may be desirable, but where the specific settlement pattern and mix of uses have not yet been determined.” This land could be developed with a variety of land uses both compatible and non-compatible with airport operations.

Beyond the Urban Expansion areas to the south of the airport there are parcels planned for low and medium-density urban development. These areas could include village, neighborhood, and convenience retail uses, public uses, and single and multiple family dwellings ranging between one and 35 dwelling units per acre.

The areas along the coast and near the highway are designated as open space and are to remain undeveloped.

## **COMMUNITY DEVELOPMENT PLAN**

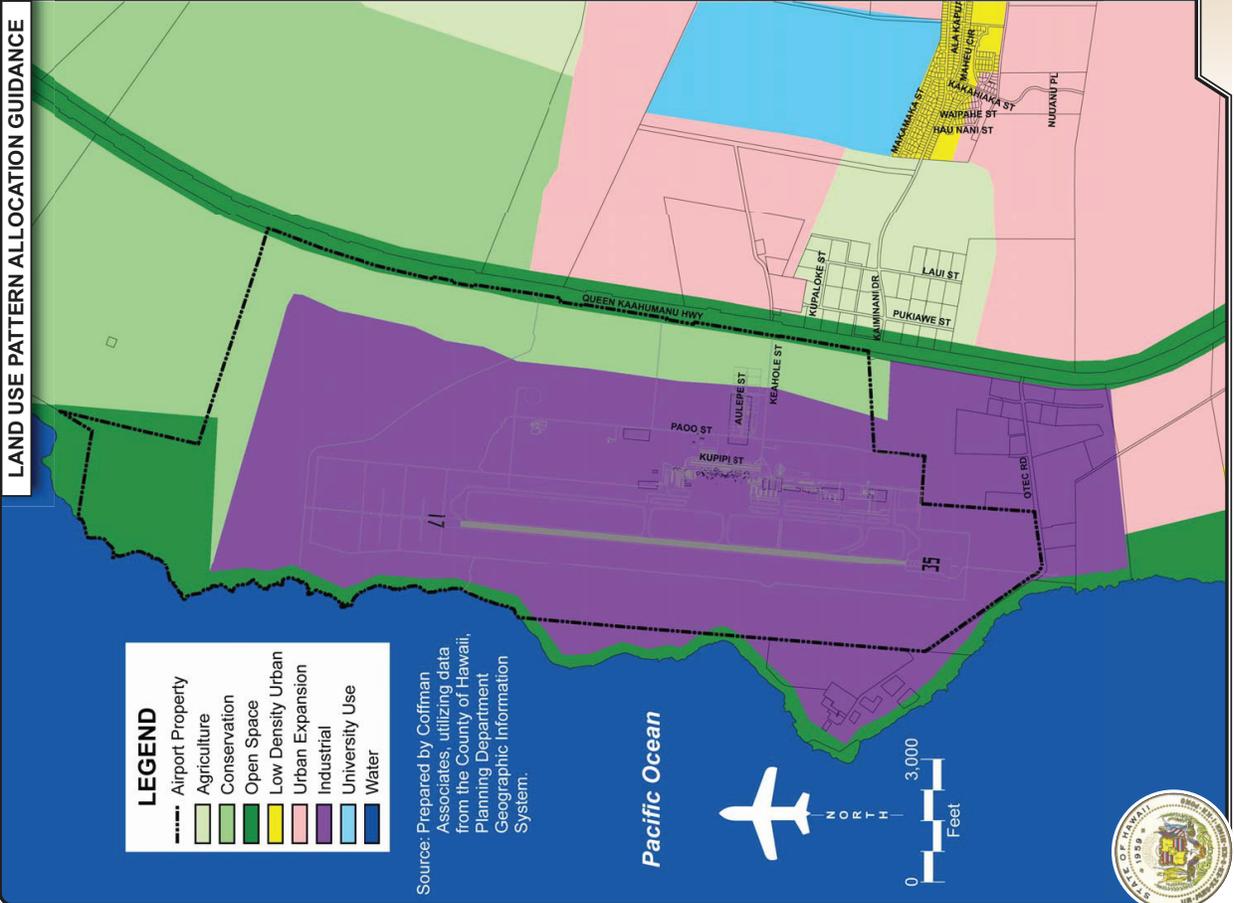
In addition to the General Plan, Community Development Plans (CDPs) are also developed for communities on the Island of Hawaii. The CDP is intended to provide more specific planning guidance for individual communities in a manner consistent with the General Plan. The CDP is also intended to serve as a forum for Community input into land use, delivery of government services, and any other matters relating to the planning area.

The Kona Community Development Plan was adopted by County Council Ordinance on September 25, 2008. The Kona CDP generally supports the LUPAG Map. A guiding principle of the CDP is “To direct future growth patterns to compact villages, preserving Kona’s rural, diverse, and historical character.” As a result, the majority of urban growth in Kona is intended to be directed to the Kona Urban Area which spans from Kona International Airport south to Keahou.

## **ZONING**

While land use plans are intended to establish policies and goals to guide future development and land use, land use is legislatively controlled through the local zoning ordinance and development codes. Lands near the airport

**LAND USE PATTERN ALLOCATION GUIDANCE**

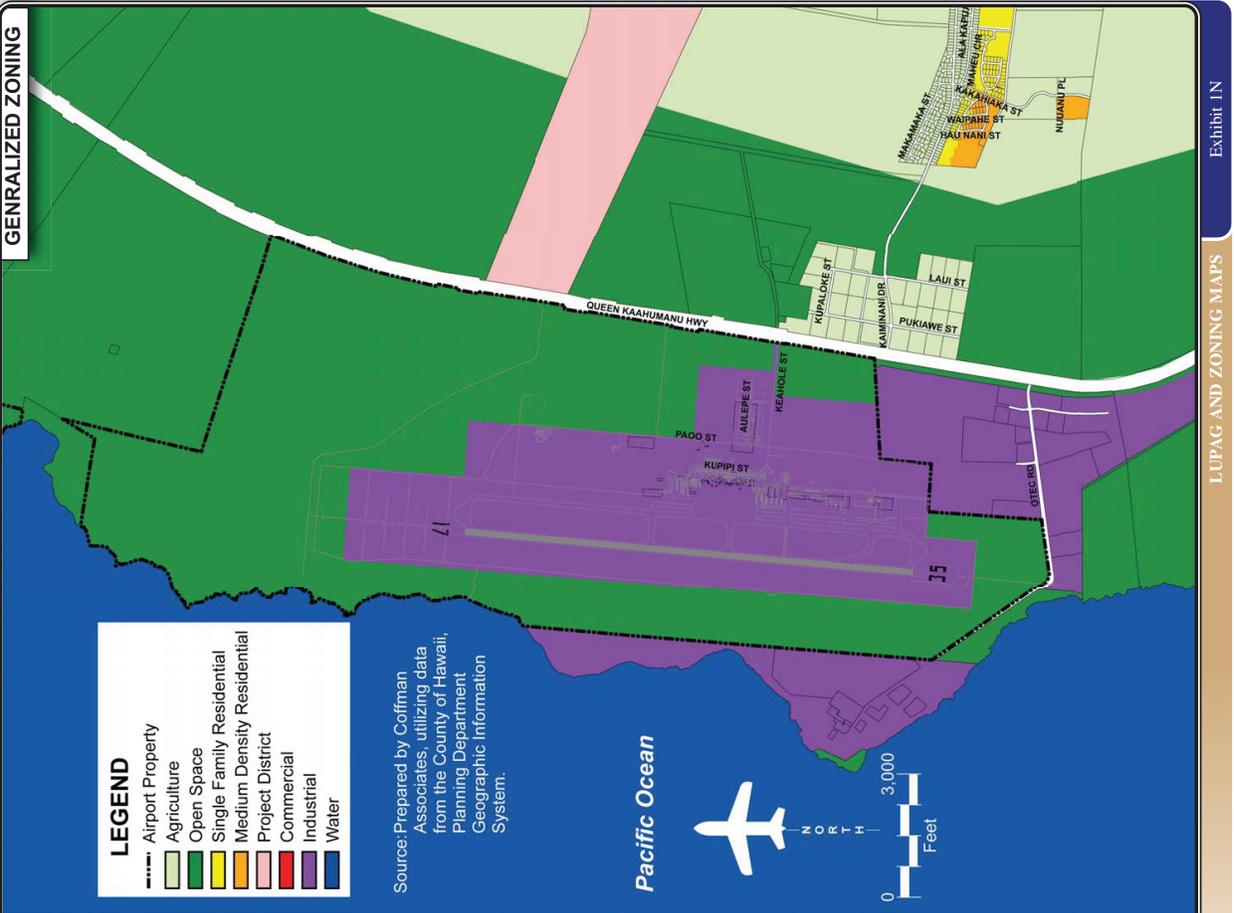


- LEGEND**
- Airport Property
  - Agriculture
  - Conservation
  - Open Space
  - Low Density Urban
  - Urban Expansion
  - Industrial
  - University Use
  - Water

Source: Prepared by Coffman Associates, utilizing data from the County of Hawaii, Planning Department Geographic Information System.



**GENERALIZED ZONING**



- LEGEND**
- Airport Property
  - Agriculture
  - Open Space
  - Single Family Residential
  - Medium Density Residential
  - Project District
  - Commercial
  - Industrial
  - Water

Source: Prepared by Coffman Associates, utilizing data from the County of Hawaii, Planning Department Geographic Information System.

which are subject to the Hawaii County zoning ordinance are those within the State's Urban District, as identified on **Exhibit 1M**.

Each zone outlined in the County ordinance has a list of permitted uses and performance standards for development. As depicted on the Zoning Map on the right side of **Exhibit 1N**, the Urban District property on the airport and in NELHA to the south and west are zoned industrial.

## ***ENVIRONMENTAL INVENTORY***

Available information about the existing environmental conditions at KOA has been derived from internet resources, agency maps, and existing literature, including *the Final Environmental Assessment for the Kona International Airport at Keahole Master Plan Update* completed in November of 2000. The intent of this task is to inventory potential environmental sensitivities that might affect future improvements at the airport. These resources are discussed further within the following sections.

### **NATURAL RESOURCES**

#### **Fish, Wildlife, and Plants**

The Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) are charged with overseeing the requirements contained within Section 7 of the *Endangered Species Act*. This Act was put into place to protect animal or plant spe-

cies whose populations are threatened by human activities. In coordination with the FAA, the FWS and the NMFS review projects to determine if a significant impact to these protected species will result with implementation of a proposed project. Significant impacts occur when the proposed action could jeopardize the continued existence of a protected species or would result in the destruction or adverse modification of federally designated critical habitat in the area.

In a similar manner, states are allowed to prepare statewide wildlife conservation plans through authorizations contained within the *Sikes Act*. Airport improvement projects should be checked for consistency with the State Wildlife Conservation Plan where such a plan exists.

Hawaii has the largest number of listed endangered and threatened species in the nation. There are 329 threatened and endangered species in the State of Hawaii, of which 273 are plants. The 56 endangered animals include:

- 32 species of birds
- Four sea turtle species
- Hawaiian monkseal
- Humpback whale
- Hawaiian hoary bat
- Two species of snails
- Two arthropods
- Blackburn's sphinx moth
- 12 Hawaiian picture-wing flies

The vegetation within the study site is characterized as a Lowland Vegetation Community. The habitat is dominated by fountain grass, an alien African

grass. Additionally, several native plants are present in small numbers. There is little vegetation on the lava flows, especially along the western, northern, and portions of the north-east side of the airfield.

A faunal survey was completed at, and in the vicinity of, the airport in December of 1999 to determine if habitat is present that would support the existence of any state or federally listed endangered, threatened, proposed, or candidate avian or mammalian species. The results of the survey indicated a lack of habitat for any federally listed species. Only one mammalian species (Indian Mongoose) was encountered on airport property. A total of 14 avian species were detected, 13 of which are alien species to the Hawaiian Islands. The only native species recorded was the Pacific Golden Plover, a common indigenous migratory species. The endangered Hawaiian Stilt has previously been recorded within airport boundaries in 2000 and 2001.

## **Floodplains**

Floodplains are defined in *Executive Order 11988, Floodplain Management*, as “the lowland and relatively flat areas adjoining inland and coastal waters...including at a minimum, that area subject to a one percent or greater chance of flooding in any given year” (i.e., that area would be inundated by a 100-year flood). Federal agencies, including the FAA, are directed to “reduce the risk of loss, to minimize the impact of floods on human safety, health, and welfare, and

to restore and preserve the natural and beneficial values served by floodplains.” According to Federal Emergency Management Agency (FEMA) Federal Insurance Rate Map (FIRM) panel number 155166 0681C, airport facilities are not located in a 100-year floodplain or floodway. A 100-year floodplain is located west of the airfield along the coast. The location of this floodplain is depicted on **Exhibit 1P**.

The County of Hawaii, Civil Defense Tsunami Evacuation Zone is also depicted on **Exhibit 1P**. As illustrated on the exhibit, the limits of the evacuation zone are west of the existing runway. The terminal buildings at the airport are located outside of the evacuation zone.

## **Wetlands and Waters of the U.S.**

The U.S. Army Corps of Engineers regulates the discharge of dredged and/or fill material into waters of the United States, including adjacent wetlands, under Section 404 of the *Clean Water Act*. Wetlands are defined in *Executive Order 11990, Protection of Wetlands*, as “those areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetation or aquatic life that requires saturated or seasonably saturated soil conditions for growth and reproduction.” Categories of wetlands include swamps, marshes, bogs, sloughs, pot-holes, wet meadows, river overflows, mud flats, natural ponds, estuarine areas, tidal overflows, and shallow



lakes and ponds with emergent vegetation. Wetlands exhibit three characteristics: hydrology, hydrophytes (plants able to tolerate various degrees of flooding or frequent saturation), and poorly drained soils.

The FWS interactive wetland mapper did not identify any wetlands on airport property. However, during a site survey completed in December of 1999, a small anchialine wetland system (approximately 58 feet by 62 feet), located at the southern end of the runway was identified. The location of this wetland is depicted on **Exhibit 1P**.

## **Farmlands**

The *Farmland Protection Policy Act* (FPPA) authorizes the United States Department of Agriculture (USDA) to develop criteria for identifying the effects of federal programs on the conversion of farmland to nonagricultural uses. Farmland protected by the FPPA is classified as either unique farmland, prime farmland (which is not already committed to urban development or water storage), or farmland which is of state or local importance (as determined by the appropriate government agency and the Secretary of Agriculture). The Land Study Bureau, Detailed Land Classification Report for the Island of Hawaii has designated the land at the airport as Class E, which is land that is very poor and least suited for agriculture. No soils designated as supporting prime or unique farmlands have been identified on airport property.

## **Geology and Soils**

Hawaii is located in a region which is subject to earthquakes and volcanic eruptions. The soil type at the airport has been classified as predominately 'a'ā and pāhoehoe lava flow. 'A'ā is characterized by a rough or rubbly surface composed of broken lava blocks called clinker. The surface is characterized as being loose, broken, sharp, and spiny. Pāhoehoe is basaltic lava that has a smooth, billowy, undulating, or ropy surface. Pāhoehoe can turn into 'a'ā if it becomes turbulent due to meeting impediments or steep slopes.

Both 'a'ā and pāhoehoe lava flows have little to no soil covering and are virtually devoid of vegetation with the exception of mosses, lichens, ferns, and small ohia trees.

## **Air Quality**

The Environmental Protection Agency (EPA) has adopted air quality standards that specify the maximum permissible short-term and long-term concentrations of various air contaminants. The National Ambient Air Quality Standards (NAAQS) consist of primary and secondary standards for six criteria pollutants which include: Ozone (O<sub>3</sub>), Carbon Monoxide (CO), Sulfur Dioxide (SO<sub>x</sub>), Nitrogen Oxide (NO<sub>x</sub>), Particulate Matter (PM<sub>10</sub>), and Lead (Pb).

Primary air quality standards are established at levels to protect the

public health and welfare from any known or anticipated adverse effects of a pollutant. All areas of the country are required to demonstrate attainment with NAAQS. According to the EPA website, the entire State of Hawaii is in attainment for all federal criteria pollutants.

Hawaii has adopted air quality standards which are more stringent than federal standards. **Table 1M** compares federal and state air quality standards.

<b>TABLE 1M Ambient Air Quality Standards</b>		
<b>Air Pollutant</b>	<b>Hawaii</b>	<b>Federal</b>
<b>Carbon Monoxide</b>		
1-hour	9 (ppm)	35 (ppm)
8-hour	4.4 (ppm)	9 (ppm)
<b>Nitrogen Dioxide</b>		
1-hour	-	-
24-hour	-	-
Annual	0.04 (ppm)	0.05 (ppm)
<b>Sulfur Dioxide</b>		
3-hour	0.5 (ppm)	-
24-hour	0.14 (ppm)	0.14 (ppm)
Annual	0.03 (ppm)	0.03 (ppm)
<b>Ozone</b>		
1-hour	-	0.12 (ppm [limited])
8-hour	0.08 (ppm)	0.08 (ppm)
<b>PM<sub>10</sub></b>		
24-hour	150 µg/m <sup>3</sup>	150 µg/m <sup>3</sup>
Annual	50 µg/m <sup>3</sup>	Revoked
<b>PM<sub>2.5</sub></b>		
24-hour	-	35 µg/m <sup>3</sup>
Annual	-	15.0 µg/m <sup>3</sup>
<b>Lead</b>		
Quarterly Average	1.5 µg/m <sup>3</sup>	1.5 µg/m <sup>3</sup>
<b>Hydrogen Sulfide</b>		
1-hour	35 µg/m <sup>3</sup>	-
Source: Environmental Protection Agency, Hawaii State Department of Health Abbreviations: ppm = parts per million; µg/m <sup>3</sup> = micrograms per cubic meter		

As mentioned earlier in this chapter, air quality on the west coast can be affected by vog (volcanic smog). The combination of the volcanic emissions with trade winds and other weather conditions can create spikes in sulfur dioxide to alert levels.

### **Water Quality**

The stormwater runoff generated from the airport rapidly percolates through the cracks and crevasses of the lava flow that lies beneath the airport and surrounding area. Water Quality

Monitoring was included as part of the November 2000 Environmental Assessment. According to the results of the monitoring, the sampled water fell within an acceptable water quality parameter. There were no unexpected features found within the water.

A new monitoring well is planned by the Palamaui development makai (west) of Queen Ka'ahumanu Highway near the ATCBI-5. This data will be incorporated into the airport's monitoring program to include potential effects migrating onto the airport property from this new offsite development.

The coastal nearshore waters have been identified by the Hawaii State Department of Health as Class AA waters. Class AA waters are intended to remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human caused source or actions. Class AA waters are the most stringently regulated of open coastal water classifications.

## **CULTURAL AND SECTION 4(f) RESOURCES**

### **Historical, Architectural, and Cultural Resources**

Determination of a project's impact to historic and cultural resources is made in compliance with the *National Historic Preservation Act (NHPA) of 1966*, as amended for federal undertakings. The NHPA requires that an initial re-

view be made of an undertaking's *Area of Potential Effect (APE)* to determine if any properties in or eligible for inclusion in the National Register of Historic Places are present in the area.

The coastal area, once a significant settlement area for the native Hawaiians, exhibits medium to high archaeological site densities, generally within 100 meters of the shore. Typical sites that are found include permanent house structures, subsidence sites, heiau, petroglyph clusters, temporary shelters, and coastal trails.

The airport and its environs have been surveyed numerous times for historical and cultural sites. In April of 2000, an archaeological survey was conducted to validate prior findings, identify potential new sites not previously studied, and to collect information on traditional native Hawaiian uses of the airport site. Six previously recorded sites were re-evaluated and it was confirmed within the Archaeological Survey that these sites are no longer significant. Three previously unidentified areas consisting of near-circular one- and two-course cobble and boulder alignments were found. These sites were described and photographed, and their locations were established for the record. The sites were evaluated due to the significant information regarding Hawaiian history and prehistory that they have yielded. Sufficient information has been gathered and documented from these sites. According to the 2000 Archaeological Survey, the sites are now considered "no longer significant."

**Department of Transportation**  
**Act: Section 4(f)**

Section 4(f) properties include publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance; or any land from a historic site of national, state, or local significance. **Exhibit 1Q** depicts the Section 4f properties located in the vicinity of Kona International Airport at Keahole.

The Mamalahoa Trail runs from Kailua/Kona north about seven miles to the 1801 lava flow near Keahole Point. The Mamalahoa Trail is a straight, curbed, cut and fill path that was built by labor forces conscripted by the island governors to transport food and other goods to the neighboring ahu-

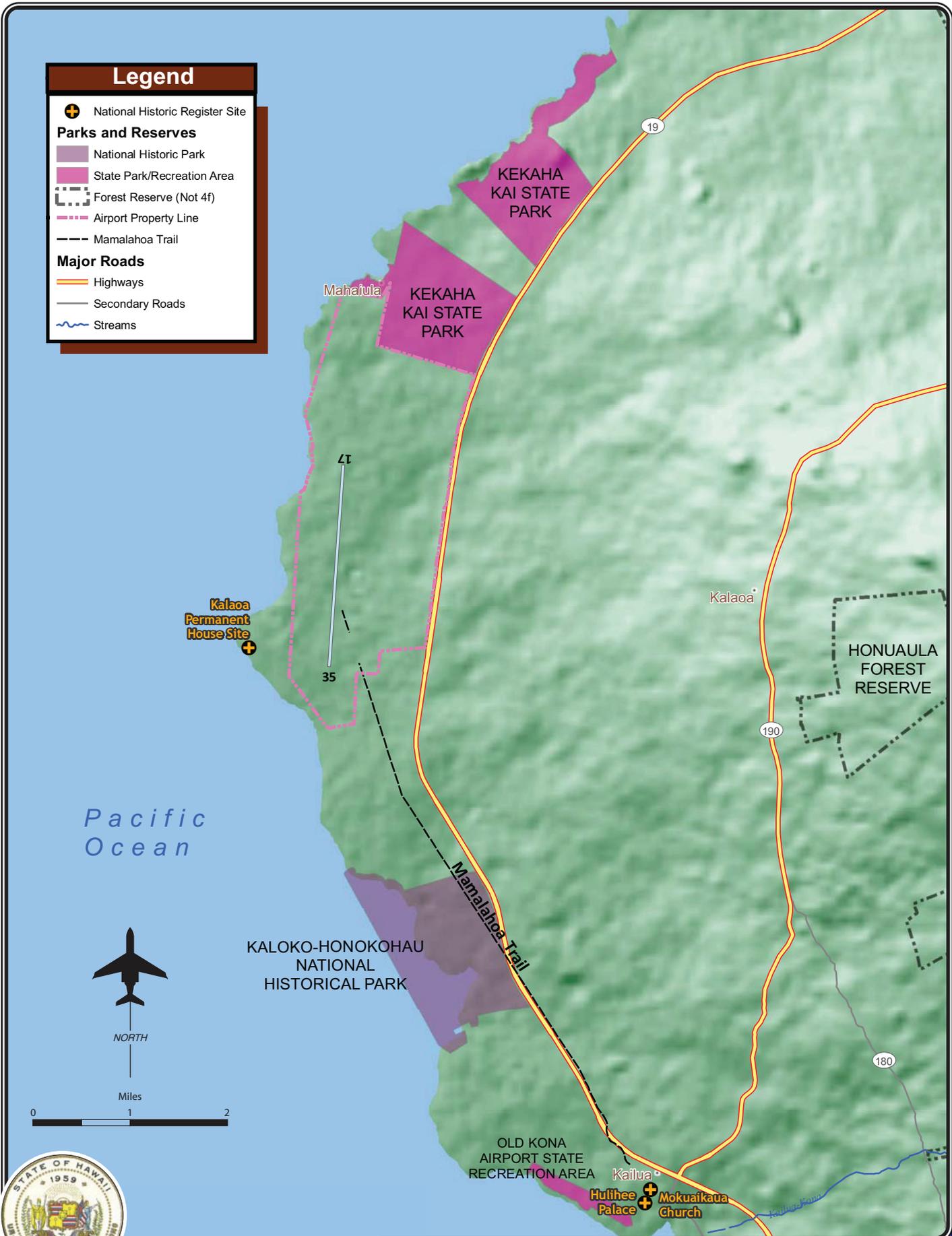
puaas and the harbor of Kailua/Kona. The Trail was also a major route along the west side of the island.

Numerous public recreation areas are located in the vicinity of the airport. Kaloko-Honokōhau National Historic Park is located approximately 3.5 miles south of the airport and is managed by the National Park Service. North of the airport approximately two miles is the Kekaha Kai State Park which is managed by the State of Hawaii Department of Land and Natural Resources.

Additionally, there are three sites listed on the National Register of Historic Places near the airport. These include Kalaoa Permanent House, Hulihee Palace, and Mokuaikaua Church.

**Legend**

- National Historic Register Site
- Parks and Reserves**
  - National Historic Park
  - State Park/Recreation Area
  - Forest Reserve (Not 4f)
  - Airport Property Line
  - Mamalahoe Trail
- Major Roads**
  - Highways
  - Secondary Roads
  - Streams



Pacific Ocean



NORTH

Miles

